3rd State of the Water Report for the Arab Region

2015

CEDARE
سيداري

المجلس العربي للمياه
Arab Water Council

OFID
THE OPEC FUND FOR INTERNATIONAL DEVELOPMENT

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Uniting against Poverty

Foreword

The Arab Region is facing one of the severest water scarcity crises in the world. Most of the Arab region lies in the arid and semi-arid zones. Rainfall is low, variable and unpredictable in most of the area. Several Arab countries are suffering from water deficiency and others are heading that way, with an annual population growth of about 3%. Above all, rising levels of water consumption due to socio-economic development have created a challenge of the first magnitude. Moreover, depletion of the non-renewable groundwater is extensive and the remaining water resources are polluted. Salt-water intrusion in many of the coastal aquifers is common. Conflicts in the region on shared international waters are higher than anywhere else in the world. Evidently, the world water crises of the future are already here in the Arab countries.

Today, in those countries, the question is whether a water crisis can be averted or whether water can be made more productive. The answer to this question relies on the way we are using and managing water resources in all water use sectors and the irrigation one in particular.

Improved water resources management and access to safe water and sanitation for all is hence essential for eradicating poverty, building peaceful and prosperous societies, and ensuring that "no one is left behind" on the path towards sustainable development.

The existence of reliable information and dependable assessment of water resources is certainly a pre-requisite for proper water management, successful development plans and soundly guided decision-making processes. From here stems the importance of the present series of reports on "State of the Water in the Arab Region," the 3rd edition of which (2015) is in hand, as an update of the previously published 1st and 2nd editions (2004 & 2012 respectively).

The State of the Water reports aim at providing an update of the country-level water resources and management assessment of the Arab region, and these Reports are regularly presented to the Arab Water Council (AWC) General Assembly every three years, pursuant to the AWC Constitution and By-Laws. It is truly considered a valuable piece of work to be consulted while outlining national water policies and projects.

Thanks are due to the inter-disciplinary team of experts, professionals, analysts, designers, IT and communication specialists, apart from the focal points of the 22 Arab countries who provided the inherent information, for their dedicated efforts and hard work to make this publication a successful output, reflecting the joint collaboration and effective partnership between CEDARE and AWC under the umbrella of the League of Arab States. A note of appreciation is importantly attributed to the OPEC Fund for International Development (OFID) for their generous contribution which made this "3rd Report on the State of the Water in the Arab Region" possible.

Prof. Dr. Mahmoud Abu-Zeid

President of the Arab Water Council

Former Minister of Water Resources and Irrigation, Egypt

Preface

The Centre for Environment and Development for the Arab Region and Europe (CEDARE) has long-standing and deeply-rooted cooperation with the Arab Water Council, at different fronts. High on the agenda is the regular publication of the widely-acclaimed State of the Water Report for the Arab Region, which was initiated in 2004.

CEDARE is proud of the fact that this third series is prepared also under the umbrella of the League of Arab States. Indeed, this would have not been possible without the tireless efforts of the National Focal Points from the Ministries of Water in the Arab Region, who consistently coordinated with several other officials in their countries.

230 indicators and parameters have been used to monitor change, progress and trends in the water sector in the Arab Region. Moreover, modern techniques and transformative technological developments in the world, such as Artificial Intelligence, and others, call upon us to adapt our methodologies and practices for the benefit of our people.

Remote sensing technology and satellite imagery, referred to in this Report, their evolution, accuracy and applications in assessment and management of water resources, provide information and data that are difficult to obtain under traditional methods, especially in remote areas and in sources of transboundary waters outside national and regional borders. Satellite data provide factual information on rainfall and agricultural water consumption as well as the impacts of land use change on water use. This is especially important where rain gauges, climate data and measurement stations are scarce. Technological developments in the field of water treatment, desalination and harvesting water vapor open many promising prospects to make use of every drop of water, whether, it exists in the atmosphere around us, or in the wastewater resulting from different uses, or in the seas, oceans or gulfs around the Arab Region.

This Report is a very useful resource for information required by decision makers, especially in pursuing the Water, Food, Energy Nexus approach, to achieve security in these three fundamentally important sectors.

That said, Climate Change is here, it is clear and it is urgent! It affects the volume and timing of the expected rainfall, as well as the agricultural water requirements. It is thus imperative to continue monitoring the impacts of these changes on water, using credible Reports, such as this.

Providing non-conventional and alternative energy and water resources, including new and renewable energy, particularly solar energy which is abundant in the Arab region, will address, and alleviate, harmful climate change emissions. In addition, non-conventional water resources, such as reusing wastewater and desalination, are areas where the Arab region has made extensive progress in size and technology. The report provides a thorough assessment of the status of non-conventional water resources in the Region.

We at CEDARE are committed to the development and publication of the State of the Water Reports in close cooperation with our leading partners: the Arab Water Council and the League of Arab States, as well as other notable institutions.

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Acronyms

AWC	Arab Water Council
BCM/y	Billion Cubic Metres per year
BOD	Biological Oxygen Demand
CEDARE	Centre for Environment and Development for the Arab Region and Europe
CM	Cubic Metres
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
EC	Electric Conductivity
EGI	External Groundwater Inflow
EGO	External Groundwater Outflow
ESWI	External Surface Water Inflow
ESWO	External Surface Water Outflow
ET	Evapotranspiration
FAO	Food and Agriculture Organization
FP	Focal Point
GIS	Geographic Information System
I	Indicator
IRG	Internal Renewable Groundwater
IRSW	Internal Renewable Surface Water
IWRM	Integrated Water Resources Management
KSA	Kingdom of Saudi Arabia
LAS	League of Arab States
m	Meters
MDGs	Millennium Development Goals
mm	Millimeters

NA	Not Available
NAp	Not Applicable
OFID	OPEC Fund for International Development
OSWG	Overlap between Surface Water and Groundwater
P	Parameter
PAD	Produced Agricultural Drainage
PDW	Produced Desalinated Water
PIW	Produced Industrial Wastewater
PMW	Produced Municipal Wastewater
RS	Remote Sensing
SDGs	Sustainable Development Goals
SOW	State of the Water
SOW3	3rd State of Water Report for the Arab Region
TAWR	Total Available Water Resources
TBWR	Total Blue Water Resources
TCWR	Total Conventional Water Resources
TDS	Total Dissolved Solids
TERBWR	Total External Renewable Blue Water Resources Inflow
TIRBWR	Total Internal Renewable Blue Water Resources
TNCWR	Total Non-Conventional Water Resources
TNRG	Total Exploitable Non-Renewable Groundwater
TRBG	Total Renewable Blue Groundwater
TRBSW	Total Renewable Blue Surface Water
TRBWR	Total Renewable Blue Water Resources
TRGWR	Total Renewable Green Water Resources
TRWR	Total Renewable Water Resources
UAE	United Arab Emirates

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Executive Summary

The Arab population in 2015 reached almost 400 million inhabitants representing about 5% of the world's population and residing on about 10% of the world's land area. While the global precipitation on land amounts to 110,000 BCM/y, the Arab Region receives only 1,462 BCM/y with a spatial average depth of about 115 mm. AQUASTAT, FAO, 2014 states that Egypt is the country with the lowest spatial average precipitation depth in the Arab region with 18.1 mm/year, followed by Libya with 56 mm/year and Saudi Arabia with 59 mm/year. The extreme aridity prevailing throughout most of the Arab countries indicates that the share of rainfall depth for the Arab Region is 28% of the global average rainfall water depth, while the Arab inhabitant is endowed with (nearly 300 m^3/cap/y) about 5% of the global per capita average share (nearly 6000 m^3/cap/y) of the internal blue renewable water resources as shown in Figure 1

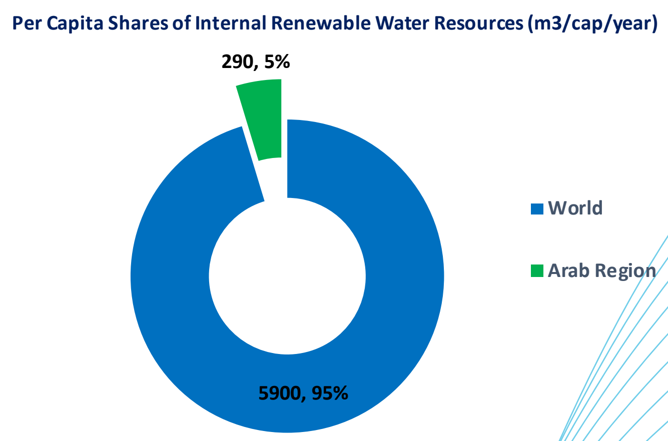


Figure 1. Per Capita Shares of Internal Renewable Water Resources for the Arab Region as compared to the Global Average Share

The critical status of water resources in the Arab Region (growing water scarcity, escalating water demands, and limited water resources) necessitates the existence of a reliable dynamic and periodical assessment and evaluation of all relevant water-related aspects. This document represents the third State of the Water Report for the Arab Region, and is hopefully intended to provide beneficial guidance to the water sector decision making process to support better water planning, management and development. The report is prepared by CEDARE and the Arab Water Council along with the focal points from the Ministries responsible for Water in the region, and is supported by The OPEC Fund for International Development (OFID). This report comprises nearly 230 indicators and parameters describing the State of the Water sector in the Arab Region. The indicators are classified into 15 major categories, namely; water & availability, water & uses, water

& land use changes, water & services, water & energy, water & population, water & health, water & quality, water & ecosystems, water & climate, water & socio-economics, water & finance, water & trade, water & governance, and water & international relations. Remote sensing techniques have been introduced to estimate many of the unmeasured/unreported parameters and to enhance the accuracy of others.

The available water resources may be distinguished according to five main classifications. The first categorization differentiates resources into conventional and non-conventional water resources. The latter is mainly attributed to three activities, namely; agricultural drainage reuse, municipal and industrial wastewater reuse, produced desalinated water, and also recycled groundwater recharged for surface water uses. Brackish groundwater presents potential addition to non-conventional water resources when economically desalinated. A double counting exists between both categories since agricultural drainage potential reuse for irrigation water, produced municipal and industrial wastewater, and recycled groundwater have already been counted as conventional resources. Figure 2 shows that the total conventional water resources for the Arab Region sums up to 709.97 BCM and the gross produced non-conventional water resources adds up to 73.55 BCM. A double counting of about 60.84 BCM exists, but it provides an amount of water that could be withdrawn again for reuse, some of which after treatment. The full amount could be reused if Zero Liquid Discharge (ZLD) is to be achieved.

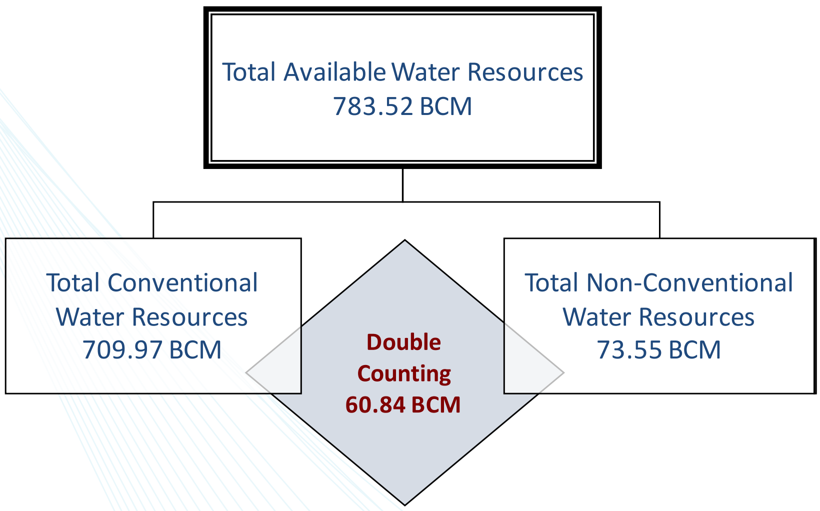


Figure 2. Conventional and Non-Conventional Water Resources in the Arab Region.

The second classification refers to whether renewable water resources for beneficial water abstractions are directly from rainfall atmospheric water (Green Water) or from surface water bodies and groundwater aquifers (Blue Water). Typically, abstractions for rainfed forests, pasture, and rainfed agriculture that are mainly fed from precipitation, are referred to as Green Water. Blue Water is simply the water that could be extracted from surface water bodies and groundwater aquifers. Figure 3 indicates that nearly two thirds (62%) of the annual conventional water resources are attributed to green water (442.88 BCM) while 38% are attributed to blue water (267.09 BCM). This highlights the significance of green water, and accordingly, any national or regional assessment which does not properly account for green water in its budget has to be rendered incomplete. In the Arab Region, natural pasture lands consumes about 48% of the green water (212.07 BCM), while Forests consume nearly 18% (80.29BCM) and rainfed agriculture consumes about 150.52 BCM/y.

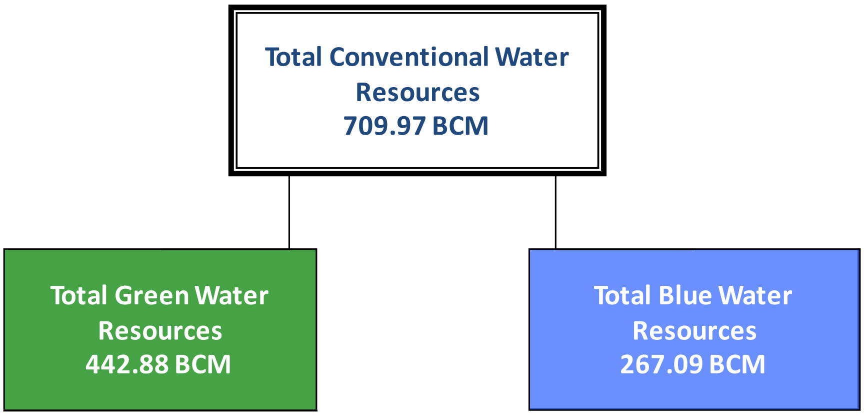


Figure 3. Green and Blue Water Resources in the Arab Region.

The water resources may be further categorized according to its renewability. Renewable resources are those which, when abstracted for beneficial use, are being replenished (renewed) annually through rainfall and/or natural surface and groundwater flows crossing the national bounders. Consequently, all green waters are considered renewable. Non-renewable water resources, like fossil aquifers, are non-recoverable, and are not replenished upon abstraction. Distinction according to renewability of resources is displayed in Figure 4. The total annual renewable water resources (green and blue) are estimated as 663.29 BCM. 82% of the total blue water (267.09 BCM) is attributed to renewable water resources, while potentially planned annual abstractions from non-renewable fossil groundwater were estimated as contributing to the remaining 18% (46.68 BCM).

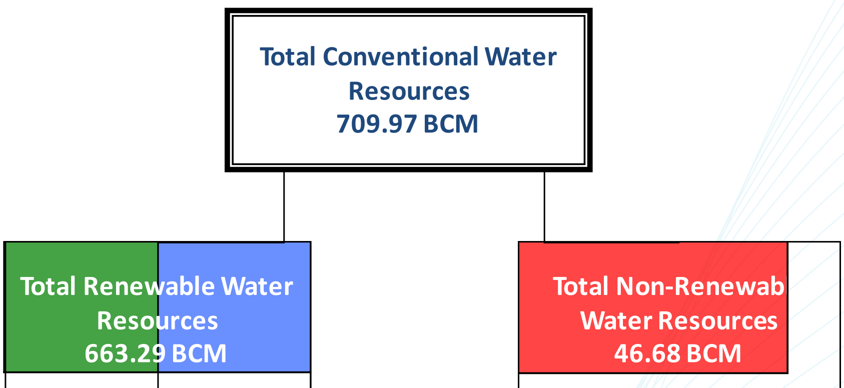


Figure 4. Renewable and Non-Renewable Water Resources in the Arab Region.

Similarly, water resources may also be differentiated according to whether they have been generated inside the national (or regional) territories, or outside of it. Endogenous precipitation, which occurs in the boundaries of each country, is the source of internal renewable water resources, (IRWR). Equivalently, incoming surface and groundwater flows, which cross the boundaries of a country (or region), account for externally generated water resources. Figure 5 shows that 581.20 BCM of water are annually available internally (including green water, renewable and non-renewable groundwater). The net external water resources represent the difference between the inflows and the outflows to the Arab countries including both surface water and groundwater.

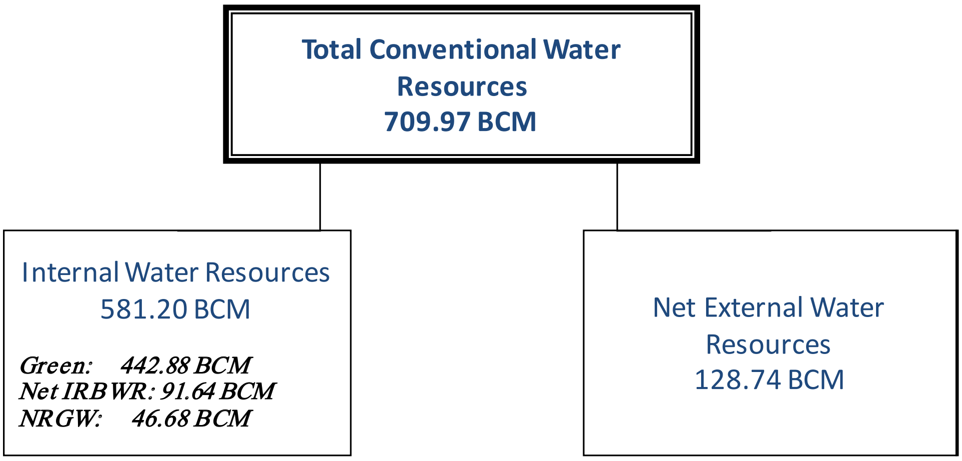


Figure 5. Internally and Externally Generated Water Resources for the Arab Region.

Moreover, the blue water resources may be also categorized as surface water resources and groundwater resources. Surface water constitutes nearly two thirds of the total blue water resources as depicted from Figure 6. The total internal renewable blue water resources equals to 91.68 BCM, which is the sum of the renewable surface blue water (69.11 BCM) and the renewable groundwater (41.27 BCM) excluding the overlap between surface and groundwater (18.7 BCM). Furthermore, 163.16 BCM of renewable blue water are being generated outside the Arab Region and are being transferred, mainly through the shared rivers of the Nile, Tigris, Euphrates, and Senegal, as well as some transboundary groundwater inflows. It represents 64% of the sum of the internal and external (to the region) renewable blue water resources (254.84 BCM). The net external renewable blue water resources equals to 128.74 BCM, which is the sum of the net external surface blue water (118.24 BCM) and the next external groundwater (10.5 BCM). It represents 58% of the sum (220.42BCM) of the net external renewable blue water resources and internal renewable blue water resources.

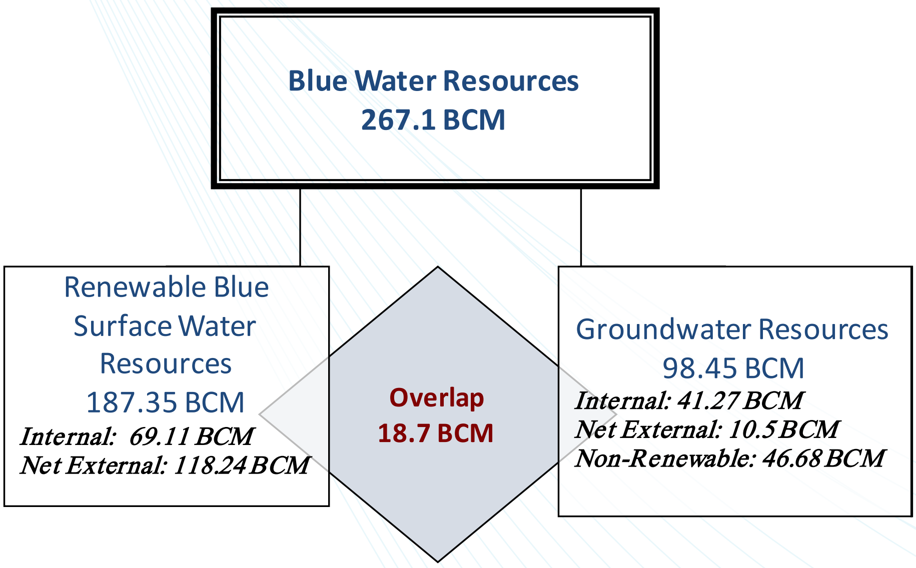


Figure 6. Surface and Ground Water Resources for the Arab Region.

The water sector in almost all Arab countries is under stress with different levels of severity and different stages of vulnerability. Upstream water development projects, for shared rivers, constitute an enormous threat to water security for the whole region. Severe impacts are already encountered by Syrian and Iraq.

The State of Water resources in the Arab Region representing the year 2015 is shown in Chart 1 while the State of Water based on the long term averages is shown in Chart 2. Table 1 and Table 2 in the Annex provide futher detailes to the different values shown in the state of the water resources in the Arab region charts.

As an example, for the difference between the former two approaches, Figure 7 displays the rainfall depth distribution per country based on: (i) the long-term average (as reported in the FAO Aquastat database), and (ii) the values reported by each country for the precipitation occurring during the year 2015, specifically. Remote sensing derived values are also added. About half of the countries have reported rainfall values in 2015 which are less than the long-term average. On the other hand, remote sensing values for 9 countries were higher than the long-term average. Qatar and Libya reported values equal to the long-term average.

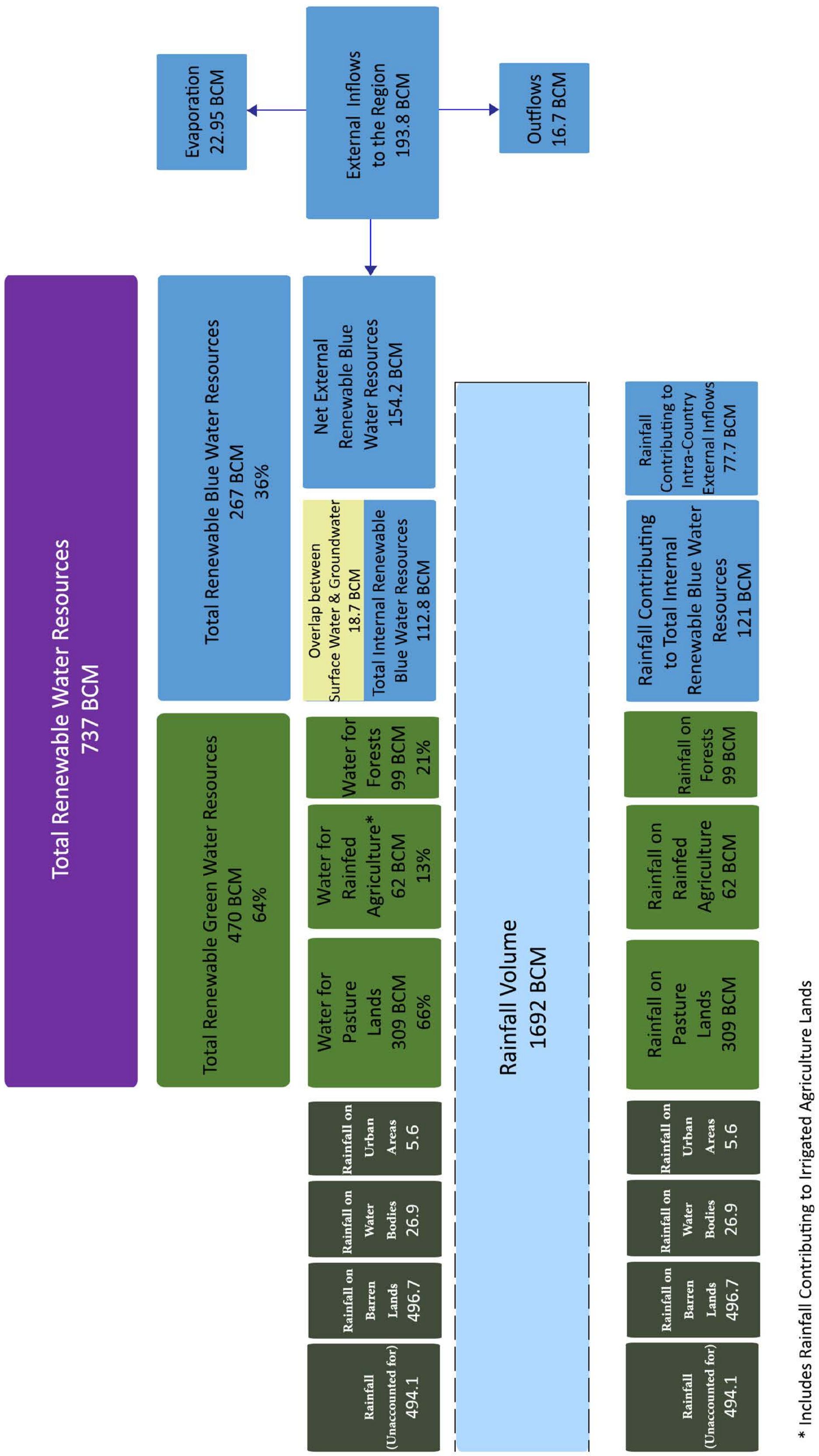


Chart 1. Estimated Long Term Annual Average State of the Arab Water Resources at a Glance

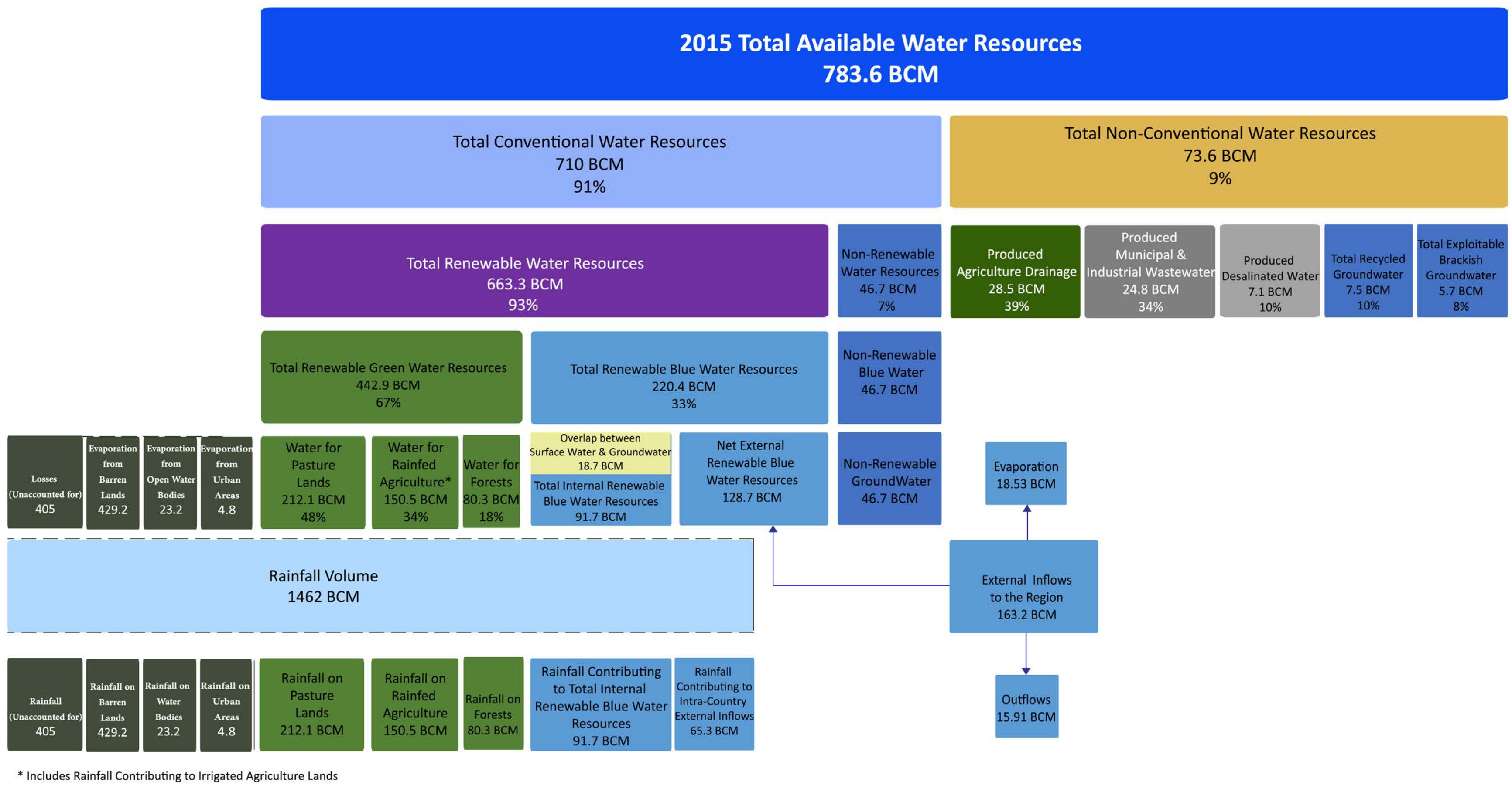


Chart 2. 2015 Annual State of the Arab Water Resources at a Glance

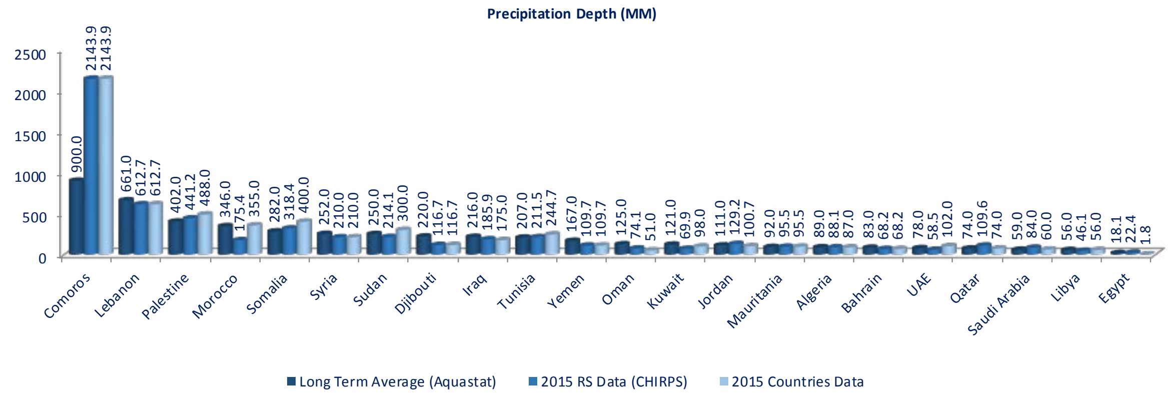


Figure 7. Long Term Average versus 2015 Precipitation (Remote Sensing & Country data).

The total annual water withdrawals from blue water resources sum up to 235.13 BCM. The agricultural sector uses 81% of total withdrawals (190.10 BCM). Domestic withdrawals add up to 32.88 BCM (14% of total) while the industrial sector uses about 5% (11.17 BCM). It has to be clear that the total agricultural uses amount to 293.68 BCM, where more than one third (103.56 BCM) is being satisfied directly from precipitation through green water (rainfed agriculture). The total irrigated agricultural lands in the Arab region amounts to 12.63 million hectares, where nearly half of these areas belong to Egypt and Iraq. Rainfed agricultural covers an area of 46.72 million hectares with more than one third of the areas (38%) pertaining to Sudan.

About 88% of total withdrawals are attributed to conventional water resources while 12% is derived from non-conventional resources, mainly agricultural drainage reuse. Annual withdrawals from blue water resources are equal to 205.76 BCM, which exceeds 77% of the total blue water resources. The average per capita share of withdrawals from total renewable blue water resources is nearly equal to 575 CM/y. The former numbers reflect a remarkably high level of water stress and provide additional pressure on already vulnerable fossil groundwater resources. 17 Arab countries are below the scarcity limit (1000 CM/cap/y) and 13 countries are below the severe water scarcity limit (500 CM/cap/y). The highest per capita share of agricultural water withdrawals occurs in Iraq (880 CM/cap/y), while the highest per capita share of industrial water withdrawals occurs in Egypt (60 CM/cap/y). Kuwait is providing a remarkably high share of domestic water equivalent to 235 CM/cap/y while the average share of domestic supplies in Somalia is less than 2 CM/cap/y.

Urban encroachment on green cover has expanded by 188,267 ha between the years 2012 and 2015. New communities and settlements have been built over 43,821 ha of previously classified desert lands. Unfortunately, new urban developments have been replacing other natural and/or beneficial land uses. In a region where 83% of the total area is mere desert, it seems highly inappropriate to expand in developments on the expense of scarcely available green areas.

In regards to water and sanitation services, country reporting shows that 79% of the total Arab population benefits from piped water connections on the premises of their dwellings. 86% of the total Arab population have access to improved drinking water services, while 76% have access to improved sanitation services, 63 million persons are still deprived from improved drinking water services, and 79 million inhabitants are equally deprived from improved sanitation services. A special section is devoted for reporting on the progress in achieving Sustainable Development Goal 6 (SDG6), which is concerned for achieving commitments towards provision of clean water and sanitation for all people. Eight targets along with their various indicators are being processed for all Arab countries.

Nearly one million kilometers of drinking water networks do exist in the Arab Region. Lengths of sewage or wastewater collection networks are significantly less, summing up to 183 thousand kilometers or nearly 20% of the water supply networks. At least 43% deficit in wastewater collection may be revealed. Municipal wastewater treatment capacity is estimated at nearly 71% of wastewater collection capacity.

The Joint Monitoring Program for Water Supply, Sanitation and Hygiene, supported by WHO/UNICEF, (JMP) estimates that 63% of rural Arab population have their drinking water accessible on premises as compared to 87% for urban communities. Population suffering from unimproved drinking water services has shrunk from 12% to 3% between the years 2000 and 2015. JMP further estimates that the percent of rural population receiving at least basic sanitation services reaches 68% in 2015 as compared to 84% for urban communities. Unfortunately, the portion of population subjected to unimproved sanitation services remains constant at 7%. 14% of rural populations in Arab countries still practice open defecation.

Country reports on several water borne diseases have shown a steady decline. While the number of incidents infected by dracunculiasis (Guinea worm) in some Arab countries were in the order of hundred thousand in 1996, it dropped to the order of tens of thousands in 2006. The last reporting show rare cases less that ten. Nevertheless, proper assessment for the situation in countries with political unrest may reveal a different status.

The Arab region generates roughly 35,127 GWH per year of electricity generated using hydropower as of 2015. Nearly 41% of the hydropower is generated in Egypt (15,510 GWh/y). Sudan and Syria generate about 44% of the total hydropower. Political unrest has affected water infrastructure and the ability for monitoring and evaluation of the water sector in several countries in the region such as Syria, Libya and others, including the repercussion of the war in Iraq.

The wetlands in the Arab Region, which are internationally acknowledged by RAMSAR sums up to 157 site, mostly in African countries. The wetlands cover an area of about nine million hectares, one third of which are in the Algerian territories.

Impacts of climate change are experienced in the day to day realities in the Arab Region, spreading desertification, devastating flash floods and prolonged droughts. Although this report include data on the numbers of drought and flooding events in some countries (including a total of 96 flooding events resulting in 665 human losses and 840 million USD of direct economic losses), yet these are insufficient to depict climate trends. The Arab countries may be lacking basic tools (and plans) to assess and monitor changes in the climate. There is an urgent need to adopt a regional program for comprehensive assessment and basic periodic monitoring for climate parameters.

Agricultural water productivity for the main food producing countries (Egypt, Sudan and Syria) report values in the range of 0.34 to 0.6 $/CM. The job per drop indicator (or the sectorial employment level) indicates 110, 54 and 20 jobs per million cubic meters of irrigation water in Egypt, Sudan and Syria respectively. Industrial water productivity is expected to be higher. Countries report a very wide range for industrial water productivity, especially in Gulf countries, which raises the average industrial water productivity to 753 USD/CM. Furthermore, the average employment in the agricultural sector amounts to 900 job per million m3 of water while employment in industry reaches 17,000 job per million m3 of water.

In Kuwait, 18.4 % of the national budget is directed towards water and sanitation programs as compared to 1.9% in Tunisia and 1.3% in Egypt. The percentage of GDP directed to sanitation & hygiene is as high as 10.9% in Jordan and as low as 0.06% in Sudan. The cost recovery for operation and maintenance for water and sanitation services reaches 83% in Jordan and 80% in Tunisia, 75% for Egypt and UAE, and 9% for Iraq.

In 2015, The Arab countries have imported 128.4 million Metric Ton of agricultural food and livestock products which a value of 70.7 Billion USD and exported about 18.3 million Metric Tons of agricultural food and livestock valuing around15.96 billion USD. The Arab countries imported 288 BCM of virtual water embedded in these food products, while the virtual water exported was about 33.4 BCM. About half of the imported virtual water for food serves three products; wheat, dairy products, and cooking oils. Wheat consumes nearly 20% of the total imports (55.3 BCM/y). The water used for local food production has increased from 282 BCM/y in 2012 to 324 BCM/y in 2015.

Arab Regional State of the Water Analysis

1. Water & Availability

The Arab Region spans an area of nearly thirteen thousand square kilometers extending from the Arabian Gulf in the east to the Atlantic Ocean in the West and from the Mediterranean Sea on the North to the Arabian Sea, the Indian Ocean and central Africa on the South. Arab countries cover 10 percent of the world's area but receive only about 1.5% of its average annual precipitation volume. The scarce precipitation is widely variable in space and time. Most of the rain occurs as seasonal showers at the African equatorial belt and along the Mediterranean coastal zones. Flash floods, however, provide another source for precipitation in arid and hyper arid wadies of the Arabian Peninsula, the Red Sea mountains, the Maghreb systems, and others. In fact annual precipitation may vary from null value in the Sahara great desert to 600 mm in the Lebanese high lands and even in excess of 2100 mm in Comoros. Direct and indirect beneficial water uses accounts to less than 15% of the total rainfall received by the Arab Region when compared to a global average that exceeds 50%. This reflects the extreme aridity prevailing throughout most of the Arab countries.

In this report, a new approach has been followed to estimate both; the precipitation volume and the average rainfall depths. This adopts the approach by the Climate Hazards Group Infrared Precipitation with Station data (CHIRPS). CHIRPS is a 30+ year quasi-global rainfall spanning 50°S - 50°N (and all longitudes), starting in 1981 to near present, CHIRPS incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series for trend analysis and seasonal drought monitoring.

Two CHIRPS products are produced operationally. A preliminary version product is available, for the entire domain, 2 days after the end of a pentad (2nd, 7th, 12th, 17th, 22nd and 27th). This version uses a single station source, Global Telecommunications System (GTS). As of February 12th, 2015 a final CHIRPS product takes advantage of several other stations sources and is complete sometime after the 15th of the following month. Final monthly, dekad (ten days), pentad (five days) and daily products are calculated at that time.

CHIRPS, as explained by its team, (Funk, et al (2015)), uses the Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis version 7 (TMPA 3B42 v7) to calibrate global Cold Cloud Duration (CCD) rainfall estimates. Estimating rainfall variations in space and time is an important aspect of drought early warning and environmental monitoring. An evolving dryer-than-normal season must be placed in historical context so that the severity of rainfall deficits may be quickly evaluated. However, estimates derived from satellite data provide areal averages that suffer from biases due to complex terrain, which often underestimate the intensity of extreme precipitations events. Conversely, precipitation grids produced from station data suffer in more rural regions where there are less rain gauge stations. CHIRPS was created in collaboration with scientists at the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center in order to deliver reliable, up to date, and more complete datasets for a number of early warning objectives (such as trend analysis and seasonal drought monitoring).

Early research focused on combining models of terrain-induced precipitation enhancement with interpolated station data. More recently, new resources of satellite observations such as gridded satellite-based precipitation estimates from NASA and NOAA have been leveraged to build high resolution (0.05°) gridded precipitation climatologies. When applied to satellite-based precipitation fields, these improved climatologies can remove systematic bias, a key technique in the production of the 1981 to near-present CHIRPS dataset.

1.1- Precipitation

Country reporting shows that the total precipitation volume is assessed at 1462 BCM for the year 2015 with an average precipitation depth of 270 mm among the countries. Alternatively, the average precipitation depth could be assessed at 115 mm if the Regional volume of precipitation is divided over the whole Arab Region area. When compared to the previous State of Water Report we find that the total rainfall volume was 1383 BCM in 2012 compared to 1462 BCM in 2015. The significance of any trend deducted from the former two volumes is highly debatable. Variations in rainfall are high both; between countries and in the same country. Figure 8 shows the distribution of average rainfall depth among different countries. Figure 9 shows the total volume of precipitation received by each country.

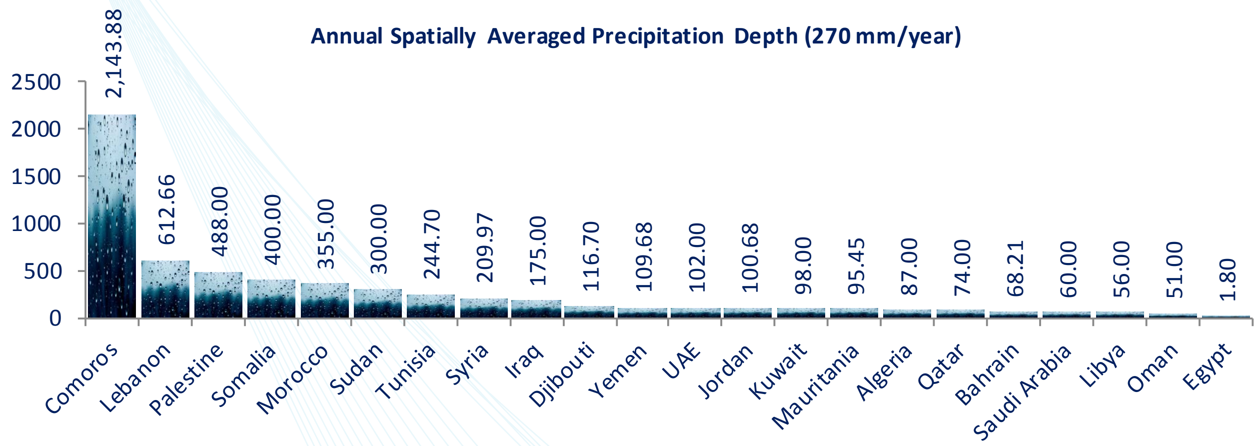


Figure 8. Average Annual Rainfall Depths Received by Arab Countries

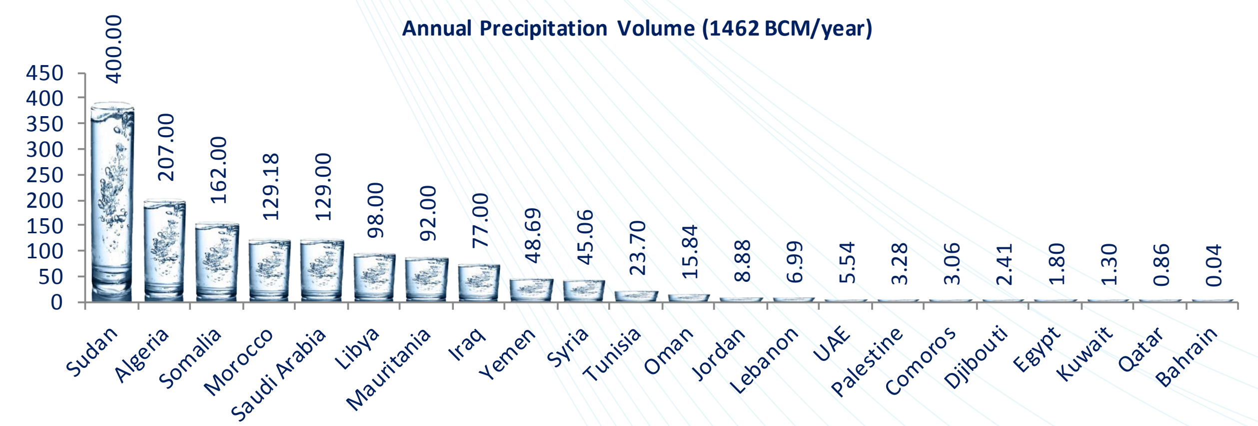


Figure 9. Annual Rainfall Volumes Received by Arab Countries

It can be easily depicted that Sudan receives about 27% of the total rainfall volume of the Arab Region (400 BCM/y), mostly occurring along its southern equatorial lands. Eleven countries, accounting for half of the Arab countries, receiving all together less than 3.5% of the total precipitation volume (about 50 BCM/y). These are not by default the most arid countries, namely: the Gulf countries, apart from Saudi Arabia, in addition to Djibouti, Palestine, Comoros, Lebanon, Jordan, and Egypt. Figure 10, which displays both precipitation volumes and depths together, provides an explanation. While Lebanon enjoys the second highest precipitation depth (612.7 mm) it receives less than 0.4% of the total precipitation volume (6.99 BCM/y) due to its relatively small effective rainfall area (10,450 sqkm). Comoros exhibits a sharper trend receiving the highest precipitation depth (2,144 mm) with only 0.2% of the total precipitation volume (3.06 BCM/y) due to its minor effective rainfall area (1,861 sqkm). Furthermore, snow fall and hail fall volumes at reporting countries are included in Figure 11.

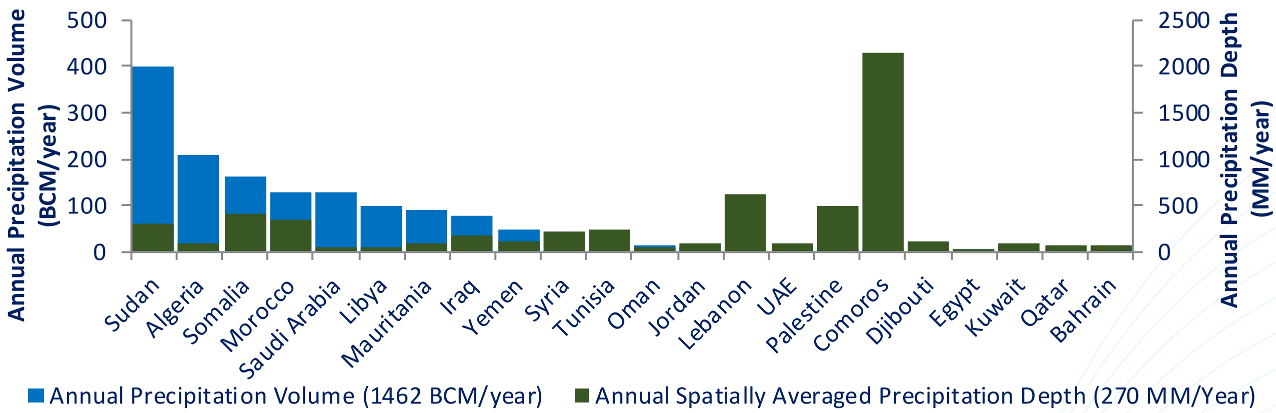


Figure 10. Annual Rainfall Distributions in the Arab Region

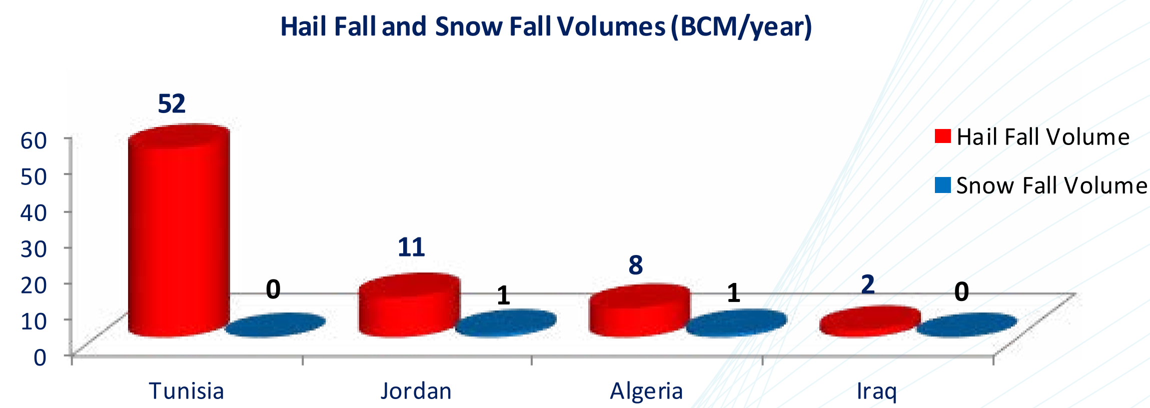


Figure 11. Annual Rainfall Distributions in the Arab Region

1.1.1- Remote Sensing Estimates for Precipitation

As previously mentioned, a remote sensing based approach is applied to identify the rainfall depths falling over all pixels, which cover the Arab region. A GIS methodology is then applied to calculate the precipitation volume in billion cubic meters (BCM) through integrating the rainfall depths over the effective rainfall area throughout a one-year period. The total annual rainfall volume, for the year 2015, amounts to about 1585 BCM with a spatial average depth of 254 mm. Figure 12 and Figure 13 show the 2015 annual precipitation volumes and depths for the Arab countries by using the CHIRPS data. Values below 25 mm were eliminated from the precipitation data to reduce the uncertainties associated with the CHIRPS data. Map 1 shows the spatial distribution of precipitation depth in the Arab Region.

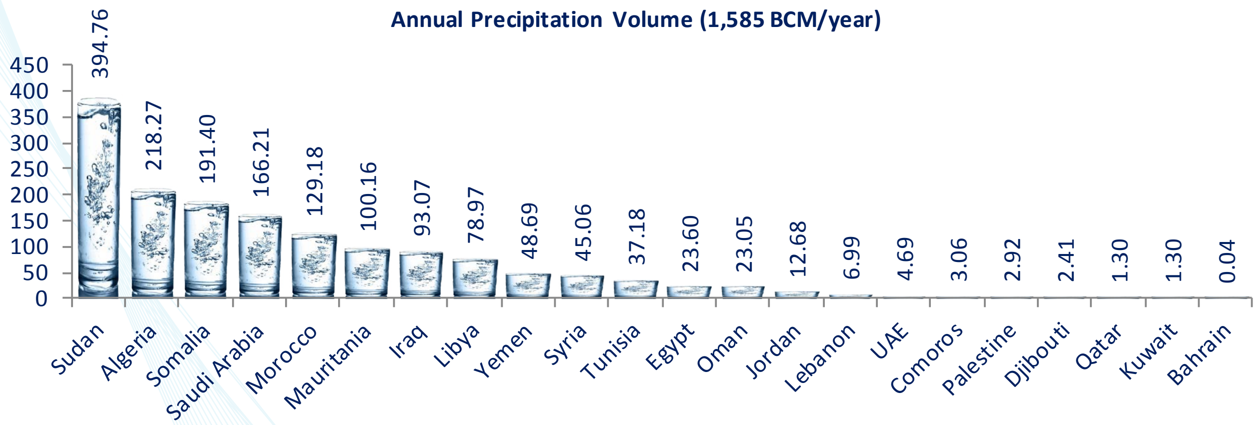


Figure 12. 2015 Annual Precipitation Volume (CHIRPS, 2015)

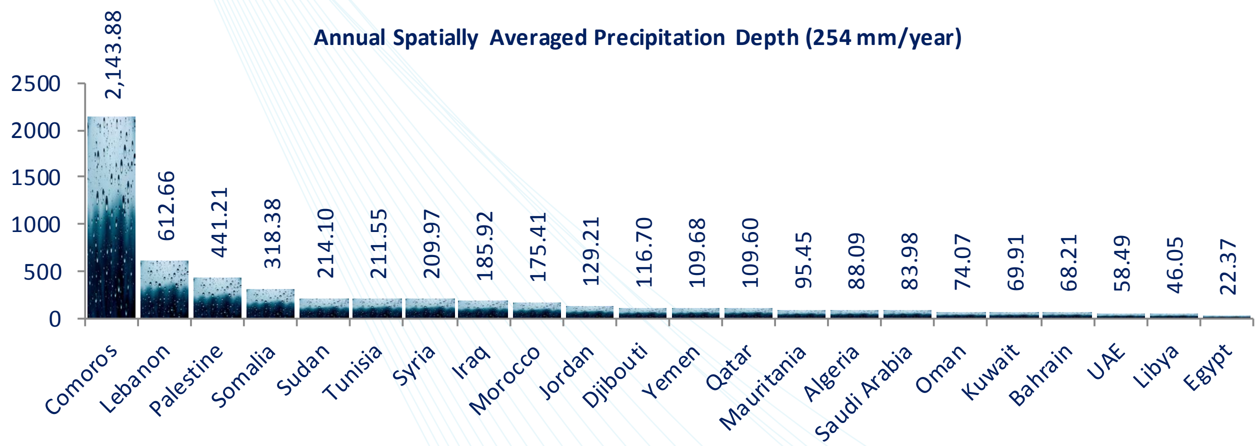
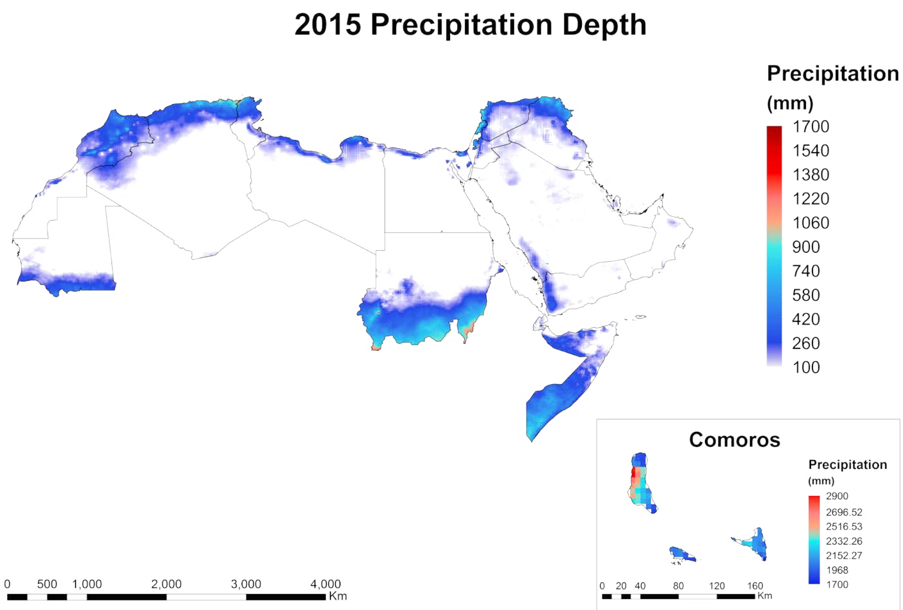


Figure 13. 2015 Annual Precipitation Depth (CHIRPS, 2015)



Map 1. Spatial Distribution of Precipitation Depth in the Arab Region

It is worth mentioning that the long-term average rainfall for the Arab region, as assessed by FAO-Aquastat, amounts to about 1692 BCM/y. Figure 14 compares between the long-term average (for all countries) and the remote sensing derived rainfall for the year 2015. The figure shows that ten out of twenty two countries exhibit an increase in rainfall above the long-term average. Twelve countries showed a decrease in rainfall following the regional precipitation which exhibits an overall reduction below the long-term average of about 6.3%. Changes in rainfall is related to various climatic factors. While a changing climate is an unequivocal fact, yet impacts on rainfall intensity and quantity differ widely from one location to another, even in the same region. More rigorous monitoring and more in depth analysis are recommended to arrive at a fairly reliable conclusion regarding future precipitation trends.

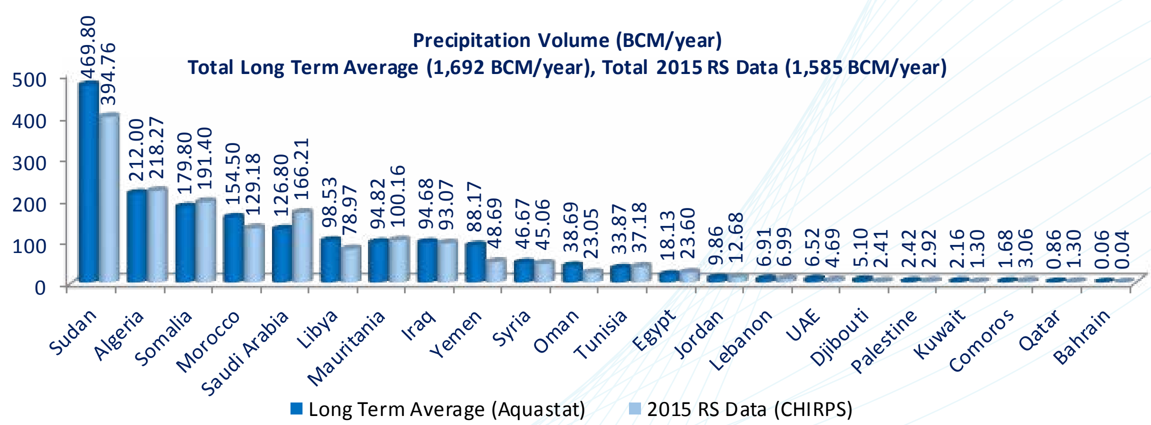


Figure 14. Long Term Average versus 2015 Remote Sensing Precipitation

1.2- Blue Water

Blue water is simply the water that could be extracted from surface water bodies and groundwater aquifers. Part of the blue water is renewed annually through rainfalls and/or natural surface and groundwater flows crossing the national bounders. The latter part, when abstracted, is expected to be replenished (renewable blue water resources). The other part of the blue water is non recoverable, not replenished upon abstraction, and is known as non-renewable blue water resources. This last part is associated with abstractions from fossil groundwater that doesn't receive significant recharge. An overlap between blue surface water resources and blue groundwater resources do exist when rainfall supplies surface stream, then this surface stream supplies groundwater. Also large-scale recharge schemes for treated wastewater represent another example for overlap. When comparing water resources for countries, the latter overlap has to be ruled out (cancelled) before arriving at the correct values for the total blue water resources. Renewable blue water resources may originate outside the national boundaries (external renewable blue water resources) or through endogenous precipitation (internal renewable blue water resources).

Endogenous precipitation, which occurs in the boundaries of each country, is the source of internal renewable water resources, (IRWR). That part of annual endogenous precipitation, which is channeled through rivers, streams, surface reservoirs, and infiltrated through the ground to recharge groundwater aquifers, is termed as total internal renewable blue water resources (TIRBWR). Simply, this is the part of water resources that is renewed annually by national rainfalls and available for extraction.

Internal renewable blue water resources for the Arab Region are plotted in Figure 15. The figure illustrates 69.1 BCM for surface renewable water resources and 41.27 BCM for renewable groundwater resources along with an overlap of 18.74 BCM. The total internal renewable blue water resources (TIRBWR) per country is displayed in Figure 16.

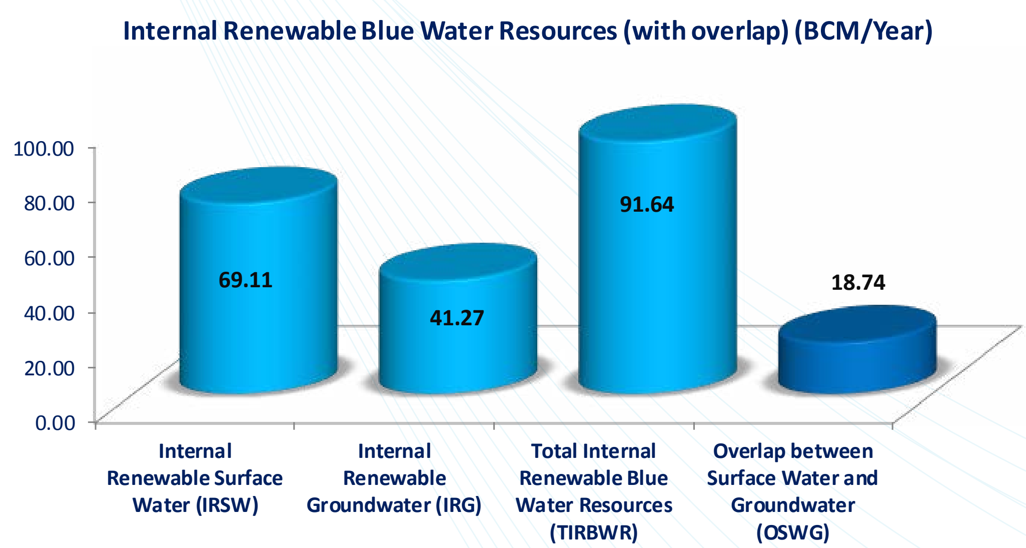


Figure 15. Surface & Groundwater Internal Renewable Blue Water Resources in the Arab Region

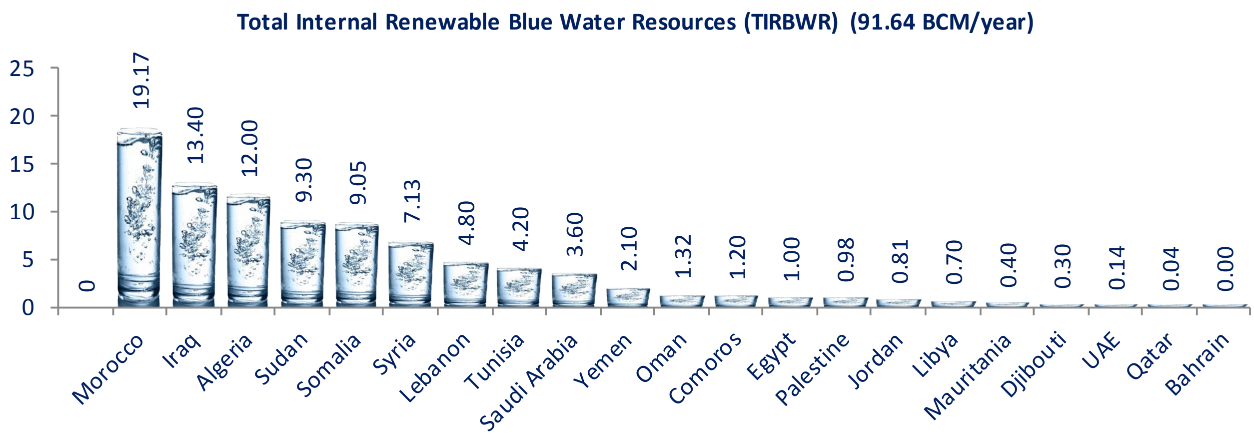


Figure 16. Total Internal Renewable Blue Water Resources (TIRBWR) for the Arab Countries

Figure 17 shows that the total annual blue water resources for the Arab region amounts to 267.09 BCM/y. 83% of the total blue waters (220.41 BCM) is attributed to renewable water resources, while allowable abstractions from non-renewable fossil groundwater contribute the remaining 17% (46.68 BCM).

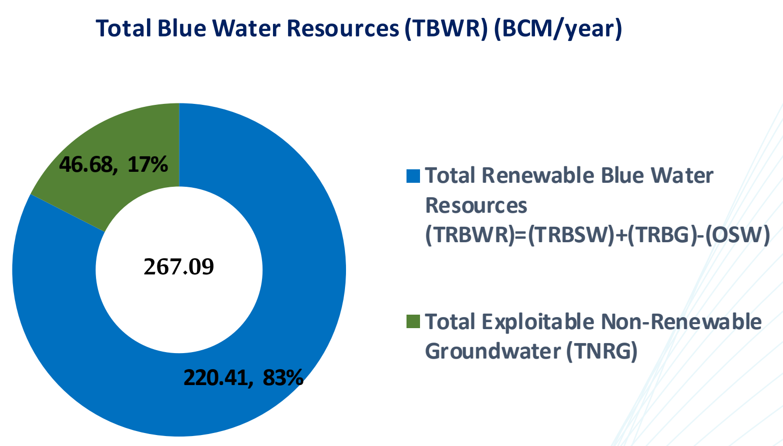


Figure 17. Total Blue Water Resources in the Arab Region

Figure 18 shows that surface waters contributes to 187.34 BCM (85%) of the total renewable blue water resources (220.38 BCM). The remaining 15% (51.77 BCM) originates from groundwater that is replenished by endogenous rainfall. An overlap between surface and groundwater resources of the order of 18.74 BCM exists. The total exploitable non-renewable groundwater sums up to 46.68 BCM and is distributed between six main countries (Sudan, Saudi Arabia, Egypt, Algeria, Libya, and UAE) as given by Figure 19. Figure 20 displays the Total Renewable Blue Water Resources (TRBWR) per each country.

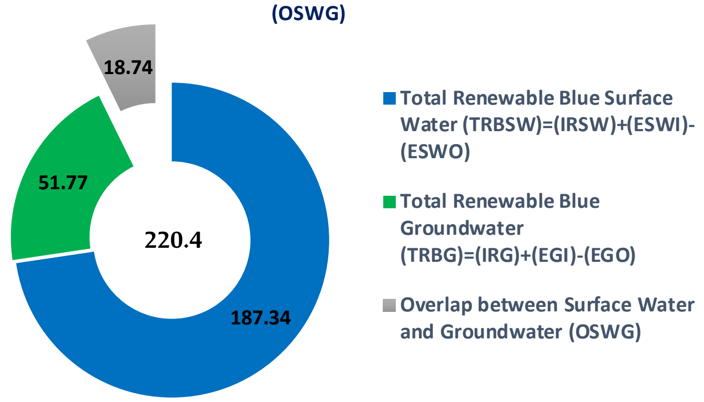


Figure 18. Total Renewable Blue Water Resources in the Arab Region (TRBWR)

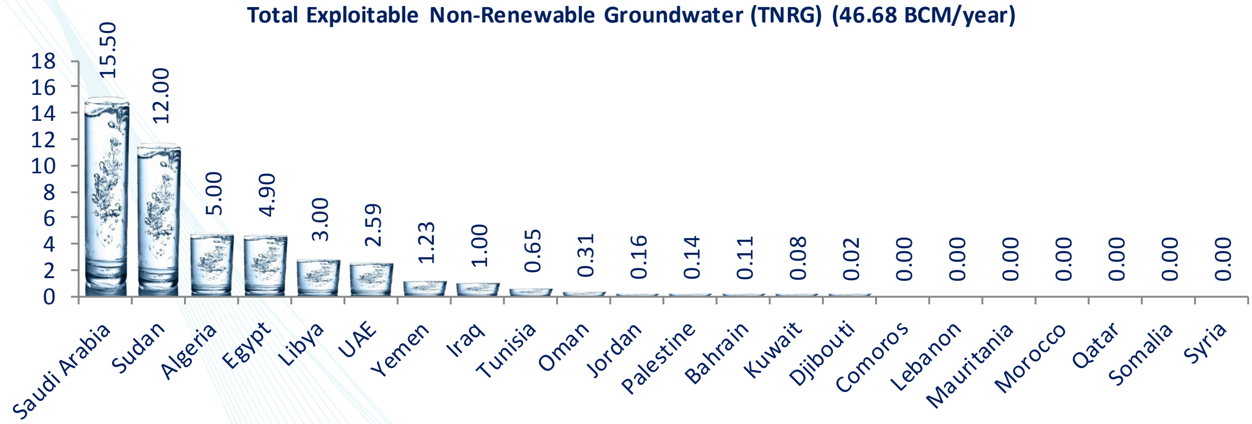


Figure 19. Total Blue Water Resources in the Arab Region (TBWR) for the Arab Countries

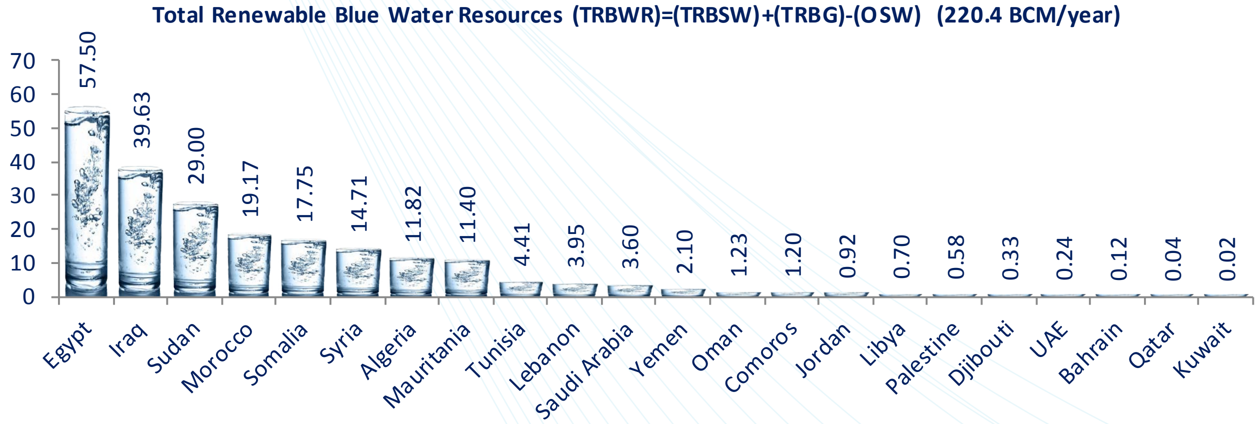


Figure 20. Total Renewable Blue Water Resources for the Arab Countries

The external renewable blue water inflows can be defined as the external inflow to the "Arab Region" from countries outside the region (this mainly represent flows for the rivers: Nile, Tigris, Euphrates, and Senegal and other groundwater inflows). It could also be defined as the total external renewable blue water inflows to each of the "Arab Countries", which includes intra-country double-counting. Figure 21 shows the renewable water resources in the Arab region including the external renewable blue water resources inflow to the "Arab Countries", while Figure 22 shows the renewable water resources including the external renewable blue water resources inflow to the "Arab Region" including blue and green water. The external renewable blue water resources represents 23% of the renewable water resources. Figure 23 shows the external/internal renewable blue water resources. It can be depicted that the external flows to the "Arab Region" represents about 64% of the total renewable blue water resources.

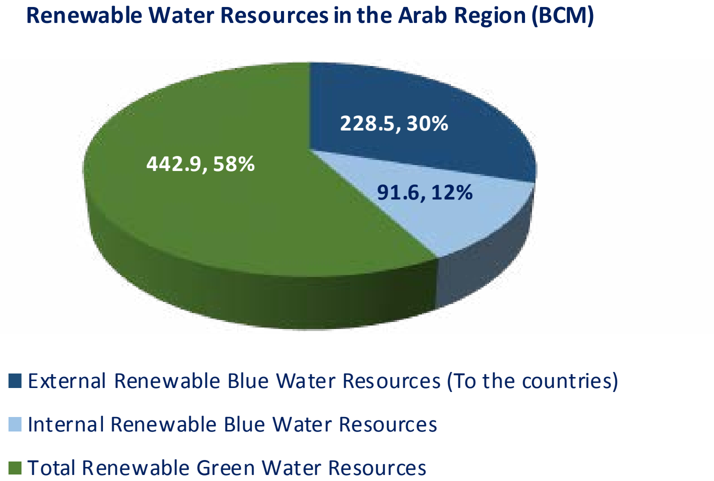


Figure 21. Renewable Water Resources in the Arab Region (incl. intra-country double counting)

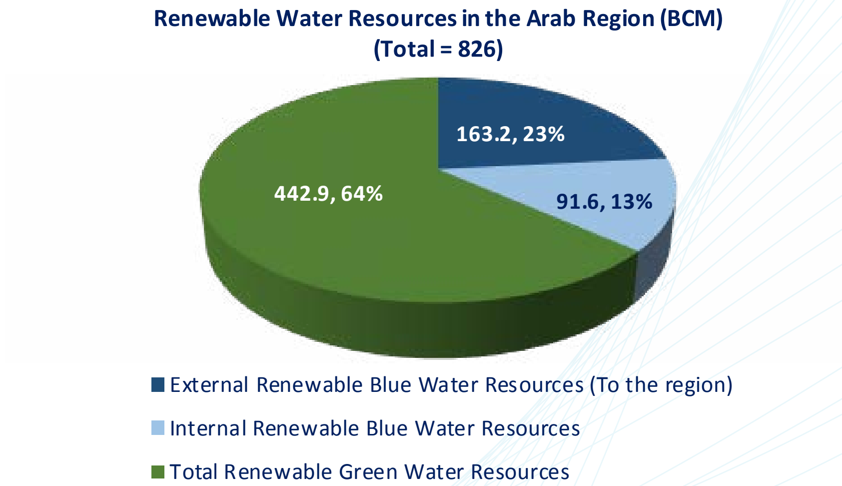


Figure 22. Renewable Water Resources in the Arab Region

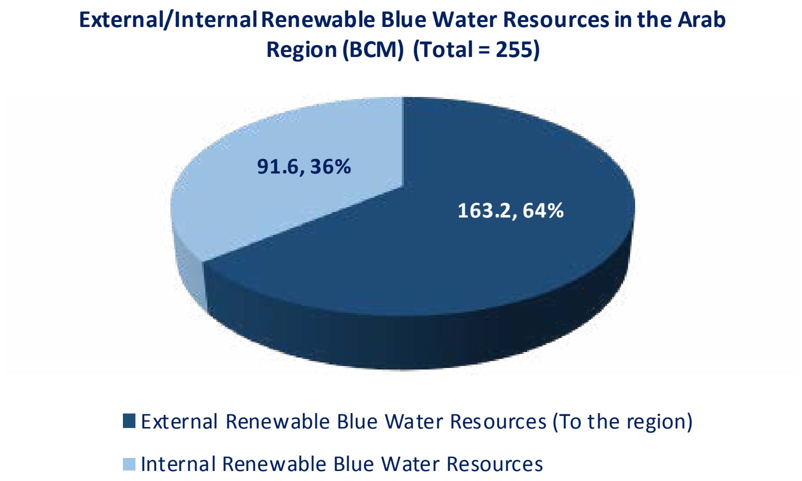


Figure 23. External/Internal Renewable Blue Water Resources in the Arab Region

The distinction between internal and the "Net" external blue water resources is shown in Figure 24. It is clear that about 58% (128.74 BCM) of the total renewable blue water resources of the Arab countries is attributed to, by the "Net" External Blue Water Resources (Whether between an Arab country or a country outside the Arab region). Net external surface water resources is estimated at 118.2 BCM, which is calculated based on the difference between the external blue water inflows and outflows to and from each of the Arab countries, while net external groundwater resources crossing the boarders accounts for 10.5 BCM, which is the difference between external groundwater inflows and outflows to and from each of the Arab countries, as displayed in Figure 25.

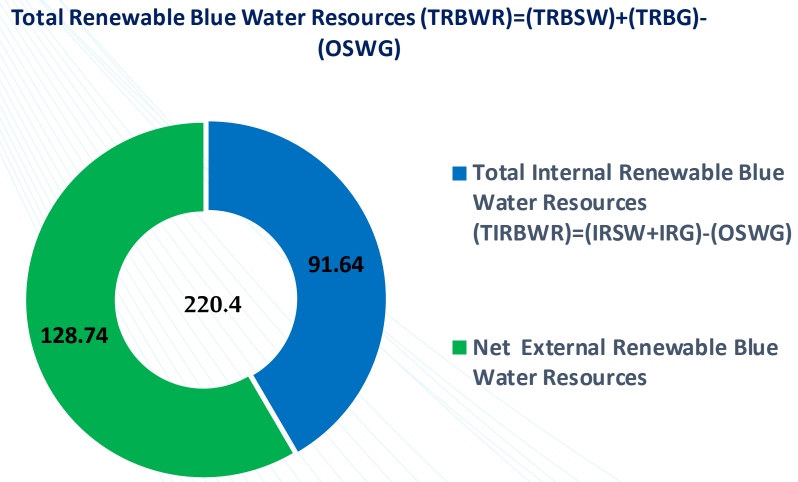


Figure 24. Total Renewable Blue Water Resources in the Arab Region (TRBWR)

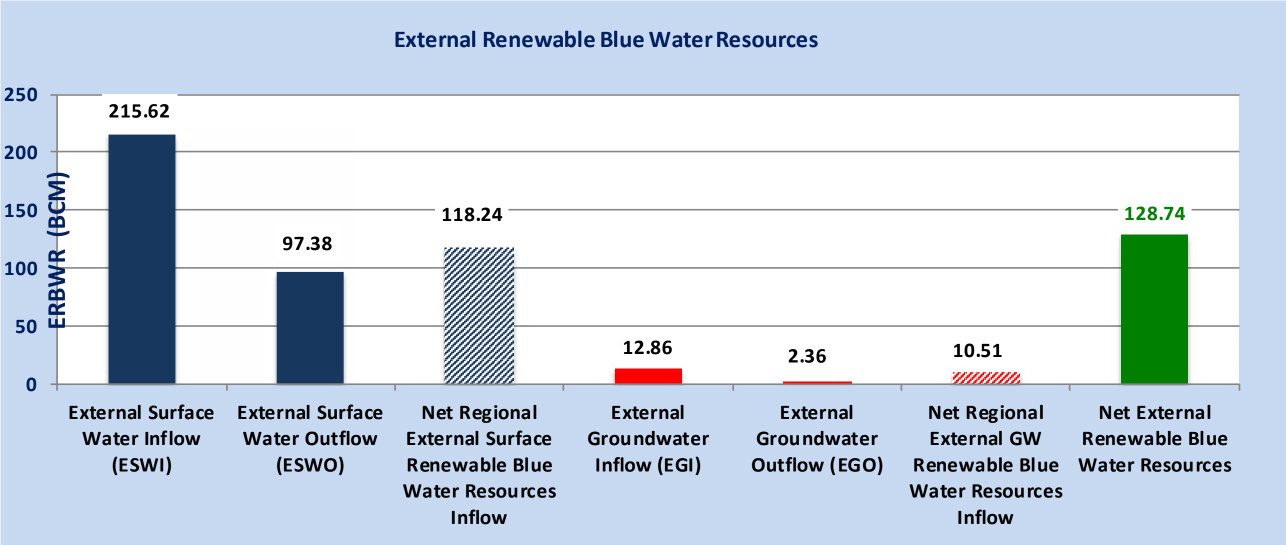


Figure 25. External Renewable Blue Water Resources in the Arab Region

1.3- Green Water

Green water is that portion of annually renewable water resources which is beneficially abstracted by different forms of green land cover (rain-fed agriculture, natural pasture, and forests). Green water is derived directly from atmospheric water through natural processes, (AbuZeid, 2008). Reliance on green water is highly observed in wet and tropical regions where agriculture may only need supplemental irrigation. Prevalence of green land cover is an indicative of main reliance on green water. Arid regions, on the contrary have to depend more on blue water and prevalence of yellow and desert land cover reflects this fact. Any assessment of water resources, at country or regional levels, will need to consider both components (blue and green) in order to be comprehensive and reliable. This fact has even more significance when considering shared resources and riparian countries. Country reporting on green water will be next discussed for the three components; rain-fed agriculture, natural pastures, and forests.

1.3.1- Regional Estimates for Green Water according to Country Reports

The total green water in the Arab Region is estimated as 443 BCM/y. 48% of green water is abstracted by natural pasture (212.07 BCM). About one third of the green water is consumed by rain-fed agriculture (150.52 BCM), while natural forests consume the remaining 80.29 BCM, as shown in Figure 26.

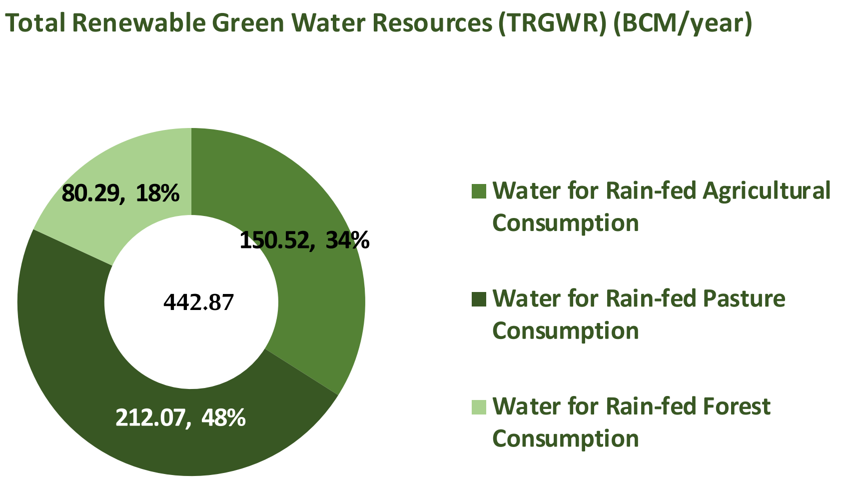


Figure 26. Total Renewable Green Water Resources (TRGWR) in the Arab Region

The availability of green water per country is displayed in Figure 27. Almost two thirds (63%) of the regional green water resources are occurring in two countries; namely Sudan (142 BCM/y) and Somalia (135 BCM/y). Two thirds of the Arab countries are endowed, all together, with only 5% of the total regional green water.

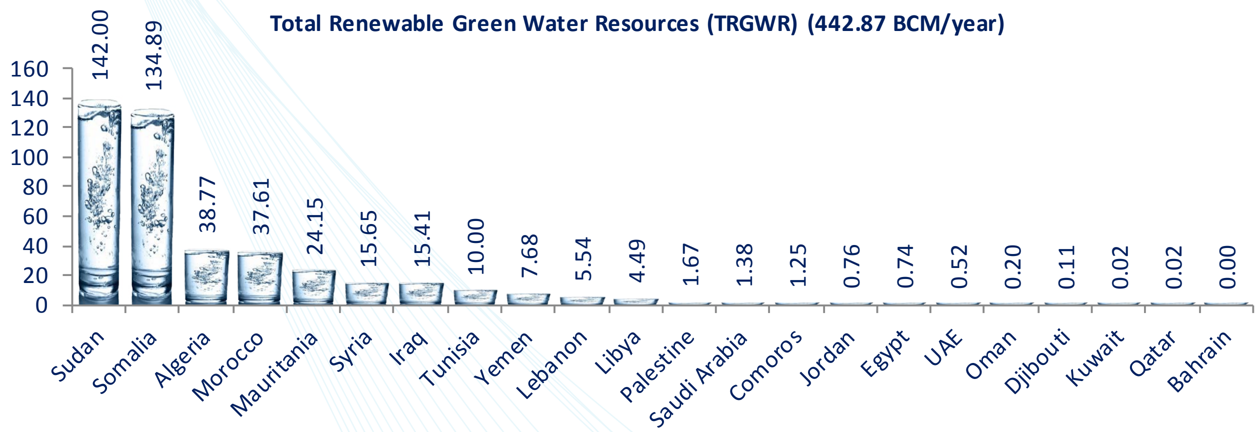


Figure 27. Total Renewable Green Water Resources (TRGWR) in the Arab Region per Country

The total regional renewable water resources (TRWR), which sums up the total renewable blue water and the total renewable green water, is calculated as 663.3 BCM/y. Two thirds of the renewable resources is attributed to green water abstractions (442.87 BCM) while one third is related to blue water consumptions (220.41 BCM) as shown in Figure 28. Country shares of TRWR is displayed in Figure 29. Sudan and Somalia are together enjoying half of the total resources available for the Arab Region, while half of the Arab countries are sharing together 2.7% of such resources (mainly the Gulf countries).

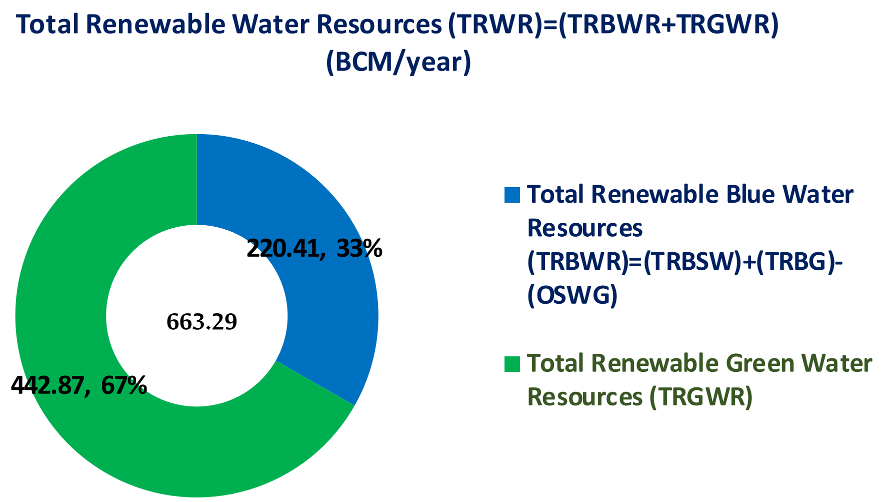


Figure 28. Total Renewable Water Resources (TRWR) in the Arab Region

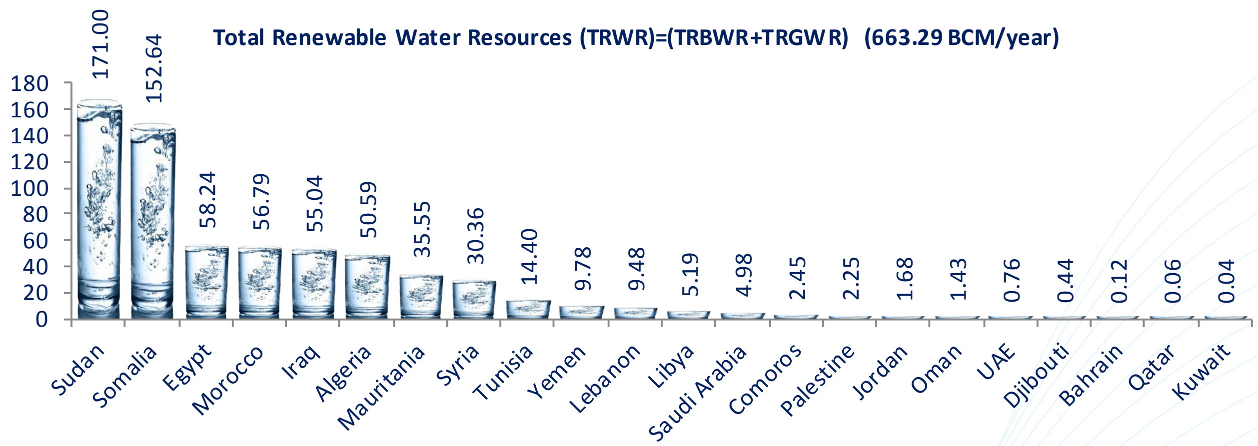


Figure 29. Total Renewable Water Resources (TRWR) in the Arab Region per Country

The total conventional water resources represents the ultimate annual conventional water resources available for abstraction from rivers, wadies, surface and groundwater reservoirs, and directly from the atmosphere (direct abstractions from precipitation). TCWR is the summation of the total blue water resources (including non-renewable water) and the total green water resources. This figure amounts to 709.97 BCM/y with a non-renewable component of 46.68 BCM, Figure 30. It is worth mentioning that abstractions from non-renewable groundwater vary yearly, and in general this abstraction is rapidly escalating.

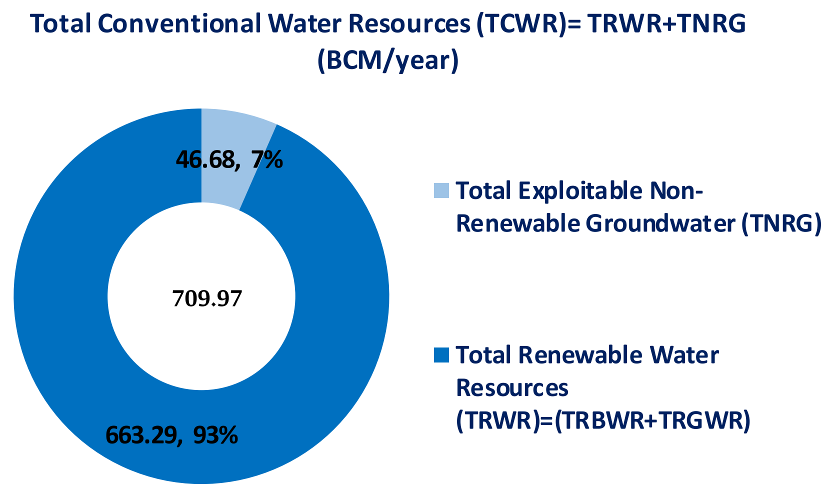


Figure 30. Total Conventional Water Resources (TCWR) in the Arab Region

1.3.1.1- Rain-fed Agriculture Green Water

The part of agricultural water demands which is satisfied directly from precipitation is called the rain-fed agricultural green water. Out of 150.52 BCM/y for rain-fed agriculture in the region, an allocation of 60 BCM (about 40%) is attributed to Sudan. 6 countries enjoy more than 85% of the regional rainfed agriculture abstractions as shown in Figure 31.

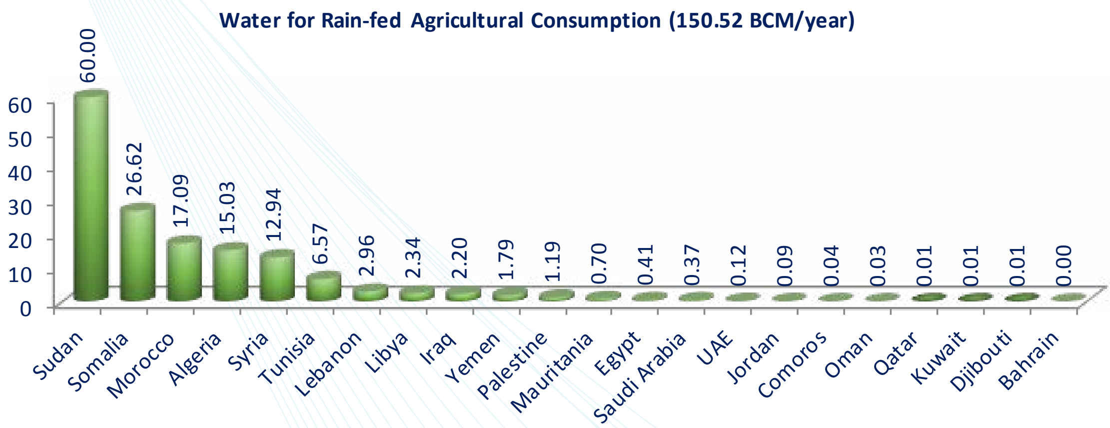


Figure 31. Rain-fed Agriculture Consumption in the Arab Region

1.3.1.2- Rain-fed Pasture Green Water

Natural pasture represents the main consumer of green water. Three countries; namely Somalia, Sudan and Mauritania are hosting pasture lands which consume about 78% of the total Arab pasture land consumption. Figure 32 shows the top 6 countries with pasture abstractions equivalent to 94% of total abstractions.

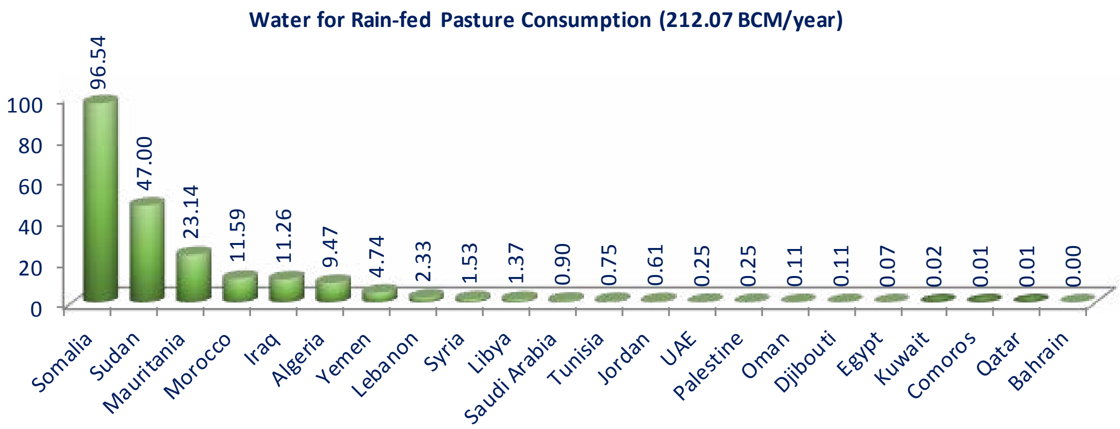


Figure 32. Rain-fed Pasture Consumption in the Arab Region

*1.3.1: Regional Estimates for Green Water according to Country Reports

1.3.1.3 Rain-fed Forest Green Water

Forests do not present a common land use in the Arab Region due to the prevailing aridity. Nevertheless, Four countries contribute to about 87% of the total abstractions by forests as shown in Figure 33.

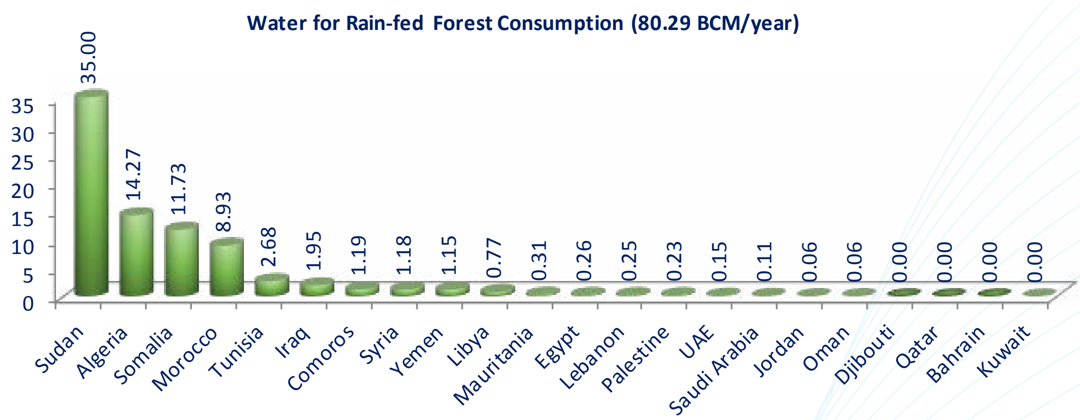


Figure 33. Rain-fed Forest Consumption in the Arab Region

1.3.1.4 Total Green Water

Almost 63% of the Arab green water is consumed by Sudan and Somalia, 17% of the total green water is consumed by Algeria and Morocco, while 12% is consumed by Mauritania, Syria and Iraq as explored in Figure 34.

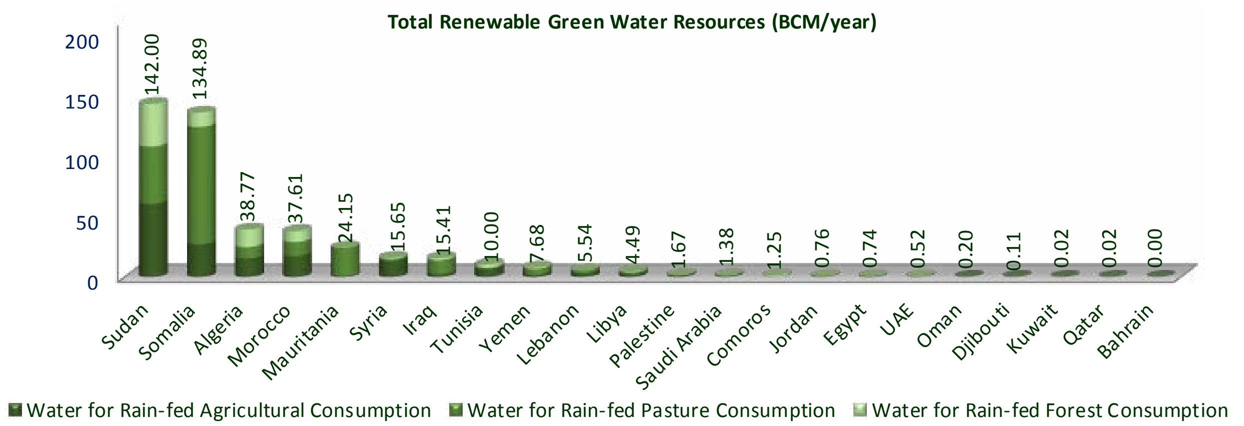


Figure 34. Total Green Water Consumption in the Arab Region

1.4- Non-conventional Water

Non-conventional water refers to such part of water resources, which require a treatment process to transfer it from a non-beneficial (or polluted) form into a beneficially extractable form, available to different water users. Sources for non-conventional water include, among others, (i) municipal wastewater, (ii) industrial wastewater, (iii) agricultural drainage water, (iv) desalinated water, and exploitable brackish groundwater. Mixing of domestic wastewater and industrial wastewater is of common occurrence in many Arab countries due to lack of infrastructure for separate collection. For the purpose of this report, municipal & industrial wastewater are analyzed without separation and in this case the combined wastewater may be referred to as **grey water**. Similarly, desalinated water is also referred to as **silver water** and is relatively more expensive than the other sources. Finally, potential for brackish groundwater use is not fully investigated, despite its importance, due to scarcity of data collected.

The total non-conventional water resources (TNCWR) for all Arab countries sums up to 73.55 BCM/y. Almost 40% of this amount is attributed to the produced agricultural drainage (PAD) which adds up to 28.5 BCM/y. On the other hand, produced municipal & industrial wastewater (PMIW) accounts for 24.84 BCM/y (34%). The remaining tenth of the non-conventional water resources is related to the produced desalinated water (PDW) where the desalination facilities in all Arab countries produce 7.09 BCM/y (9%). The total exploitable brackish water, as reported, is equal to 5.73 BCM/y and the recycled groundwater is equal to 7.5 BCM/year. The status of non-conventional water resources in the region is better explored from Figure 35.

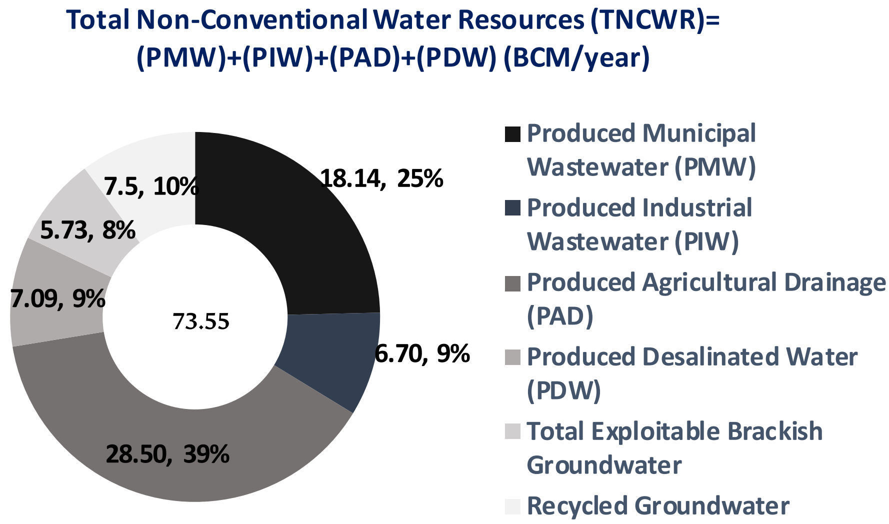


Figure 35. Total Non-Conventional Water Resources (TNCWR) in the Arab Region

1.4.1- Municipal & Industrial Wastewater

Wastewater generated by domestic, commercial and industrial users constitutes the grey water. Figure 35 and Figure 36 display the situation, in 2015, for grey water in the Arab region. A total of 24.84 BCM of grey water are produced in the region. The last figure shows that, on the average, each person produces nearly 61 m^3/y (about 170 l/cap/d) of municipal & industrial wastewater. Of such amount, only 13.9 BCM/y find their way to national wastewater collection systems (55%). Uncollected wastewater causes several health hazards and imposes numerous environmental stresses on different ecosystems. Country reports show that 10 BCM/y out of 13.9 BCM collected annually are undergoing different treatment levels (primary, secondary, and tertiary).

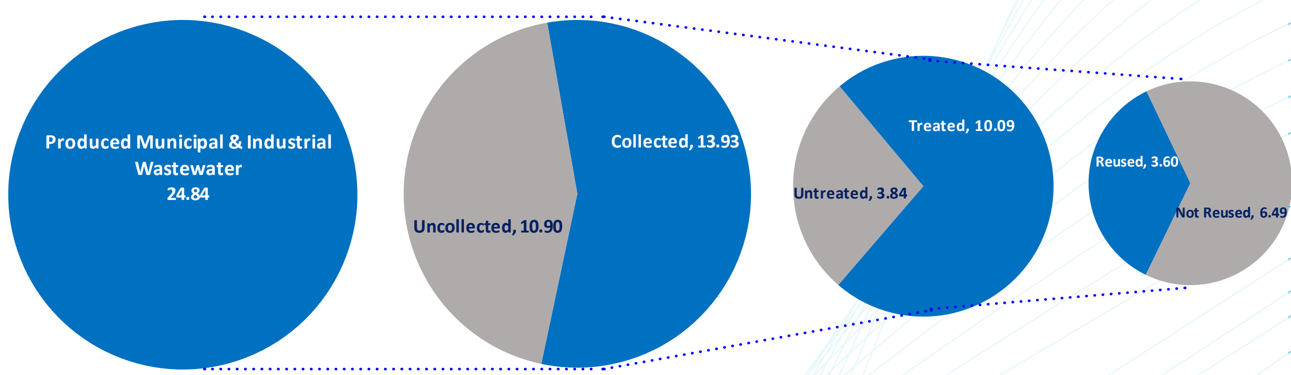


Figure 36. State of the Municipal & Industrial Wastewater in the Arab Region

The last estimate needs further verification since it shows that nearly 73% of the collected grey water is subject to some level of treatment. The amount of untreated municipal and industrial wastewater are distributed among different Arab countries (with respect to absolute volume) as per Figure 37 which shows that Egypt alone contributes to nearly 44% of the regional untreated effluent. Untreated municipal and industrial wastewater amounts to about 14.73 BCM in the year 2015.

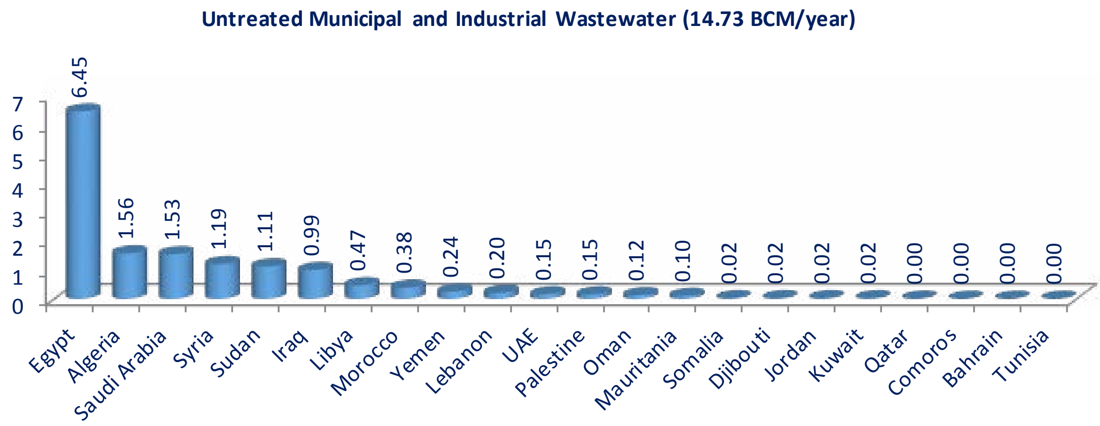


Figure 37. Untreated Municipal and Industrial Wastewater in the Arab Countirs

1.4.2- Agricultural Drainage Water (ADW)

Irrigation water in excess of crop water demands mostly finds its way to surface or tile drains or recharges shallow alluvial aquifers. Drainage water, in many practices, rejoins surface water streams to compensate for the national deficiencies in agricultural water uses. As demands on water escalate, due to different social, demographic and climatic drivers, in addition to trans-boundary threats, the reuse of agricultural drainage water becomes non-dispensable Figure 38 shows the high dependence of Egypt and Iraq on reused agricultural drainage. It also shows a significance for Sudan and Morocco. This component is also important for Syria and Somalia. It is important to mention that ADW, which actually originates from blue (or sometimes green) water resources, has already been included in the national water budget and should not be duplicated.

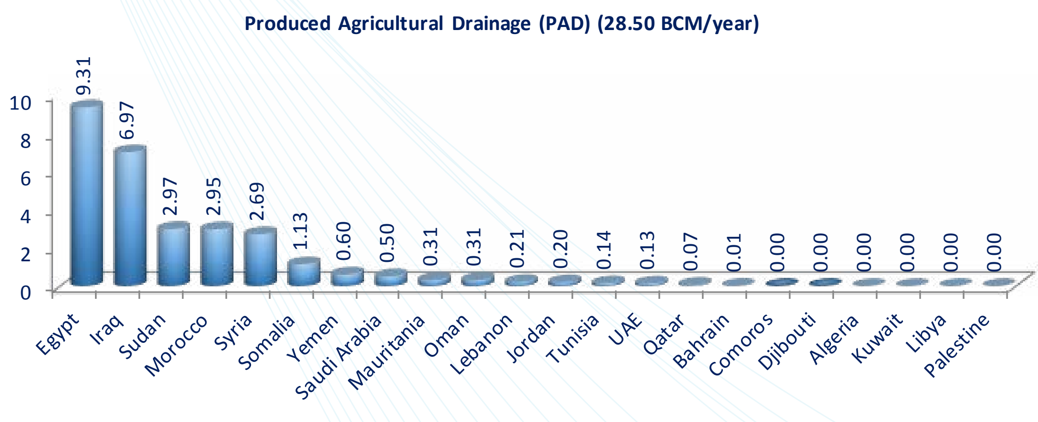


Figure 38. Produced Agricultural Drainage (PAD) for the Arab Coutries

1.4.3- Desalinated Water

As of July 2015, a desalination capacity of 90 MCM/d is installed globally (around 33 BCM/y). These involve around 18,500 desalination plants in 150 countries and provide services to more than 300 million inhabitants around the globe. Figure 39 displays the desalination capacities (actual production) for different Arab countries.

The figure shows predominance of desalination in the gulf countries, as expected. However, the south Mediterranean countries also exhibit an escalating reliance on desalination. Desalination production in Libya is severely hindered due to political instabilities.

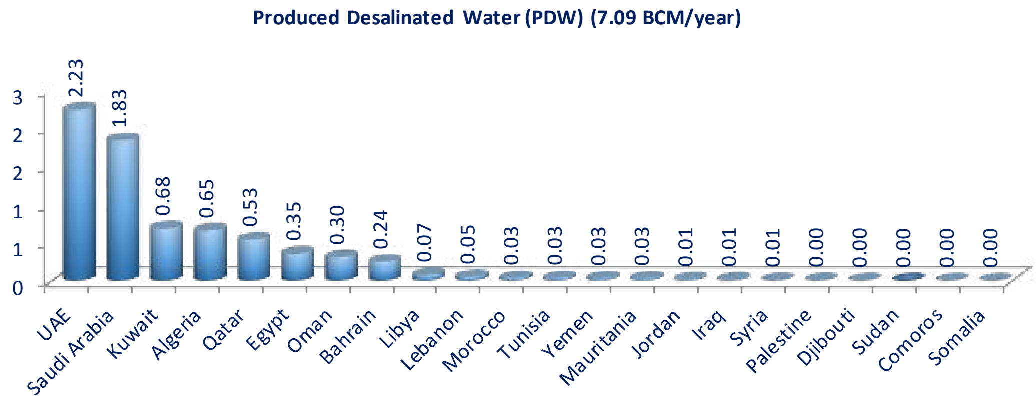


Figure 39. Produced Desalinated Water (PDW) for the Arab Countries

1.5- Available Water Resources

The total conventional water resources distribution among countries is given in Figure 40 while that for the non-conventional resources is given in Figure 41. For cross comparison the total available water resources is also given in Figure 42 and it shows the status of water availability in the Arab Region. It is obvious that the total conventional water resources are about ten times larger than the non-conventional resources. The latter is estimated as 73.55 BCM/y, while the former is calculated as 709.97 BCM/y. The total available water resources are the summation of the last two numbers and are equal to 783.51 BCM/y. The total available water resources (TAWR) by country is shown in Figure 43.

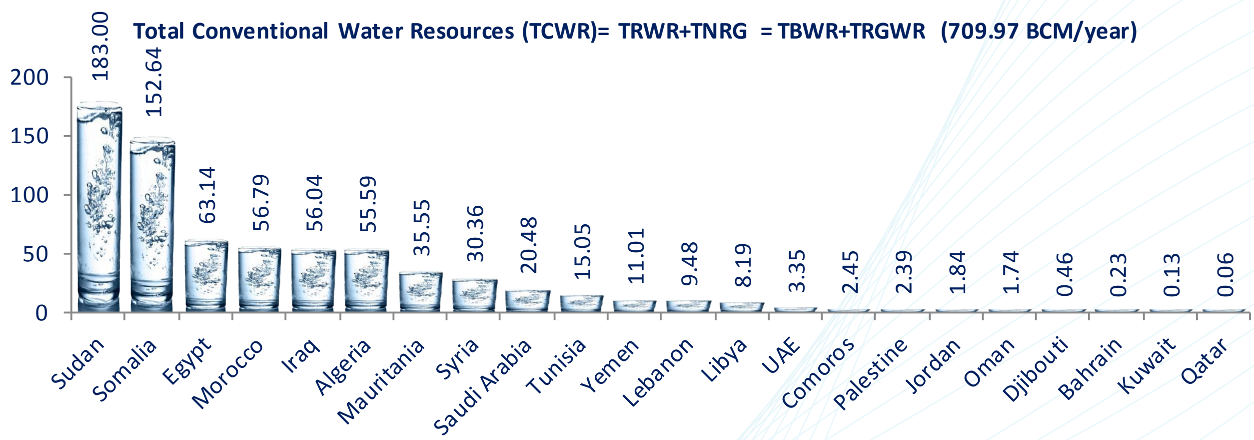


Figure 40. Total Conventional Water Resources for the Arab Countries

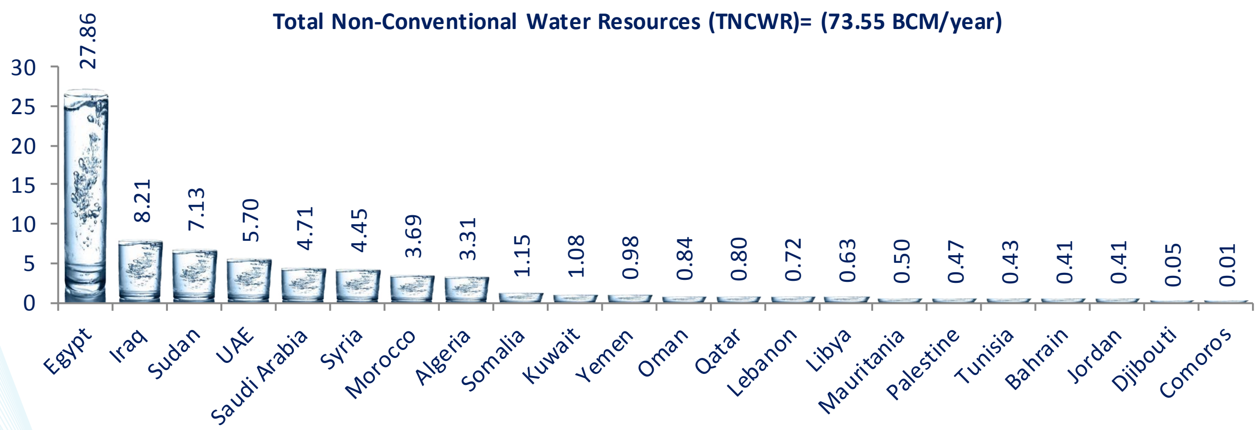


Figure 41. Total Non-Conventional Water Resources for the Arab Countries

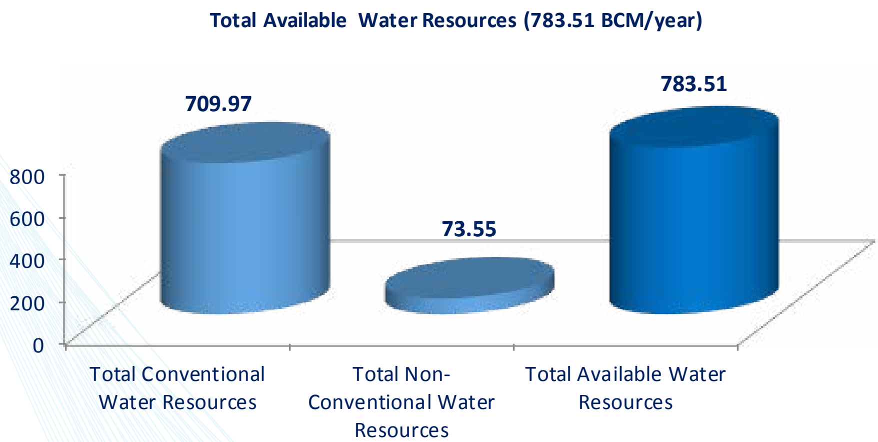


Figure 42. Total Available Water Resources in the Arab Region

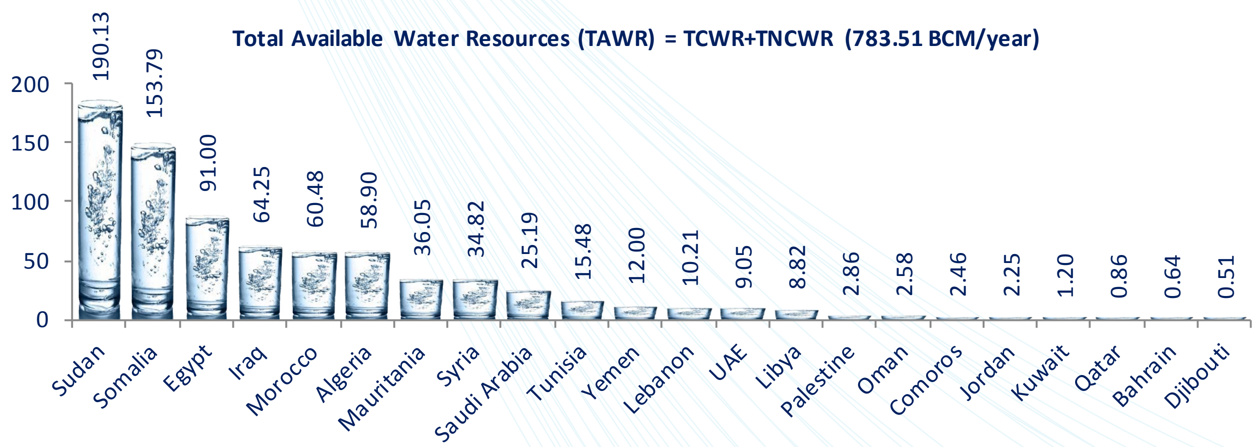


Figure 43. Total Available Water Resources (TRWR) for the Arab Countries

2. Water & Uses

The top three sectors in water withdrawals are the domestic, industrial, and agricultural sectors. Other sectors, which are not less important, include (among others) oil & gas sector, navigational uses and environmental flows necessary to sustain ecosystems. Last, but not the least, is the rainfed green cover which includes natural pastures, forests, rainfed agriculture, desert shrubs, etc... In countries falling in temperate and humid regions, usually industrial and domestic sector withdrawals are dominant (since agricultural requirements are mostly compensated by green water). In arid countries, agricultural withdrawals are predominant. Water requirements for different sectors may be derived from surface or groundwater, from renewable or non-renewable water, from blue or from green water (in case of rain-fed agriculture), and finally from conventional or non-conventional resources.

2.1- Sectoral Withdrawals

The total freshwater withdrawals from Blue water and non-conventional water resources in the Arab Region amounts to 235.1 BCM/y as shown in Figure 44. This is equal to the sectoral withdrawals as shown in Figure 45, while adding consumption from green water will augment the sum of the total abstractions to 385.6 BCM/y as shown in Figure 46. Irrigation abstractions constitute almost 50% (190.1 BCM) of the total abstractions. Domestic withdrawals add up to 32.9 BCM (8.5% of total) while the industrial sector uses about 3% (11.2 BCM).

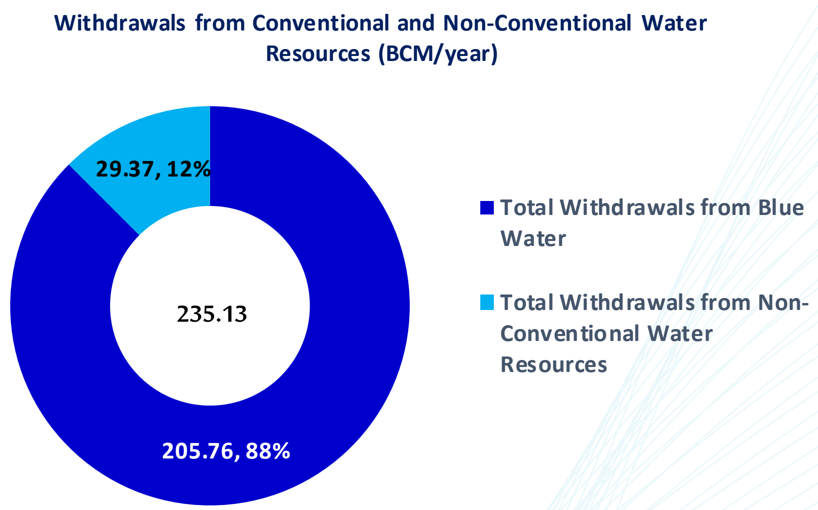


Figure 44. Withdrawals from Blue Water Resources in the Arab Region

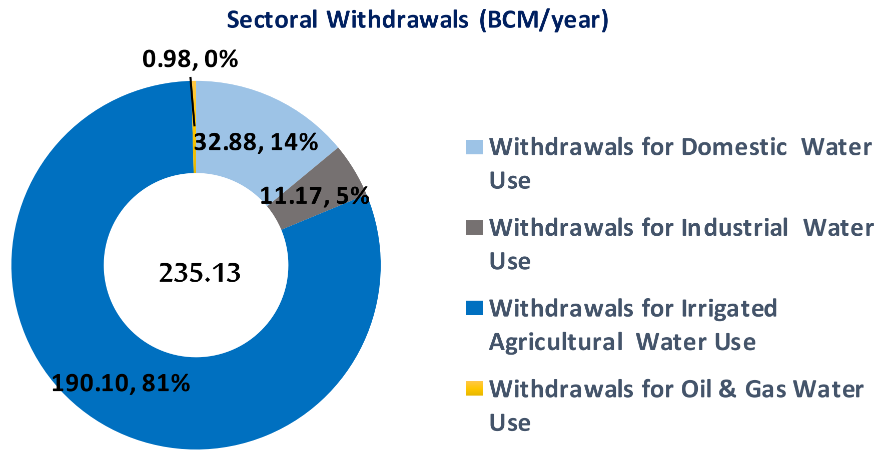


Figure 45. Sectoral Withdrawals in the Arab Region

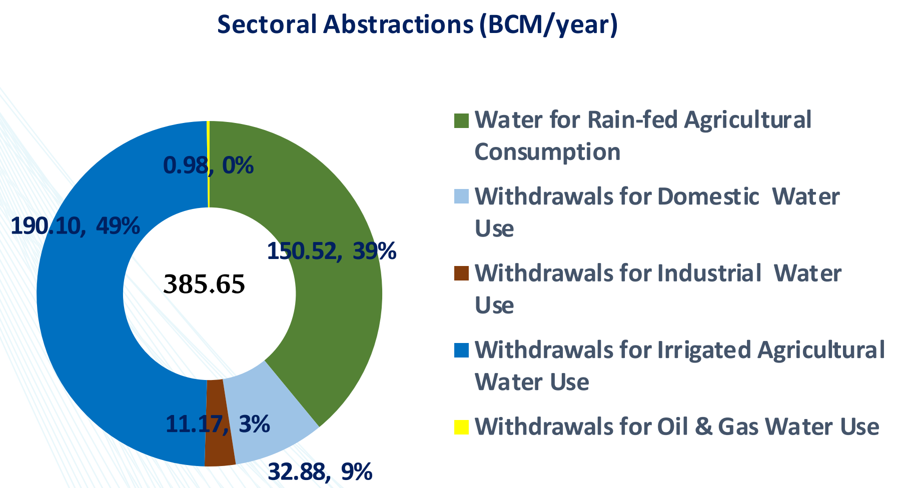


Figure 46. Sectoral Freshwater Withdrawals in the Arab Region

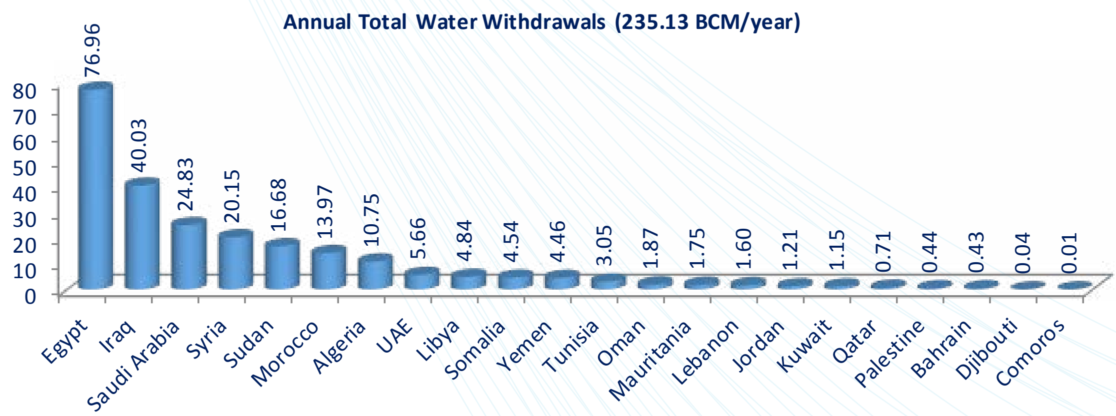
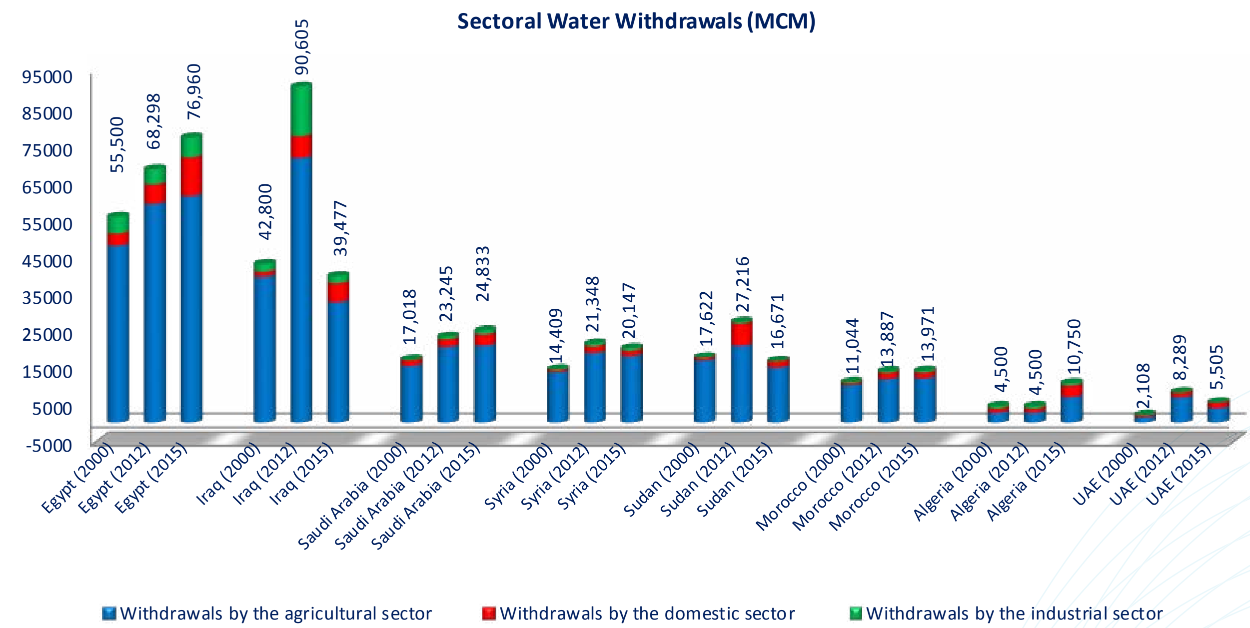
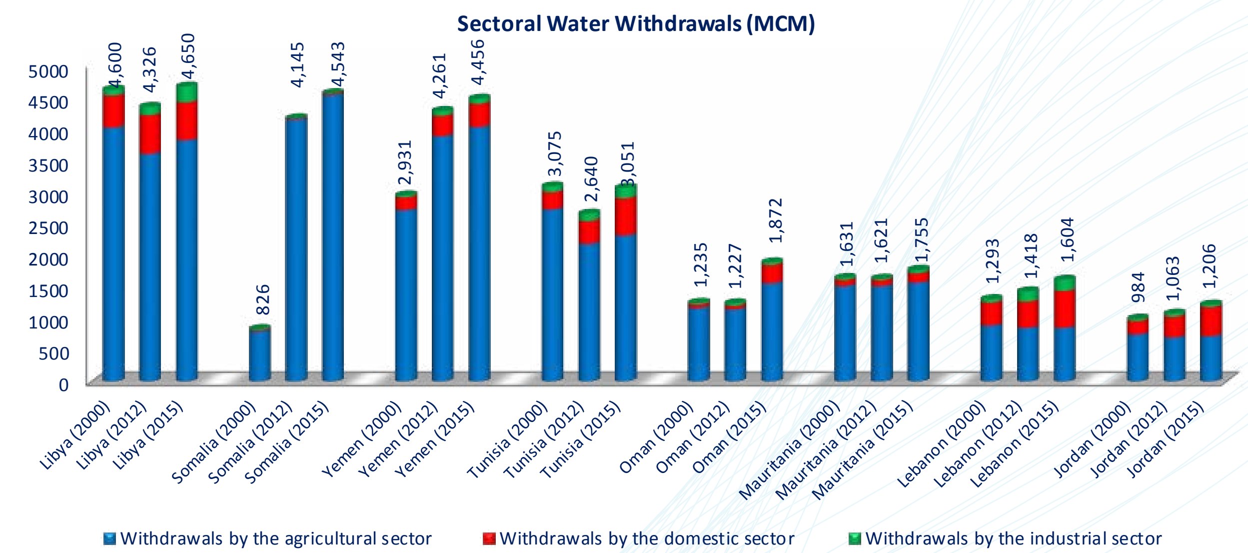


Figure 47. Annual Total Water Withdrawals in the Arab Countries

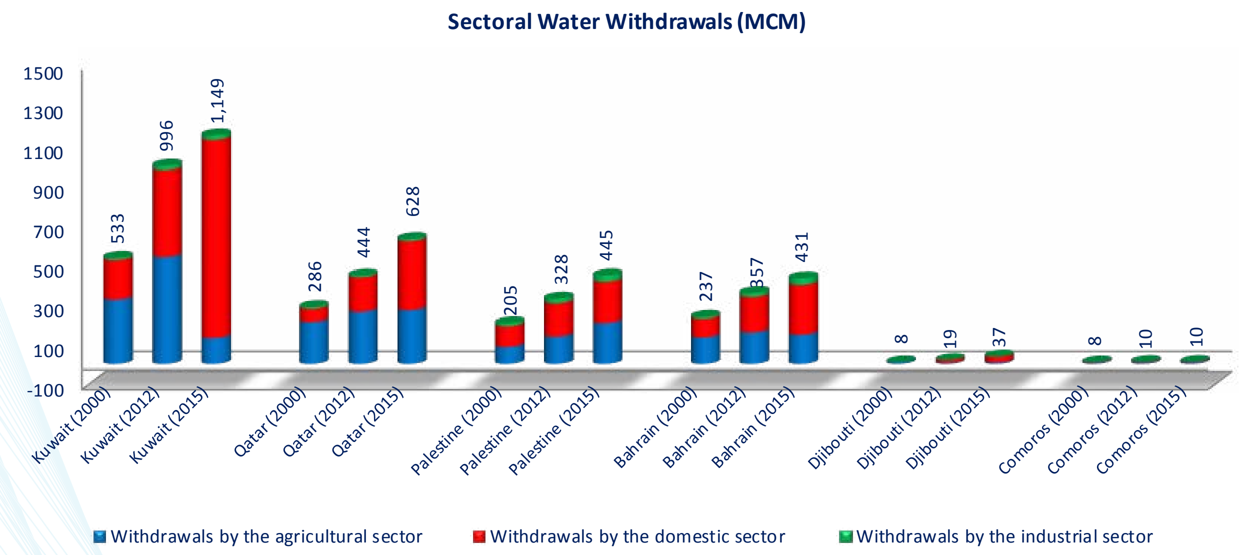
Figure 48 show the sectoral withdrawals for the 3 major sectors and their development since year 2000, for 2012 and 2015. It shows that withdrawals are generally in continuous increase. In certain cases due to political unrest and migration, it showed a decrease in withdrawals such as in 2012 for Libya and Tunisia, and in 2015 for Syria. Sudan showed a decreased withdrawals in 2015 compared to 2012 due to the separation of South Sudan. Iraq and UAE also showed a decrease in 2015 compared to 2012 it that might be due to over estimation in the 2012 withdrawals.



(A) Change in Sectoral Water Withdrawals in the Arab Countries



(B) Change in Sectoral Water Withdrawals in the Arab Countries



(C) Change in Sectoral Water Withdrawals in the Arab Countries

Figure 48. Change in Sectoral Water Withdrawals in the Arab Countries

Furthermore, Figure 49 shows that the total agricultural water abstractions is equal to 340.62 BCM/y. Almost 44% of the agriculture water requirements is satisfied directly from rainfall (150.52 BCM/y of rain-fed agricultural abstractions). The remaining is mainly provided through irrigation channels, groundwater wells, reuse of agricultural drainage water or reuse of treated wastewater wherever possible. Moreover, green water abstractions for agriculture as per different countries are shown in Figure 50. 60 BCM/y out of a total of 150 BCM/y of green water for agricultural uses is attributed to Sudan.

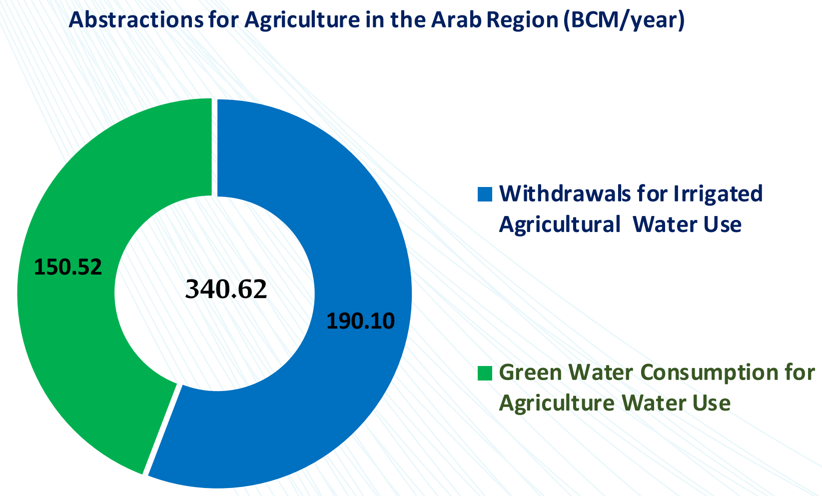


Figure 49. Agricultural Withdrawals in the Arab Region

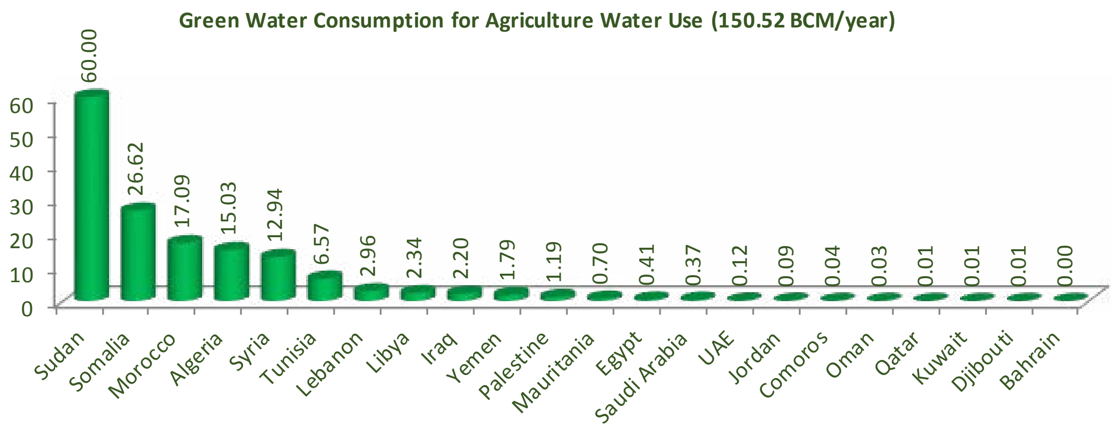


Figure 50. Green Water Consumption in the Arab Countries

Figure 51 shows that the total withdrawals from blue water (205.76 BCM) are divided between surface water, renewable groundwater, and fossil groundwater. Abstractions from surface water bodies provides the major share of 141.2 BCM (nearly two thirds of total) while abstractions from renewable groundwater amounts to 31.1 BCM (15%) and fossil groundwater contributes about 16% of the total. Finally, withdrawals per each country from blue water resources are given in Figure 52. Egypt, with the largest country population in the Arab region, withdraws 57.6 BCM/y from blue surface and groundwater resources (about one quarter of the total blue water withdrawals), which is mainly affected by its high dependency on the surface water of the Nile River. Egypt, Iraq, Saudi Arabia and Syria account for two thirds of the total blue water withdrawals.

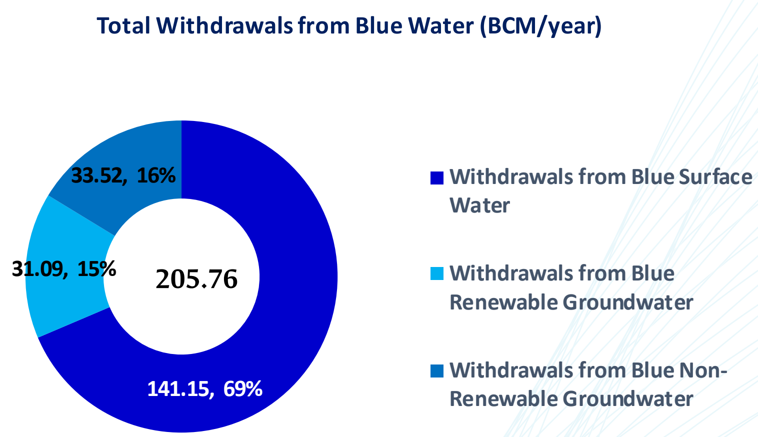


Figure 51. Withdrawals from Blue Water Resources in the Arab Region

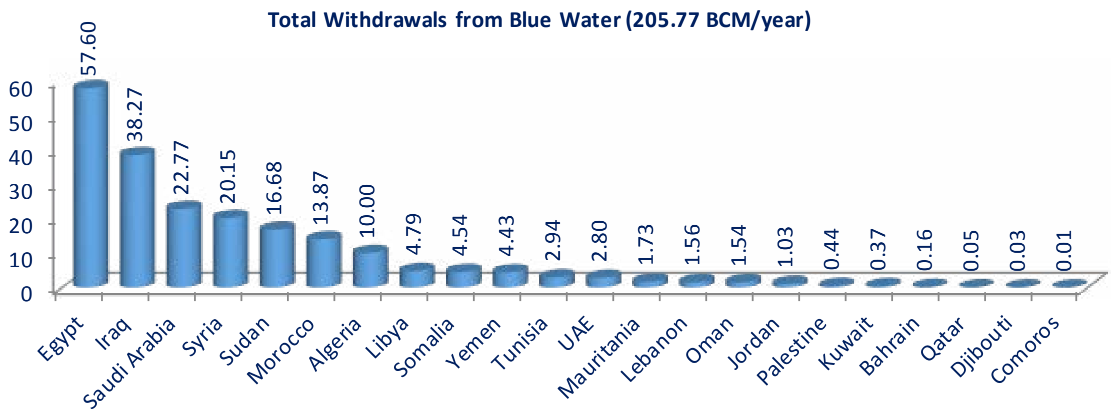


Figure 52. Blue Water Withdrawals in the Arab Coutries

Figure 53 shows that withdrawals from non-conventional water resources sums up to 29.37 BCM/y which are mainly attributed to three sources; agricultural drainage reuse providing 11.2 BCM/y (38% of total non-conventional water withdrawals), and is mostly occurring in Egypt. Reused treated wastewater is equivalent to 3.6 BCM/y, desalination plants provide 7.05 BCM/y, while withdrawals from exploitable brackish groundwater and regulated groundwater recharge represent an amount of 7.5 BCM/y.

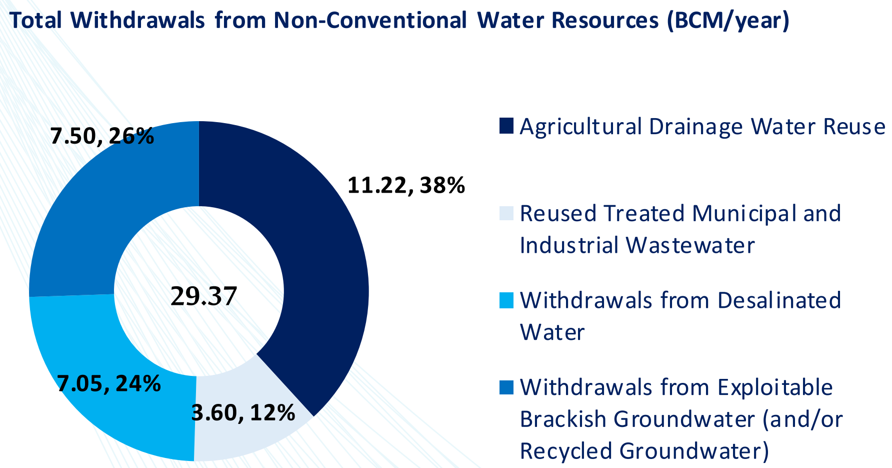


Figure 53. Withdrawals from Non-Conventional Water Resources in the Arab Region

It should be highlighted here that out of 10.09 BCM of wastewater treated annually, only 3.6 BCM are being reused. In a hyper arid region like the Arab region, this number should be maximized as much as possible. In fact targeting 50% reuse of the produced wastewater does not seem to be a difficult-to-reach aim. Figure 54 displays the latter notes and concerns showing the 2015 produced municipal and industrial wastewater to be 28. 84 BCM/y.

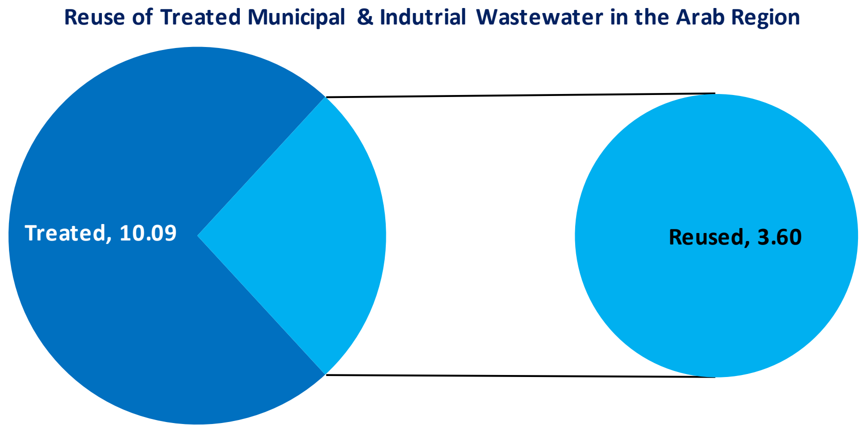


Figure 54. Reuse of Treated Municipal & Indutrial Wastewater in the Arab Region

2.2- Country Withdrawals

Withdrawals for domestic purposes in the Arab region amounts to 32.88 BCM/y. Figure 55 displays domestic withdrawals per country, while Figure 56 compares domestic water withdrawals to actual population. Figure 57 shows that the least three countries in per capita share of domestic water withdrawals are Somalia (5 l/cap/d), Comoros (17 l/cap/d) and Yemen (37 l/cap/d). The top three countries are Kuwait (643 l/cap/d), Bahrain (502 l/cap/d), and United Arab Emirates (448 l/cap/d).

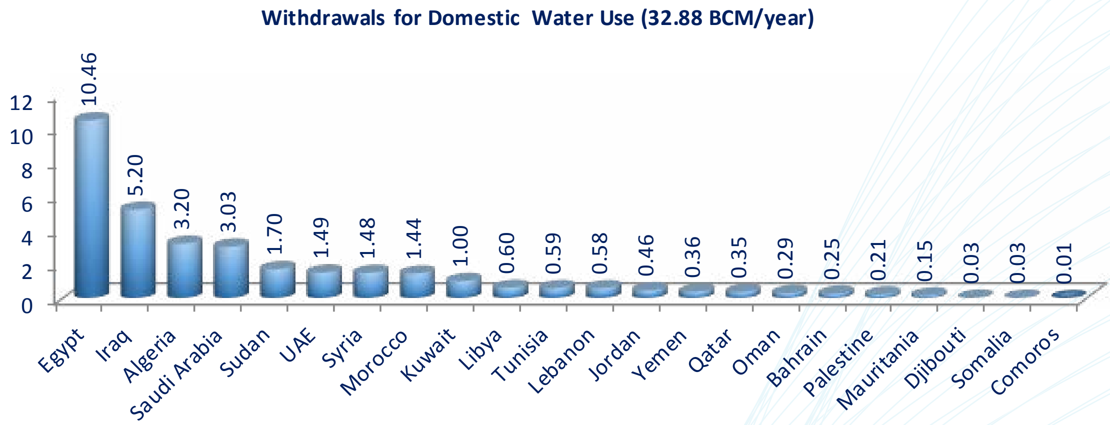


Figure 55. Withdrawals for Domestic Demands in the Arab Region

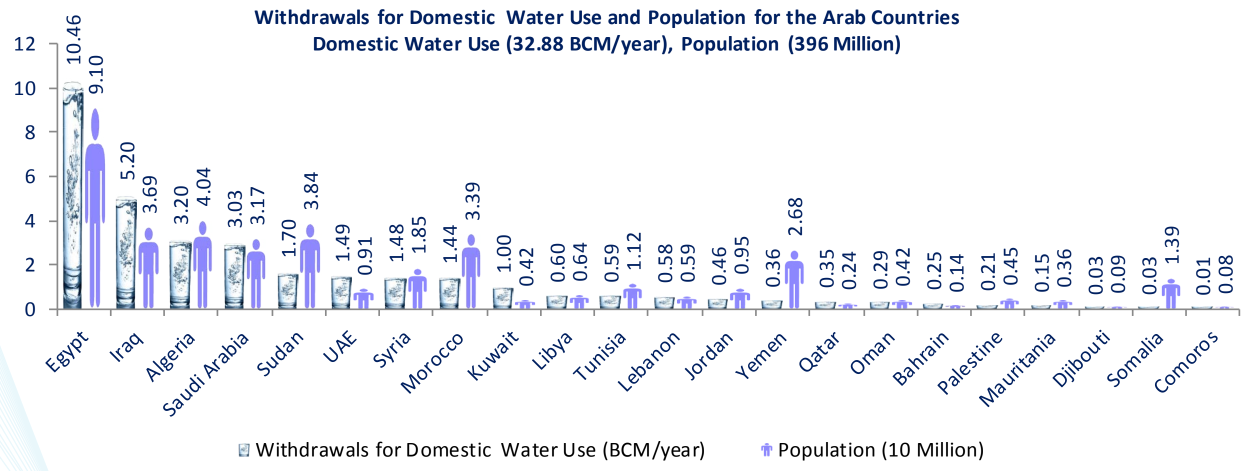


Figure 56. Domestic Demands as Compared to Population (in 10 millions)

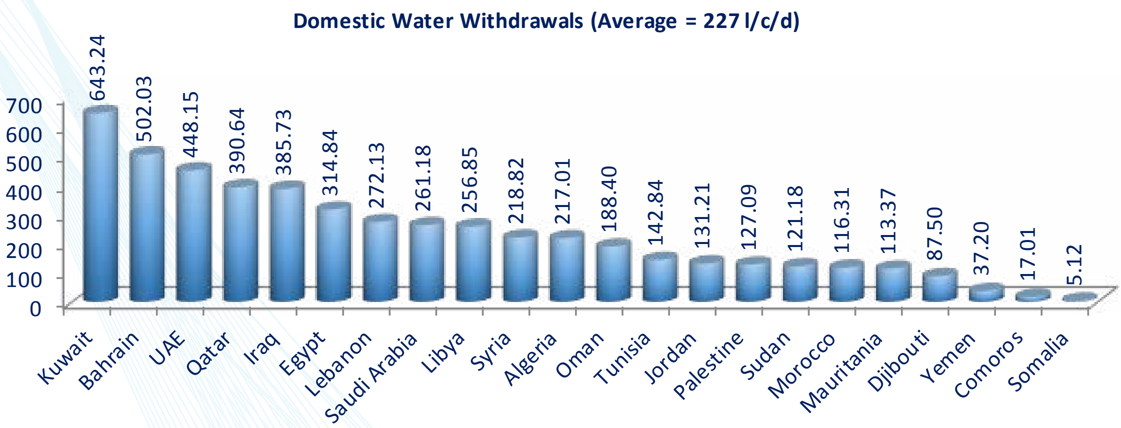


Figure 57. Domestic Water Withdrawals in the Arab Coutries

Total withdrawals for irrigation purposes are shown in Figure 58 for each country. Out of a total of 190.1 BCM/y of irrigation water, Egypt withdraws 61.1 BCM and Iraq withdraws 32.5 BCM. Saudi Arabia withdraws 20.8 BCM, while the rest of the Gulf countries withdraw about 2.0 BCM. Total sectoral withdrawals are given in Figure 59 and it shows that some countries does not use non-conventional water resources and rely only on blue water resources for sectoral withdrawals such as Sudan, Somalia, and Comoros.

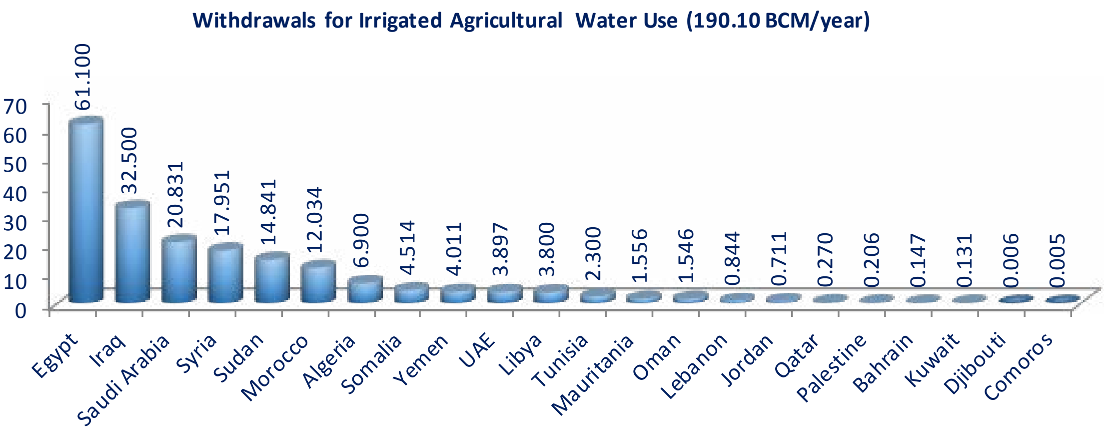


Figure 58. Withdrawals for Irrigation Demands in the Arab Coutries

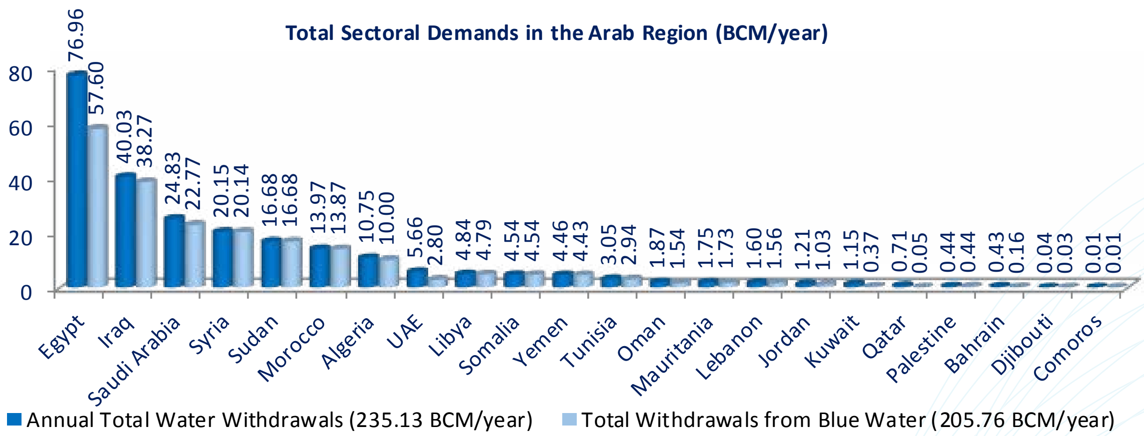


Figure 59. Total Sectoral Demands in the Arab Coutries

Total withdrawals from non-conventional water resources account for 29.37 BCM/y and are shown in Figure 60 and Figure 61. Distinction between withdrawals from conventional water resources and those from Non-conventional water resources given in Figure 61 shows the significance of non-conventional resources for most of the Gulf countries. The figure also emphasizes the results deducted above regarding the countries that does not benefit from non-conventional water resources (Sudan, Somalia and Comoros). Some other countries, including Syria, Yemen, Mauritania, Lebanon, Palestine and Djibouti, rely on a small portion of non-conventional water resources to satisfy their respective sectoral demands.

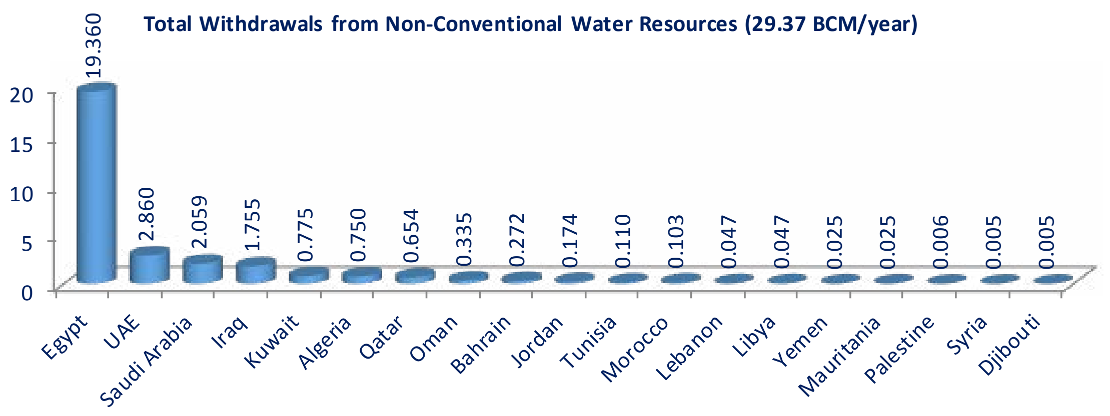


Figure 60. Total Withdrawals from Non-Conventional Water Resources in the Arab Coutries

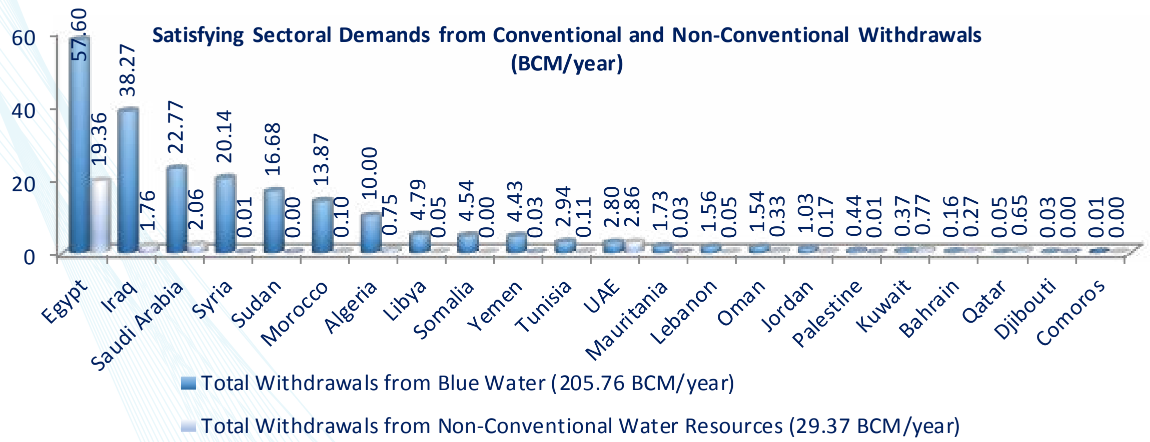


Figure 61. Satisfying Sectoral Demands from Conventional and Non-Conventional Withdrawals

2.3- Remote Sensing Estimates for Evapotranspiration, Evaporation and Green Water

2.3.1- Actual Evapotranspiration and Evaporation Volumes

Evaporation and evapotranspiration (ET) estimates rely on remote sensing data for the year 2015 and processed through GIS. The total evapotranspiration (ET) and evaporation in the Arab Region has been divided into seven major categories; irrigated agriculture ET, rainfed agriculture ET, pasture lands ET, forests ET, evaporation from barren lands, evaporation from open water bodies and evaporation from urban areas.

Actual evapotranspiration data, composed of the combination of transpiration from green covers and evaporation from soil in non-green areas, was used in this analysis. The data is provided by the USGS through the Early Warning and Environmental Monitoring Program portal. Actual evapotranspiration is produced using the operational Simplified Surface Energy Balance model (SSEBop). The approach used to produce the data set is combining ET fractions from the MODIS thermal imagery captured every 8 days and a reference ET using the thermal index approach. The European Space Agency land cover maps were used for the definition of the land classes throughout the Arab region.

Figure 62 displays the distribution of the actual ET for the previous categories. The evapotranspiration volumes per each Arab country and for each green cover type are displayed in Figure 63 to Figure 66. The total volume of actual annual evapotranspiration is estimated to be 1022 BCM/y. The majority is being contributed by the rainfed pasture with 491.6 BCM/y (48%) followed by the rainfed agriculture with 264.5 BCM/y (26%), the irrigated agriculture evapotranspiration is 163.6 BCM/y (16%), while the rainfed forests ET is estimated to be 102.3 BCM/y (10%).

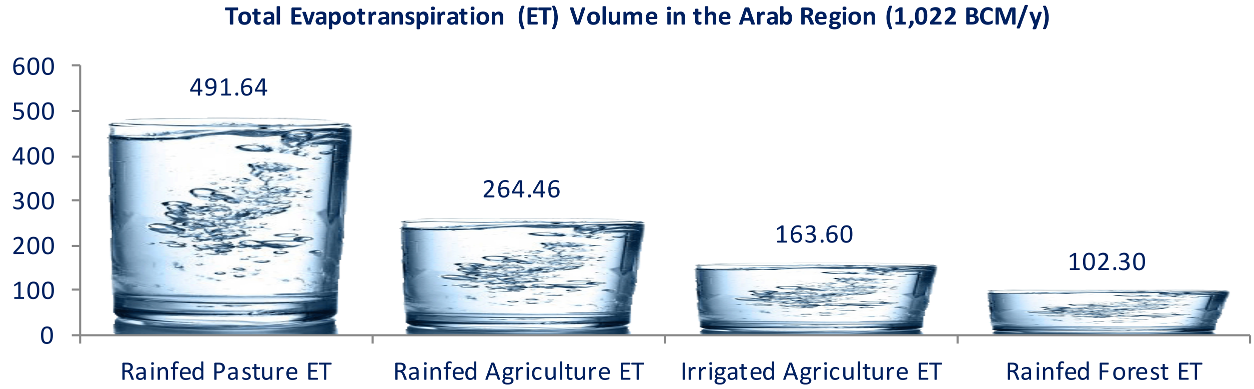


Figure 62. Total Volume of Evapotranspiration for Different Land Uses in the Arab Region

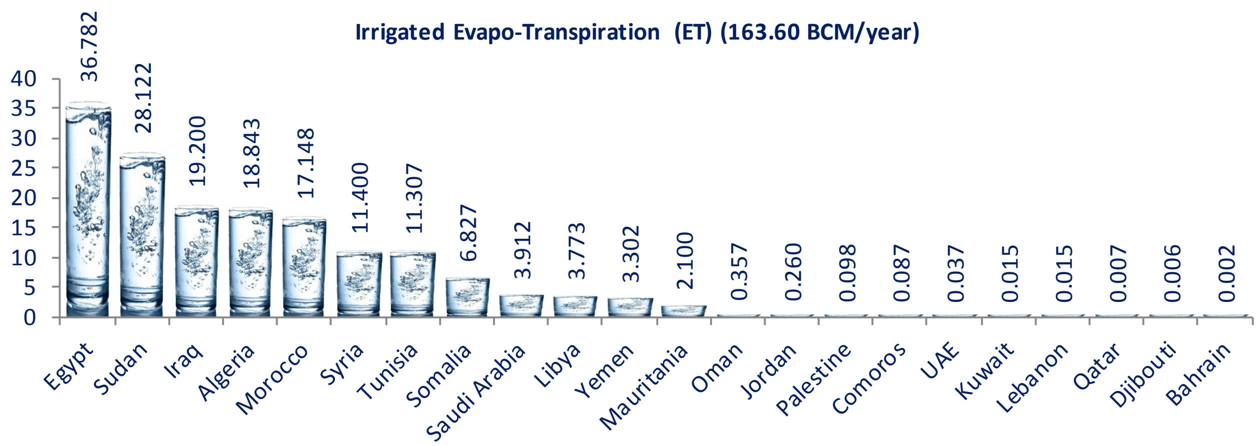


Figure 63. Irrigated Agriculture Evapotranspiration Volume in the Arab Region

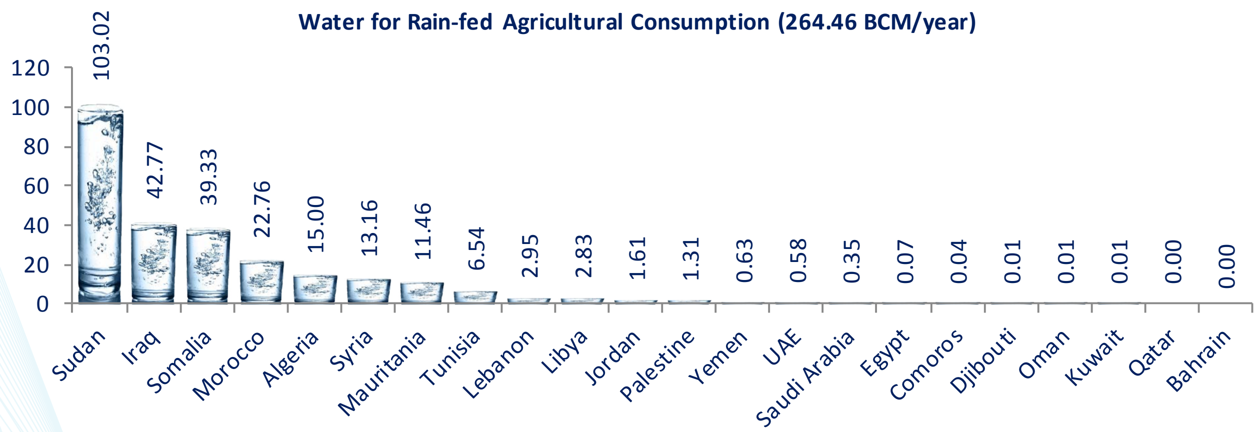


Figure 64. Rainfed Agriculture Evapotranspiration Volume in the Arab Region

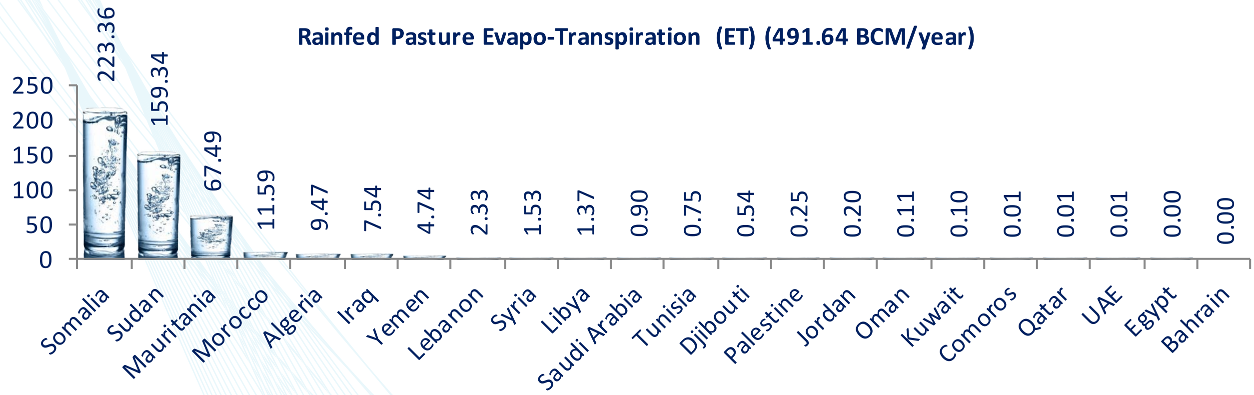


Figure 65. Rainfed Pasture Evapotranspiration Volume in the Arab Region

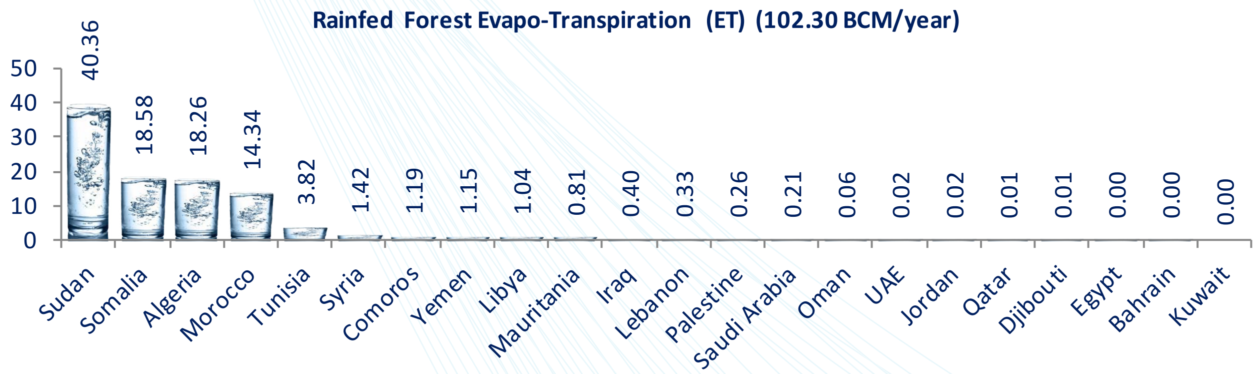
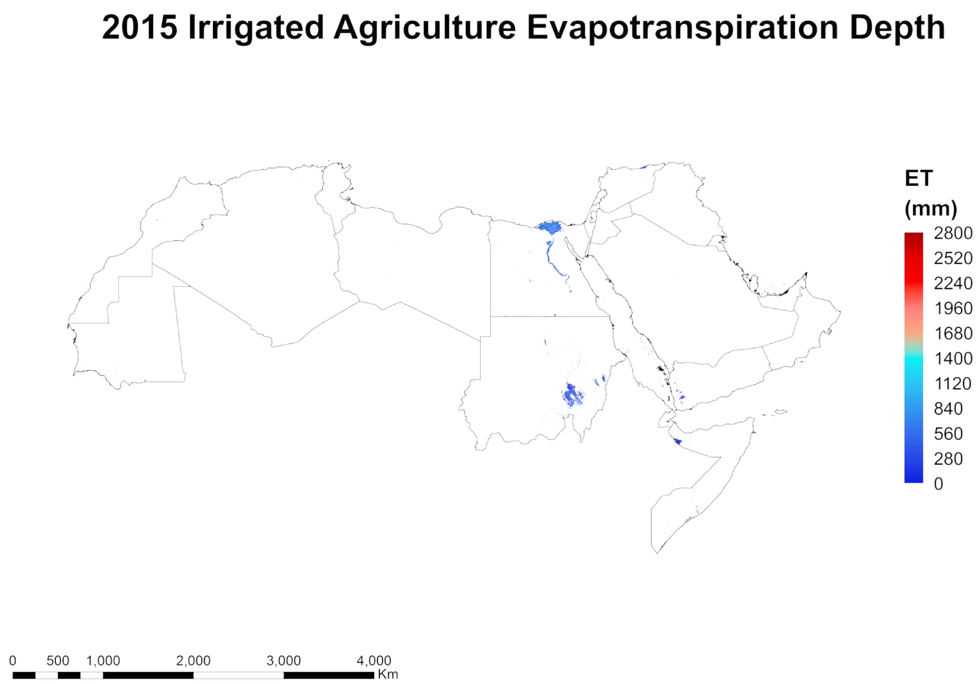
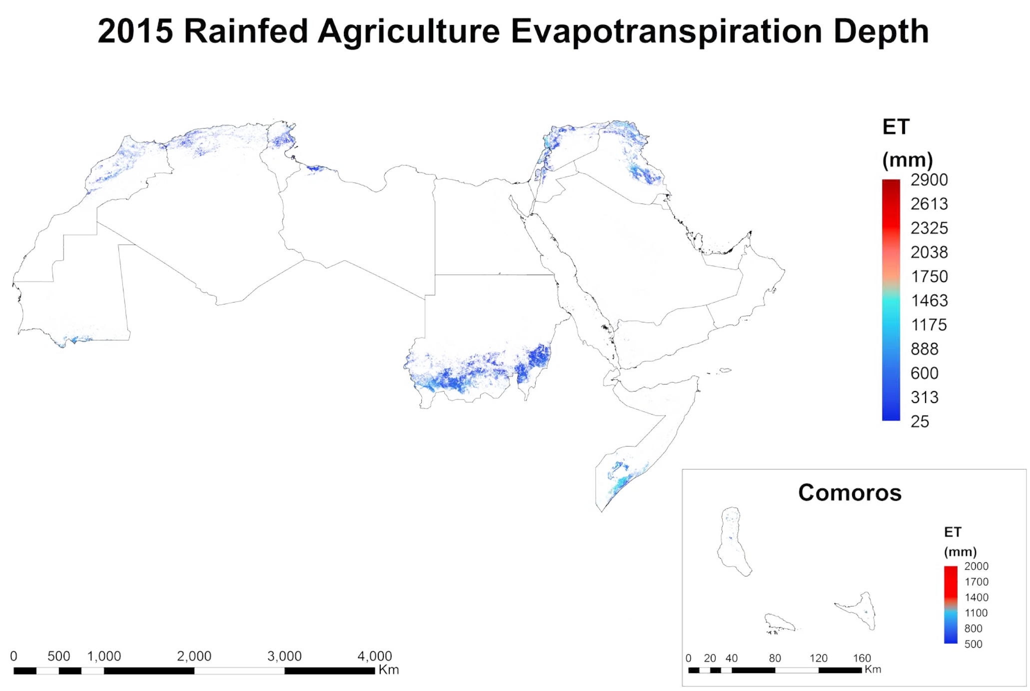


Figure 66. Rainfed Forest Evapotranspiration Volume in the Arab Region

Maps from 2 to 5 show the spatial distribution of actual evapotranspiration depth for the irrigated agriculture, rainfed agriculture, pasture and forest lands in the Arab Region.

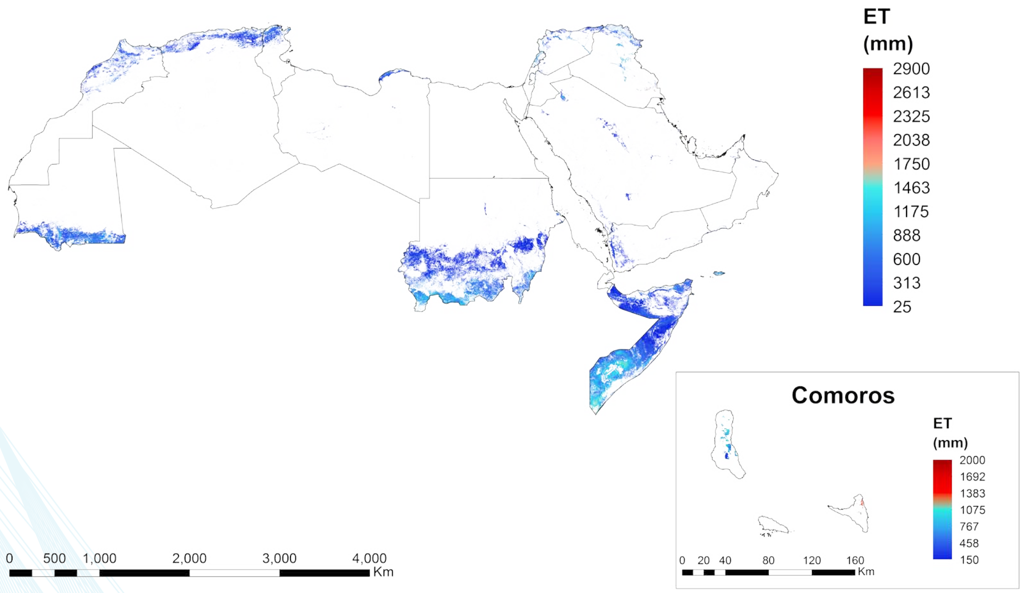


Map 2. 2015 Irrigated Agriculture Evapotranspiration Depth



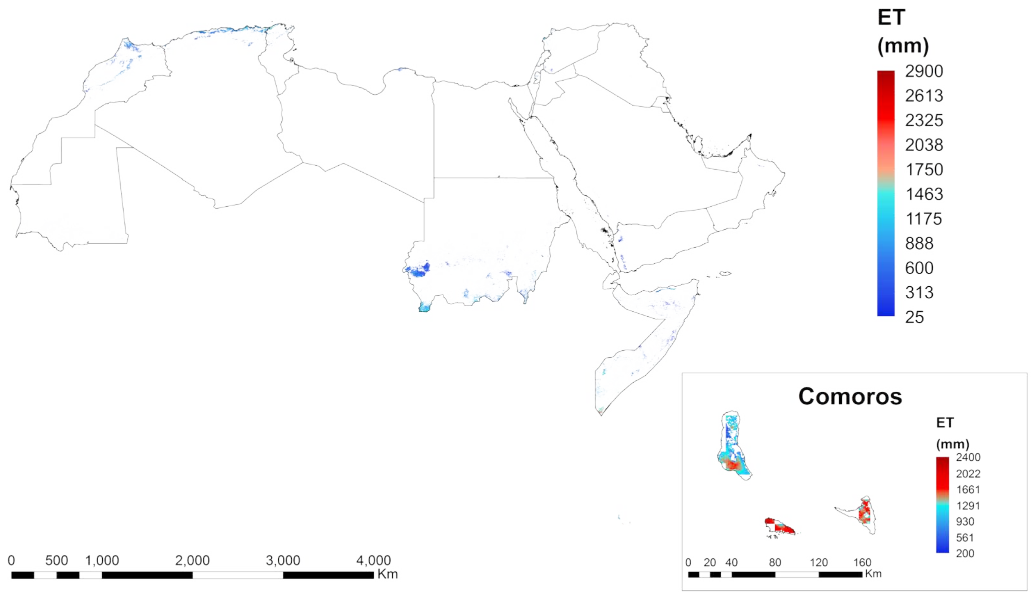
Map 3. 2015 Rainfed Agriculture Evapotranspiration Depth

2015 Pasture Lands Evapotranspiration Depth



Map 3. 2015 Pasture Agriculture Evapotranspiration Depth

2015 Forest Evapotranspiration Depth



Map 4. 2015 Forests Agriculture Evapotranspiration Depth

The evaporation losses from both the barren lands and the open water bodies are displayed in Figure 67. The majority of the evaporation volume is coming from the barren lands (94%) while the evaporation from the open water bodies only account for 6% of the total evaporation losses. The value of the evaporation from barren lands corresponds the vast barren and deserted areas in the Arab region. Figure 68 and Figure 69 show the values for the evaporation from barren lands and open water bodies for the Arab countries. Algeria and Morocco with their enormous desert areas contribute to about 45% of the total barren lands evaporation.

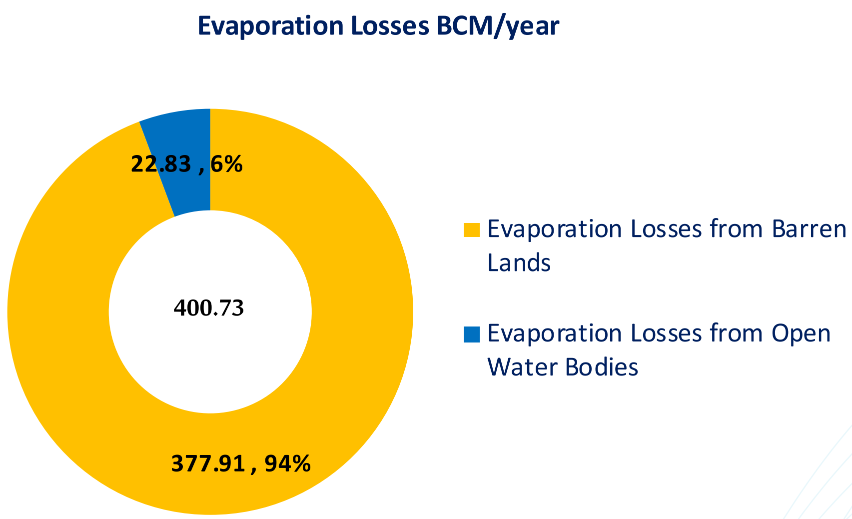


Figure 67. Evaporation Losses in the Arab region

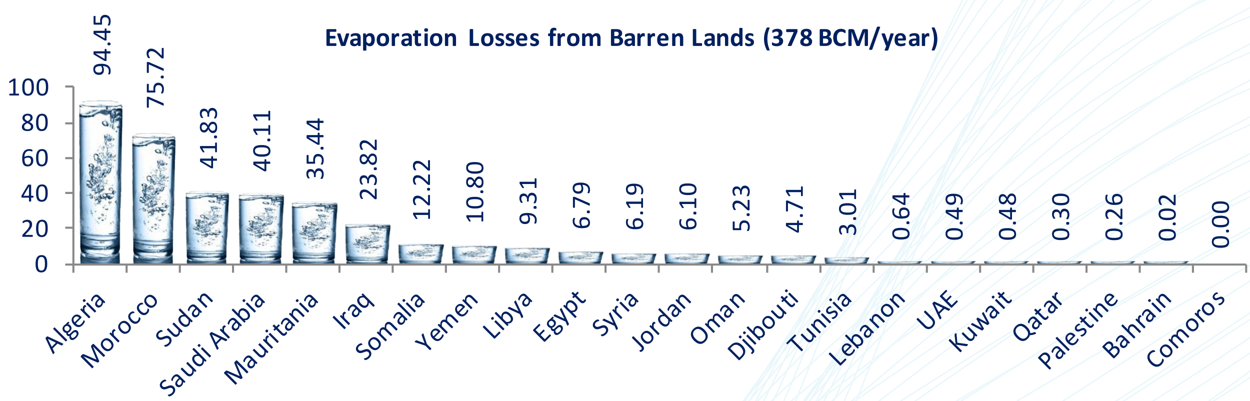


Figure 68. Evaporation Volume from Barren Lands in the Arab Region

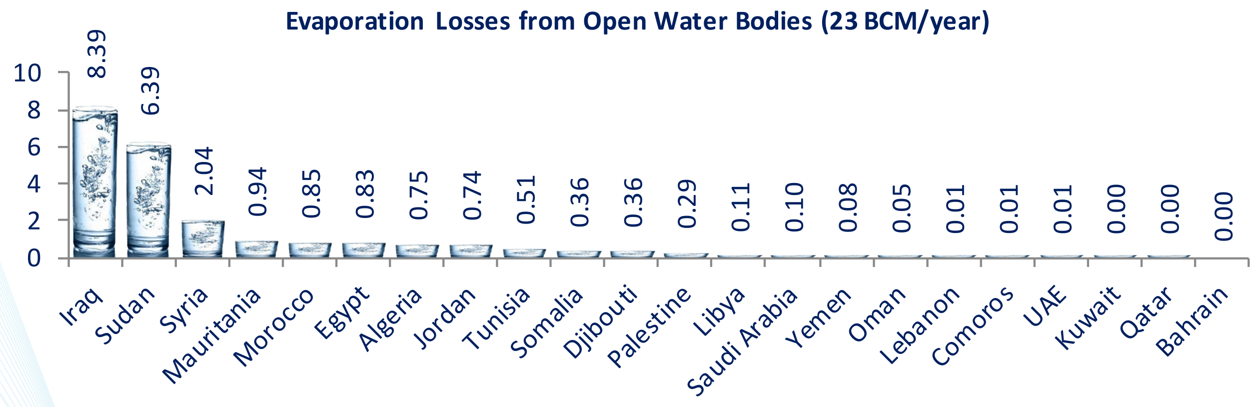
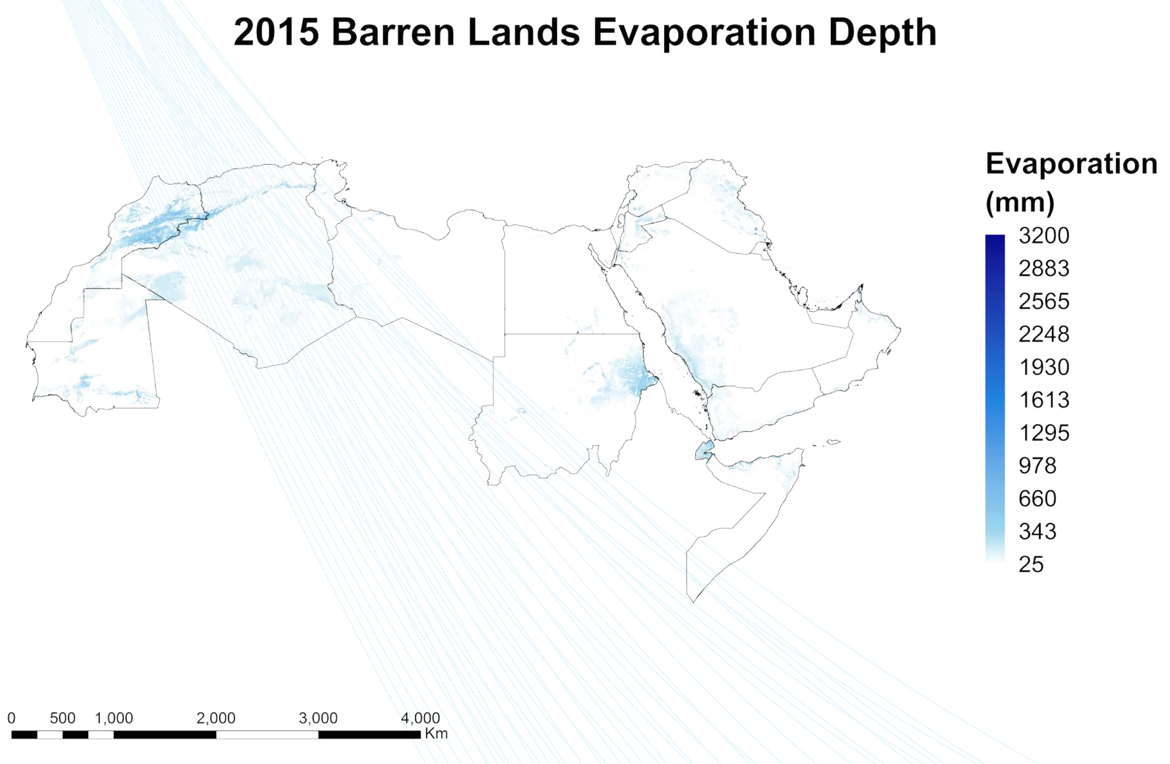
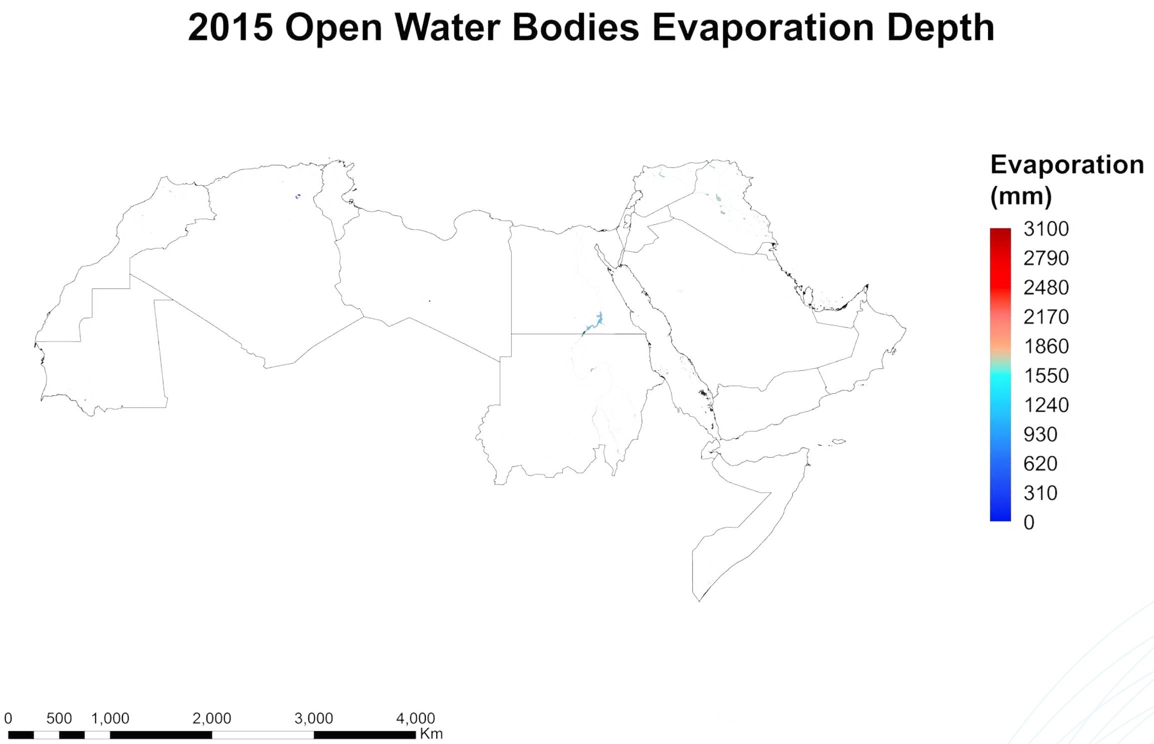


Figure 69. Evaporation Volume from Open Water Bodies in the Arab Region

Maps 6 and 7 show the spatial distribution of the actual evaporation depth from barren lands and open water bodies in the Arab Region.



Map 6. 2015 Barren Lands Evaporation Depth



Map 6. 2015 Open Water Bodies Evaporation Depth

Finally, the total actual 2015 evapotranspiration from green cover for the Arab countries is displayed in Figure 70. The total volume of evapotranspiration in the region is 1022 BCM for the year 2015. Sudan and Somalia are the countries with the highest volumes of evapotranspiration (60% of the total evapotranspiration volume).

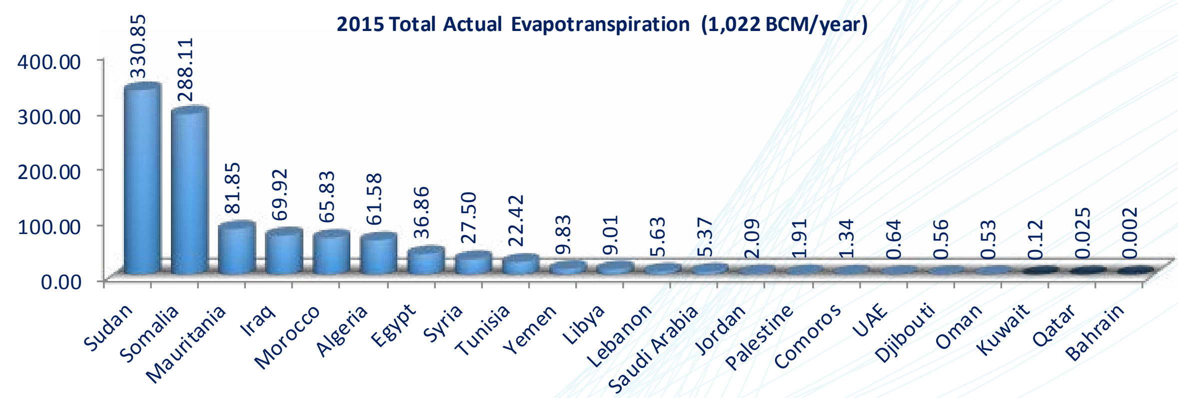


Figure 70. Total Actual Evapotranspiration

2.3.1- Green Water Consumption

The green water for each green cover category were estimated by calculating the volumes of evapotranspiration detected at those areas, and comparing those values to the rainfall amounts. The rainfall data is included in this estimation to guarantee that the green water values calculated for the rain-fed areas (including rainfed agriculture, pasture lands and forests) are only associated with the rainfall and no other water sources such as surface water or groundwater are contributing to the evapotranspiration. Thus, if the amount of evapotranspiration is higher than the amounts of rainfall for a specific area, only the amount of rainfall would be assigned as the renewable green water. For the irrigated agriculture areas, the green water was estimated based on the rainfall amounts only. In contrast with the total actual evapotranspiration value assessed in the previous section (1,022 BCM) for the year 2015, the green water consumption only, which is based on the rainfall contribution to evapotranspiration, is estimated to be about 688.56 BCM. Figure 71 shows the green water consumption for each green cover type. Figure 72 shows the Green and Blue water consumption (833.98 BCM) of the green Cover in the Arab Region, which includes also the Evapotranspiration component from Irrigated Agriculture attributed to by Blue Water. The same Green and Blue Water consumption (833.98 BCM) for each green cover type for each country is illustrated in Figure 73. Precipitation volumes for each green cover category is found in Table 3 in the Annex. Annex Table 2 shows the calculations performed to estimate the green water consumption for each green cover type

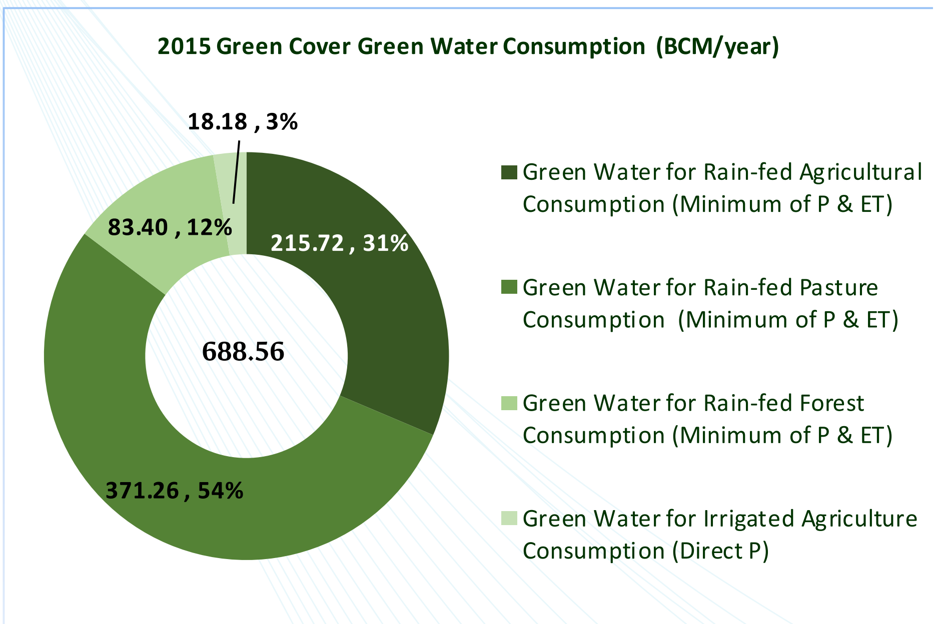


Figure 71. 2015 Green Cover Green Water Consumption in the Arab Region based on Remote Sensing Data

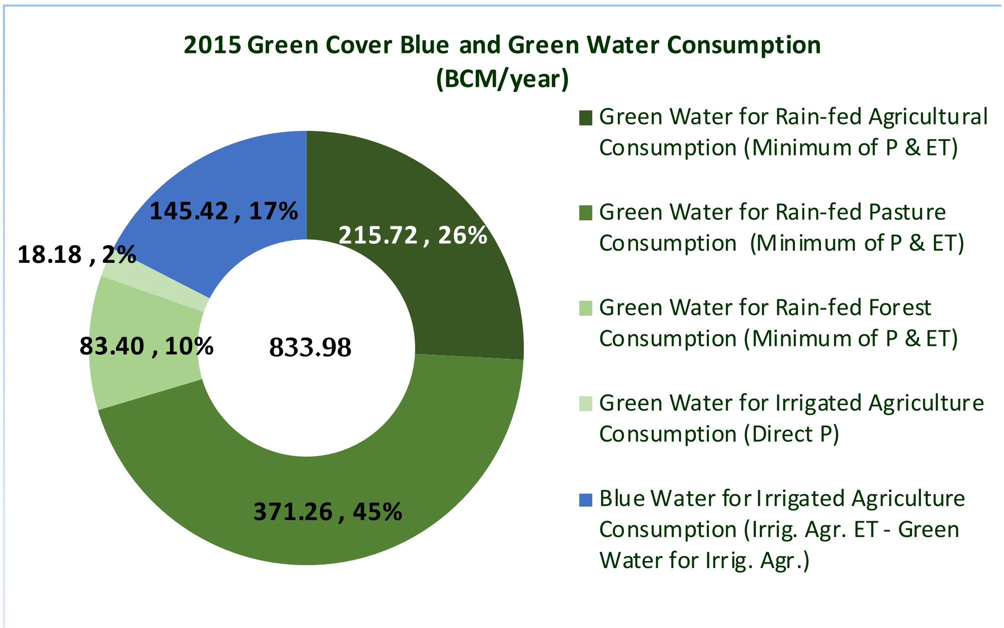


Figure 72. 2015 Green Cover Blue and Green Water Consumption in the Arab Region based on Remote Sensing Data

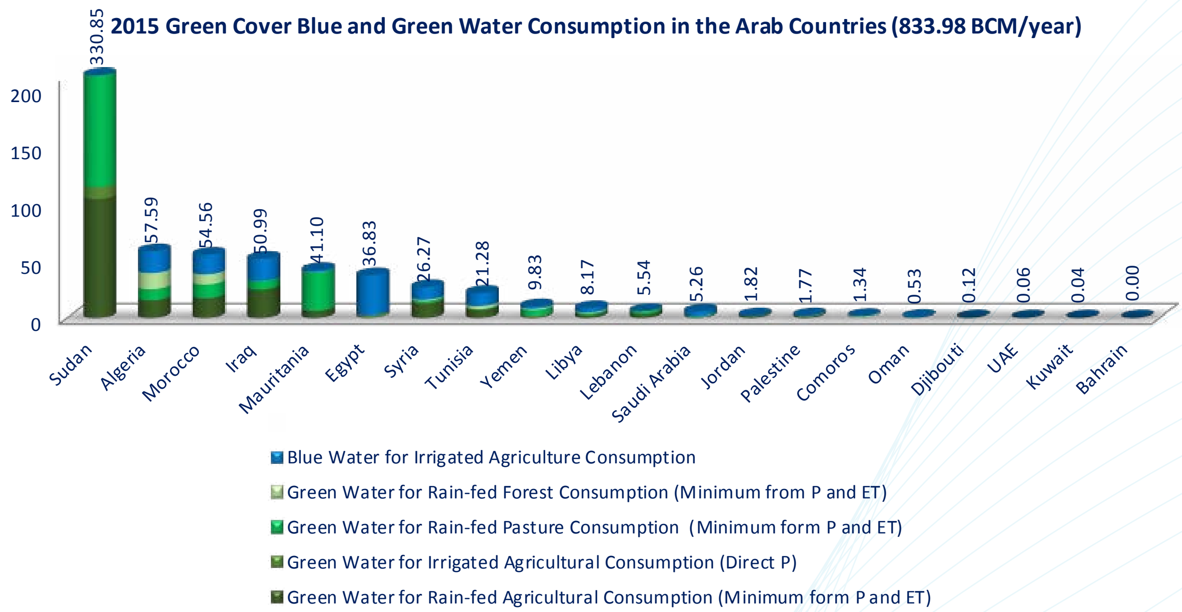


Figure 73. 2015 Green Cover Blue and Green Water Consumption in the Arab Countries based on Remote Sensing Data

3. Water & Land Use Changes

3.1- Country Reporting Regarding Land Use

Four major land use categories are considered, since they are directly related to the green cover and the main freshwater abstractions. These are: irrigated agricultural land, rain-fed agricultural land, pasture land, and forests land. Barren lands are only considered in the remote sensing assessment, as will be explained later. Figure 74 shows the relative distributions across the Arab Region for the previous areas. Pasture lands constitute about 59% of the major green cover land uses (about 141 million ha). Forests and rain-fed agriculture lands, each represents about 15% and 20% respectively of the green cover land use, while irrigated agricultural lands constitute nearly 6% (13.9 million ha).

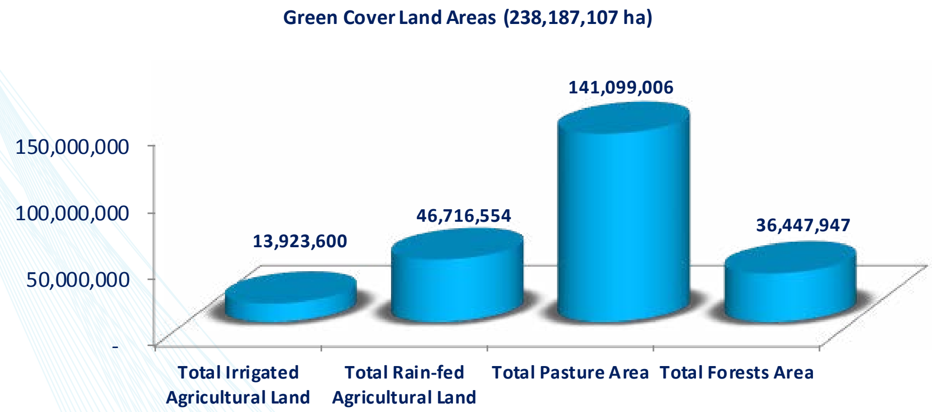


Figure 74. Main Categories for Green Cover Land Uses which Consume Freshwater

For the sake of comparison, total water abstraction is plotted side by side to the land use area in Figure 75 where pasture lands are seen to consume the largest share.

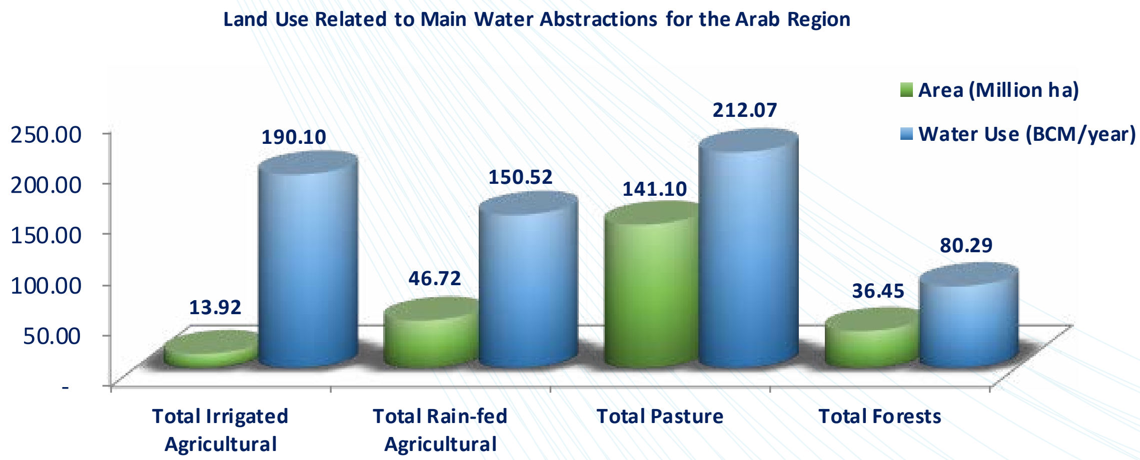


Figure 75. Land Use Areas and Corresponding Water Consumption

3.1.1- Irrigated Agricultural Lands

The total irrigated agricultural lands in the Arab region amounts to 13.9 million hectares. More than 80% of the irrigated lands are residing in five countries, namely; Egypt, Iraq, Sudan, Morocco, and Algeria. Figure 76 shows the distribution of irrigated lands among all countries. Irrigated agriculture is supported by blue water.

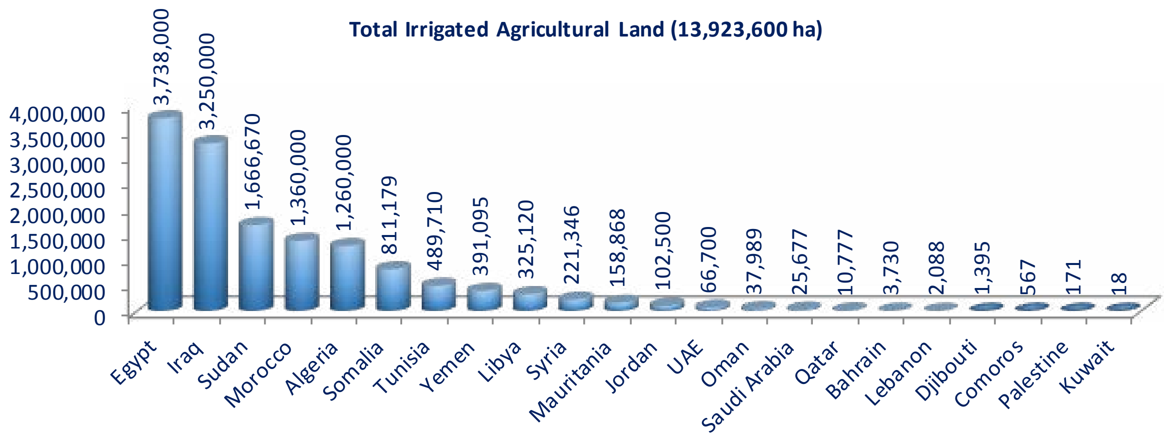


Figure 76. Irrigated Agricultural Land for Arab Countries

3.1.2- Rain-fed Agricultural Lands

Figure 77 displays the distribution of rain-fed agricultural lands among Arab countries, where five countries (Sudan, Algeria, Morocco, Somalia and Tunisia) contain 80% of the total rainfed agriculture lands. Rainfed agriculture is supported by green water.

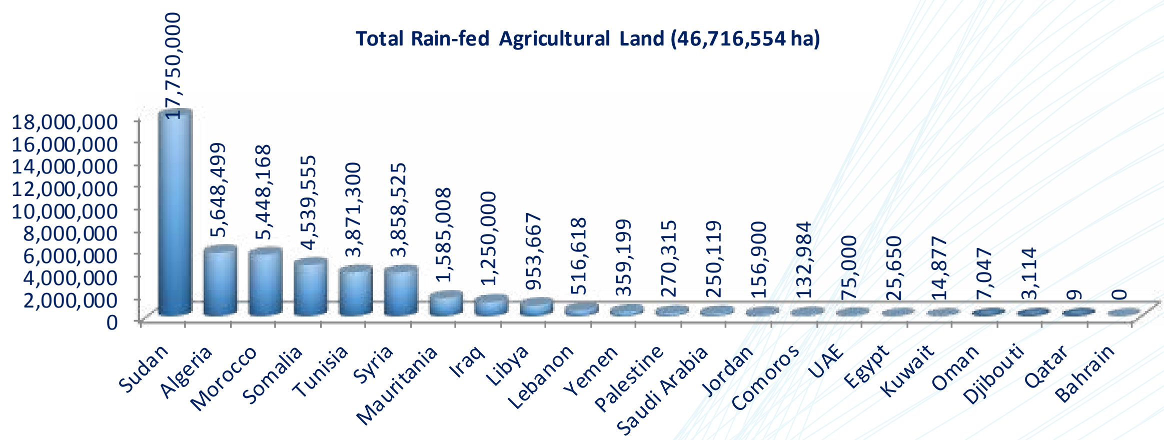


Figure 77. Rain-fed Agricultural Areas for Arab Countries

3.1.3- Pasture Lands

Figure 78 reveals the allocation of pasture lands areas among Arab countries. About 38% of the total pasture lands are located in Sudan (54 million ha), while another 47% lie in four countries (Somalia, Mauritania, Algeria and Morocco). Pasture lands are totally supported by green water.

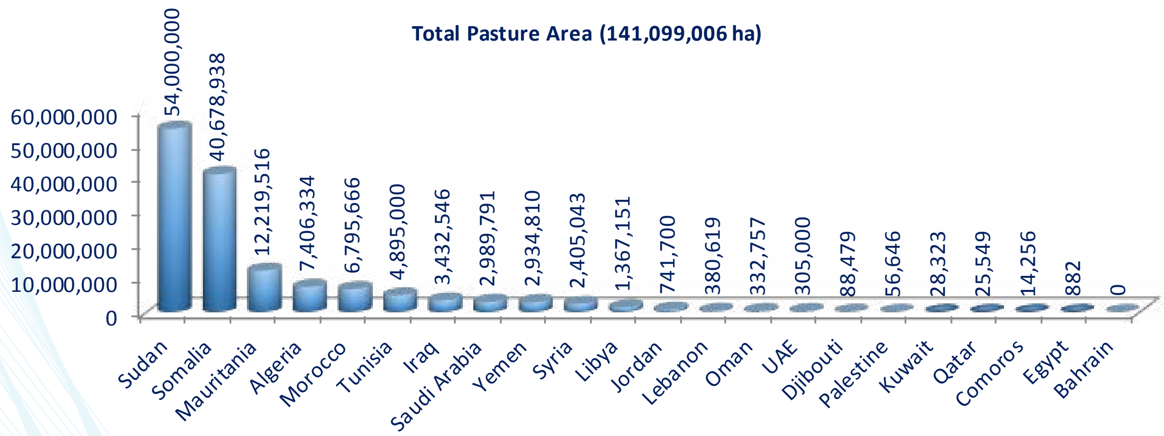


Figure 78. Total Pasture Area for Arab Countries

3.1.4- Forest Lands

Forest lands are not common in the Arab Region. Nevertheless, Figure 79 depicts the location of forest areas among Arab countries. About 61% of the total forest lands are located in Sudan (22.3 million ha), while another 34% lie in four countries (Tunisia, Somalia, Algeria and Morocco). Forests are totally supported by green water too.

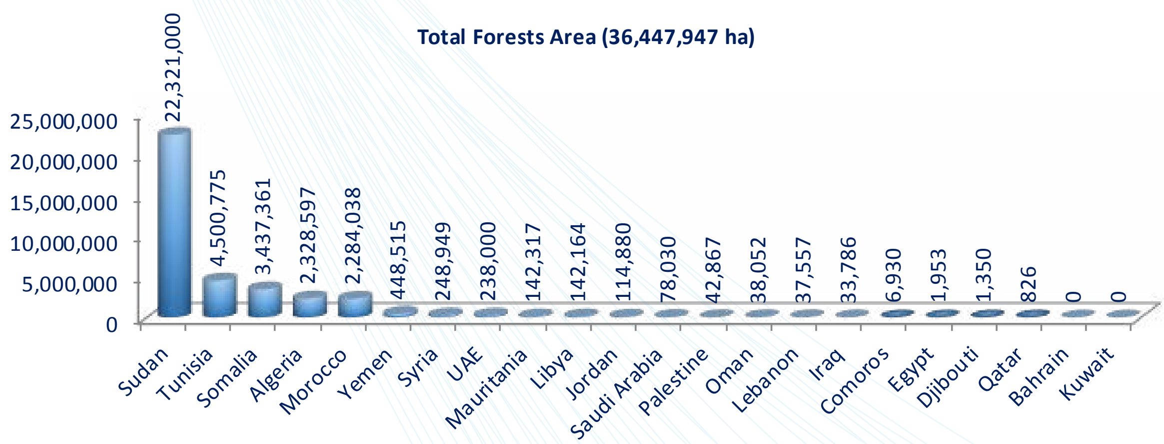


Figure 79. Forests Areas for Arab Countries

3.2- Remote Sensing Estimates

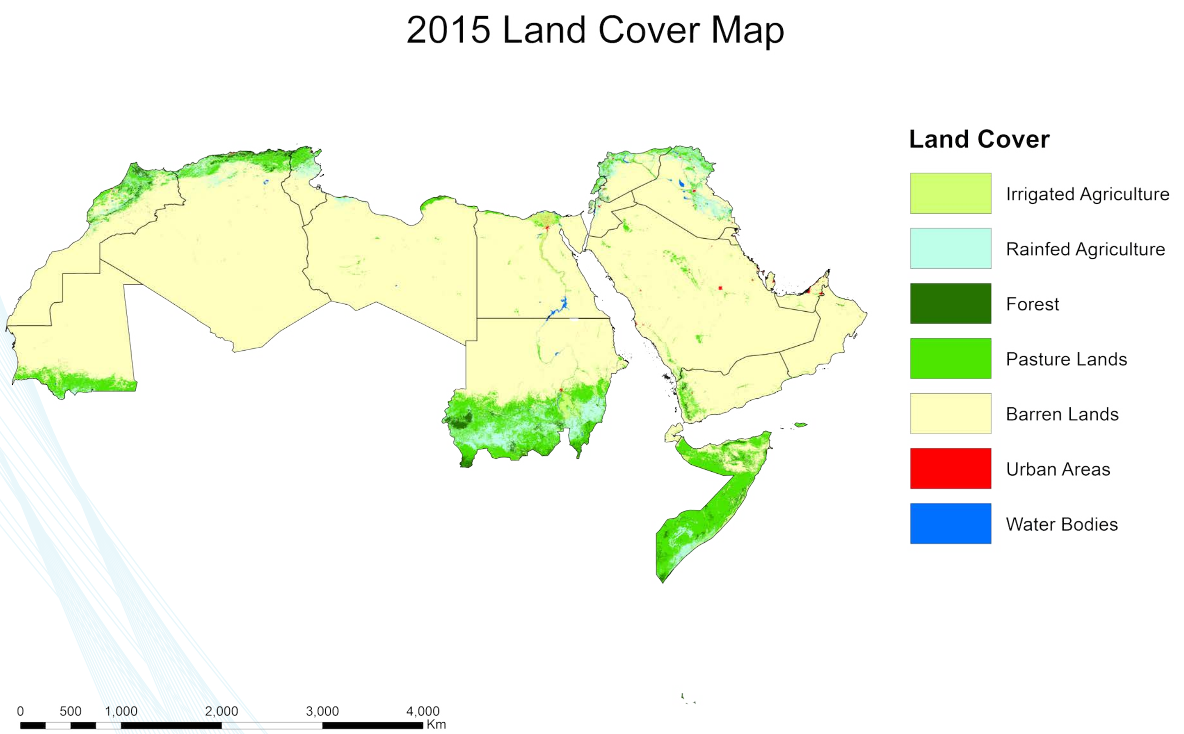
Due to the possible errors or inconsistency in the countries' reporting regarding the land cover classification and corresponding areas, remote sensing data has been utilized in this report to accurately determine the different land uses areas, and furthermore, to detect the changes in land use occurred during the 3 years period between 2012 and 2015. Urban encroachment on green cover has been estimated including the effects on the water resources, and desert encroachment has been estimated as well. The remote sensing data used in the analysis is introduced below.

3.2.1- Land Cover Maps

The European Space Agency land cover maps were used for the definition of the land classes throughout the Arab region. The land cover (LC) maps has a 300 m spatial resolution and referenced using the geographic coordinate system (GSC) based on the World Geodetic System 84 (WGS84) ellipsoid. The maps were produced using a set of baseline land cover data including the Medium Resolution Imaging Spectrometer (MERIS) full resolution (FR) and reduced resolution (RR) archiver spanning the duration from 2003 to 2012 at 300 m spatial resolution, the Advanced Very-High-Resolution Radiometer (AVHRR) global SR composites from the year 1992 to 1999, as well as the Satellite Pour l'Observation de la Terre Vegetation (SPOT-VGT) time series for the years 1999 and 2003 and the PROBA-V satellite data for the years 2013, 2014 and 2015 that was re-mapped at 300 m resolution from the original 1 km change detection spatial resolution. The product used in this study is the land cover maps for the year 2015.

The land cover data is presented using Land Cover Classification System (LCCS) developed by the United Nations Food and Agriculture Organization (FAO), the land classes are classified into a global categorization (Level 1) and a more detailed regional categorization (Level 2) to increase the level of accuracy and detail on the global level.

For the purpose of this study, the Level 2 regional classification was used to achieve a high level of detail. The land cover classes were reclassified into 7 land cover categories; irrigated agriculture, rain-fed agriculture, forests, pasture lands, urban areas, water bodies, and barren lands. The level 2 regional classification and reclassification is presented in the Annex. Map 8 shows the land cover classes distribution over the Arab region. Table 5 in the Annex shows the reclassification of the land cover data.



Map 8. Land Cover Classes Distribution over the Arab Region

Figure 80 displays the distribution of the areas corresponding to different land use across the Arab Region. It is obvious that the regional land use is dominated by barren lands (deserts) which represent nearly 83.5 % of the total area, and are prevailing in all Arab countries except for Comoros. Table 6 in the Annex presents the detailed land cover distribution for each country.

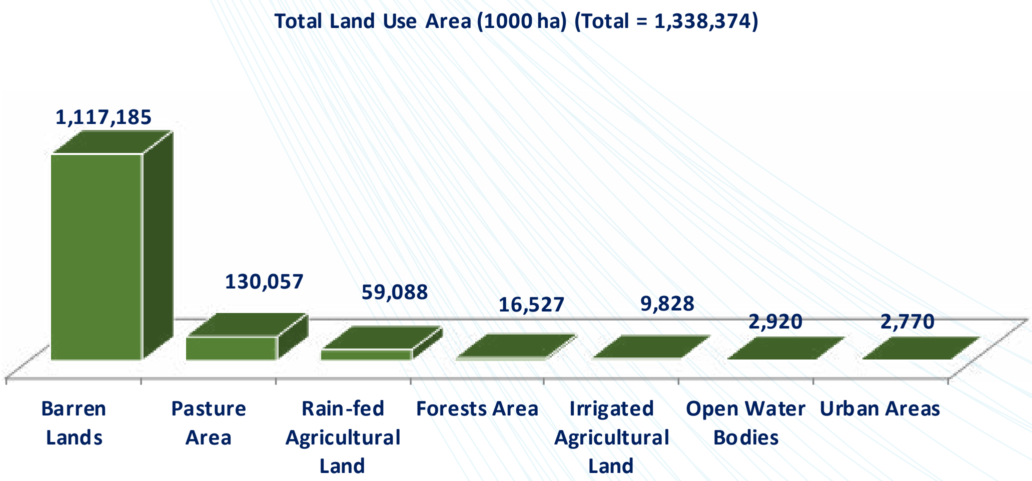


Figure 80. Land Cover Distribution in the Arab Region

About 130 million hectares of pasture lands exist as the second most prevailing land use (almost 9.7% of total area). Rainfed agricultural lands and irrigated agricultural lands represent 59 million ha (4.4%) and 9.8 million ha (0.7%) respectively. Forests cover about 1.2% of the total area of the region (16.5 million ha). Finally, urban areas in the region (2.7 million ha) are nearly equivalent to inland water bodies (2.9 million ha) and each represent nearly 0.2% of the total area.

The distribution of different land use categories among countries where countries contributing to nearly two thirds of the total area of each category are listed. Irrigated agricultural lands are shown in Figure 81 with Sudan, Egypt, Somalia, Yemen and Syria are ranking as the top 5 countries in irrigated land areas. It is important to note that irrigated areas may not be matching with irrigation water consumption when comparing different countries. One reason is that each country has its own cultivation intensification strategy. For example, Egypt may have up to 3 growing seasons per year while another country may have a single cultivation season. Another reason maybe that while some agriculture lands are classified as irrigated lands, they could be receiving supplemental rainfall in some countries. Figure 82 to Figure 84 plots the distribution of different land use categories.

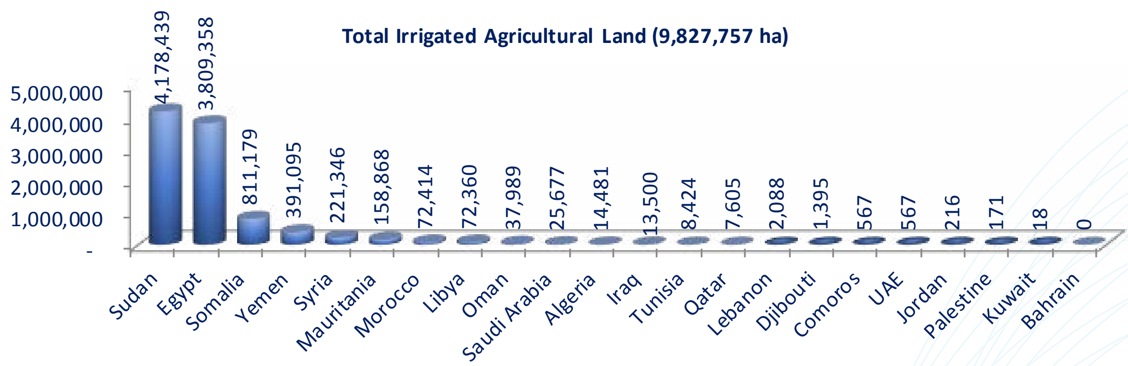


Figure 81. Total Irrigated Agricultural Land by Country

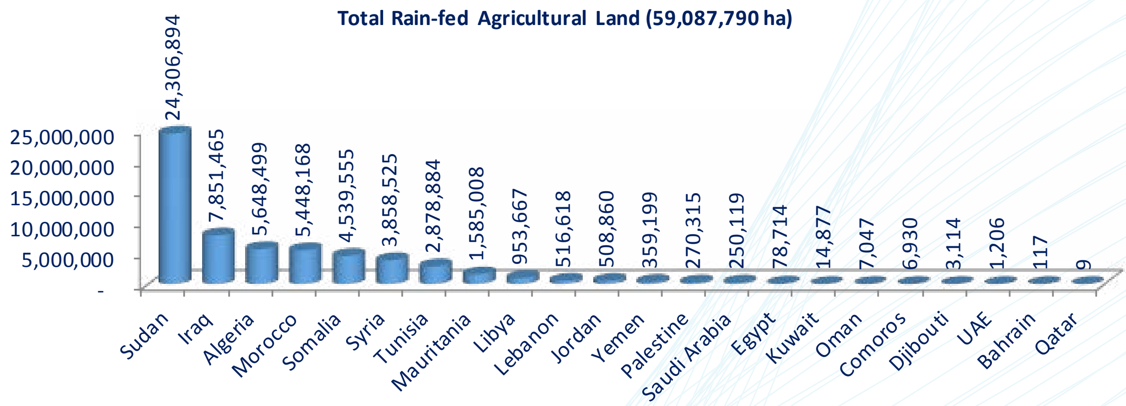


Figure 82. Total Rainfed Agricultural Land by Country

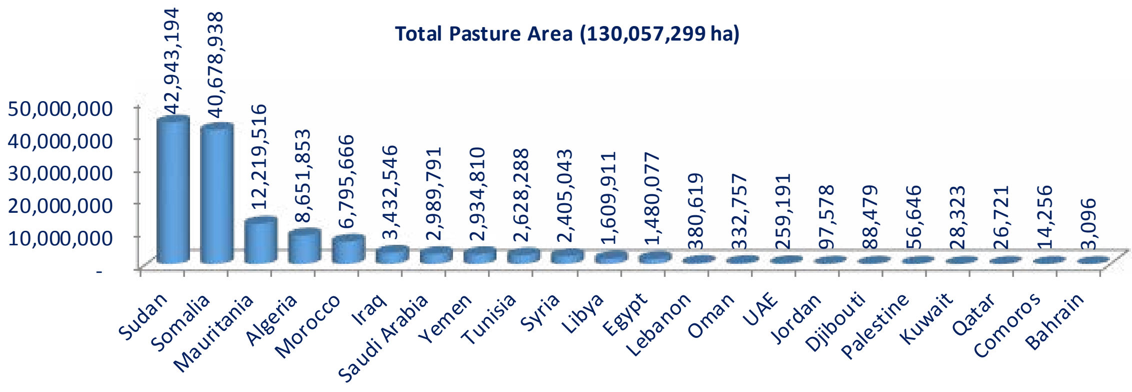


Figure 83. Total Pasture Lands by Country

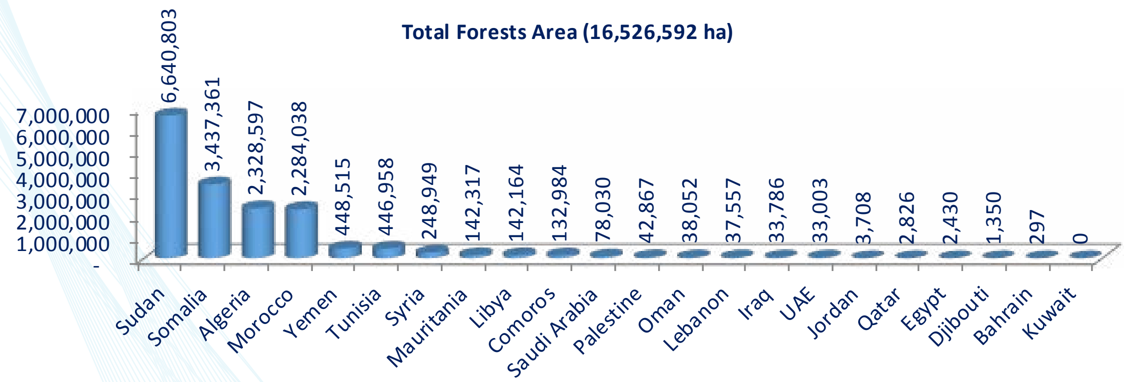


Figure 84. Total Forest Areas by Country

Remote sensing estimates, just presented, do differ from data provided by country reports, and some external references. Variations may arise from relying on historical un-updated information layers, or from grey areas in the remote sensing classification techniques where a considerable difference in the classification category may occur between different land uses. Nevertheless, variations in land use (land use changes) are relative and should not be carrying over a significant absolute error.

3.2.2- Land Use Changes and Impact on Water

Land use change between the years 2012 and 2015 is detected to assess the trends and the expected changes in the water distribution and uses. A land use change is detected when an area of land, which previously fell under one category of land use, no longer belongs to the same previous category. For example, if an area of 500 ha, which has been classified as forest area in 2012 is now classified as irrigated agriculture in 2015, then a land use change is detected as 500 ha being changed from forests to irrigated lands. Figure 85 show the total change in the green cover during the period between the end of 2012 till the end of 2015. A decrease of about 138,000 ha has occurred in the 3 years period. The majority of the change has occurred in Sudan as the country has lost more than a 100,000 ha of green cover. Somalia, Tunisia, Morocco and Egypt has also lost more than 10,000 ha.

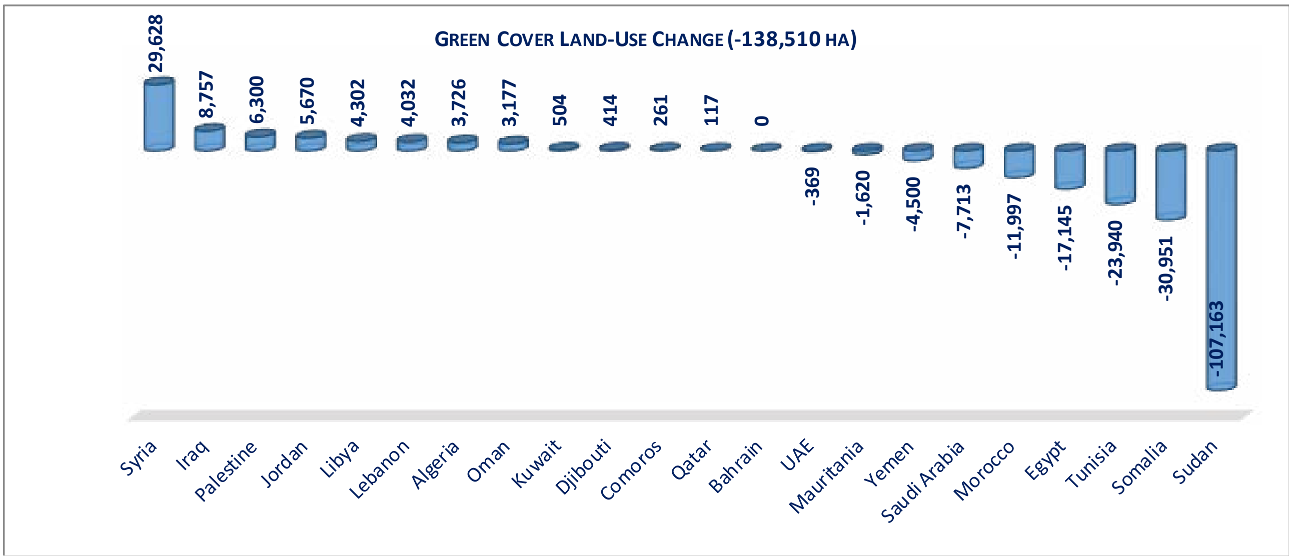


Figure 85. Green Cover Land-Use Change in the Arab Coutries

Two major types of land use changes will be addressed since they may result in serious future implications. These are: urban encroachment on different land uses, and desertification, or desert encroachment on other land uses.

3.2.2.1- Urban Encroachment

One of the major indicators is the detection of the urban encroachment on green cover, the encroachment would change the land cover and subsequently change how the water reacts. The detections were estimated by comparing the European Space Agency land cover data between the years 2012 and 2015 by quantifying the green areas that transformed into urban areas in the year 2015. Unfortunately, the majority of new urban developments have been replacing other natural and/or beneficial green cover land uses. In a region where 83% of the total area is mere deserts, it seems highly inappropriate to expand in developments on the expense of scarcely available green areas. The urban encroachment on green cover is summarized in Figure 86 and its associated impact on water resources is given in Figure 87. Table 7 in the Annex shows the urban encroachment on green cover for each Arab country. Urban encroachment results in a main increase of nearly 1.8 BCM in domestic water abstractions, and a main decline of nearly 1.0 BCM in consumption of green cover.

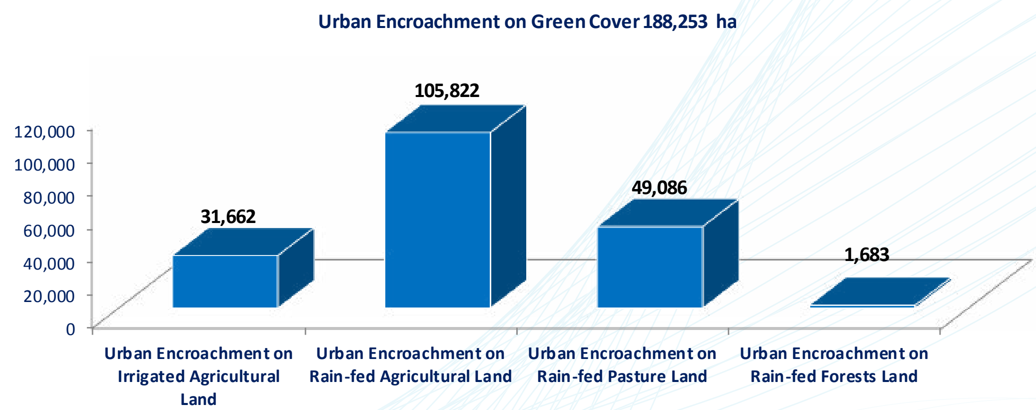


Figure 86. Urban Encroachment on Different Land Uses in the Arab Region

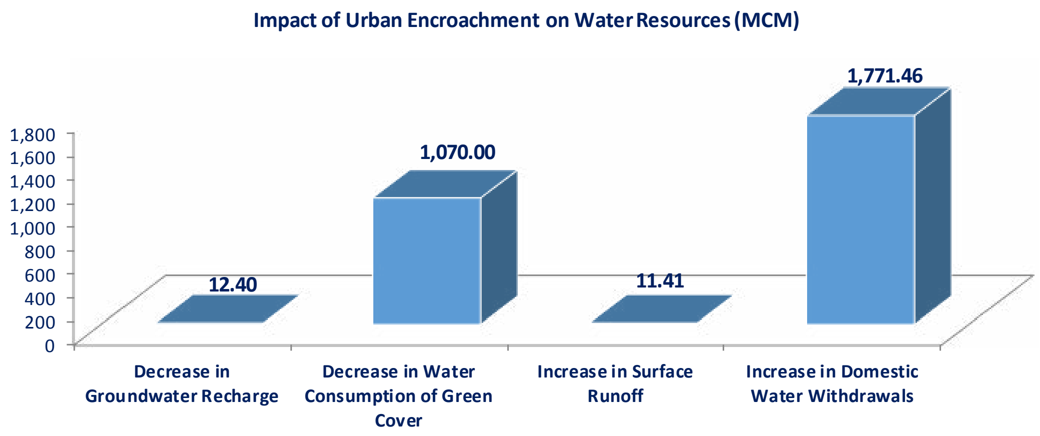


Figure 87. Impact of Urban Encroachment on Water Resources in the Arab Region

One can clearly depict that about 188,253 ha of green cover has been lost to urban encroachment, of which 31,662 ha are irrigated agricultural lands, while about 105,822 ha of rainfed agricultural lands have suffered the same destiny. These very precious agriculture lands are often non-retrievable.

Figure 88 displays the severity of the latter problem per each Arab country. More than two thirds of the total urban encroachment have been attributed to five countries; Egypt, Iraq, Algeria, Syria, and Sudan. The case of Egypt is harsh and unique. In three years, more than 32,000 ha have been transformed into urban areas, mainly on the expenses of 26,000 ha of irrigated agricultural areas (mostly in the fertile Nile delta). Most of these transformations have been concurrent with political unrest that was prevailing 2012-2013. Should this encroachment rate continues, god forbids, more that 2% of fertile and highly productive lands will be lost every decade..

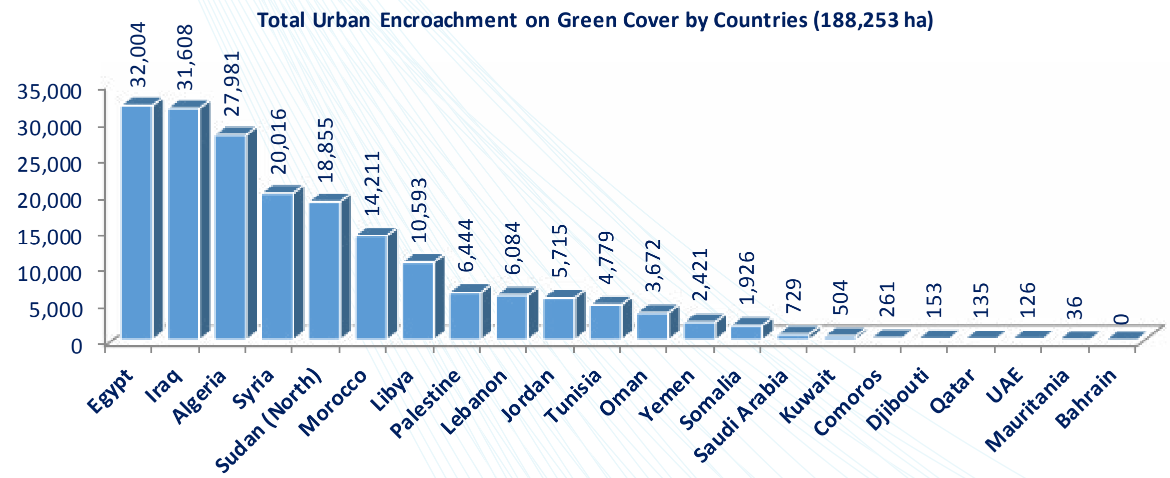


Figure 88. Total Urban Encroachment by Countries

Urban encroachment also affects how the water is distributed in those areas where a change has occurred, newly urbanized areas would require domestic water for the inhabitants, while the water demand for the green cover before encroachment is not available anymore. Increase in surface runoff is expected due to the nature of the land cover for the urban areas, while a decrease in the groundwater recharge could also occur.

The decrease in the water consumption of the green cover would be estimated as the amount of evapotranspiration from the green areas that changed into urban areas in the year 2015 as shown in Figure 89.

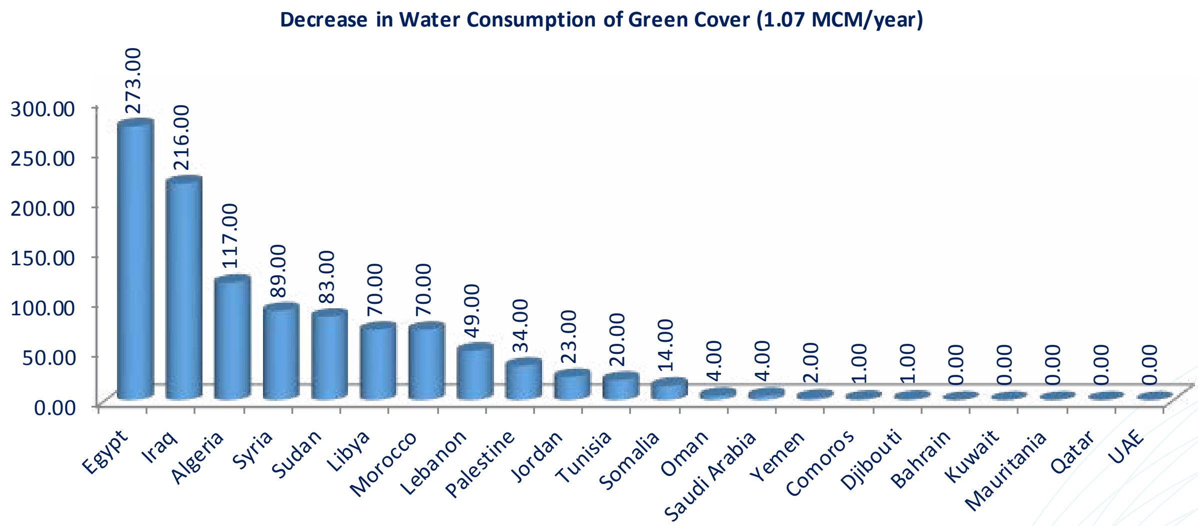


Figure 89. Decrease in Green Cover Water Consumption due to Urban Encroachment

For the change in surface runoff and groundwater recharge, it was assumed that all the effective rainfall after subtracting actual evapotranspiration depths from the rainfall depths occurring on the areas where urban encroachment occurred will be considered as direct runoff. Therefore, the values of groundwater recharge in those areas in the year 2012 are considered to be the amount of groundwater recharge decrease due to urban encroachment. Using the rainfall and evapotranspiration data in the year 2015, the amount of runoff is calculated using the curve number method, then the groundwater recharge amounts are calculated using a simple mass balance equation. The SCS-Curve Number method was included in the Technical Report (TR-55) from the United States Department of Agriculture (USDA). The runoff volume is calculated using the curve number by using the Rainfall and evapotranspiration volumes, the recharge is then calculated using a simple water mass balance. The detailed method of calculation is included in the indicators' definitions section (I-3-1).

Figure 90 and Figure 91 shows the decrease in groundwater recharge and the increase in the surface runoff due to urban encroachment.

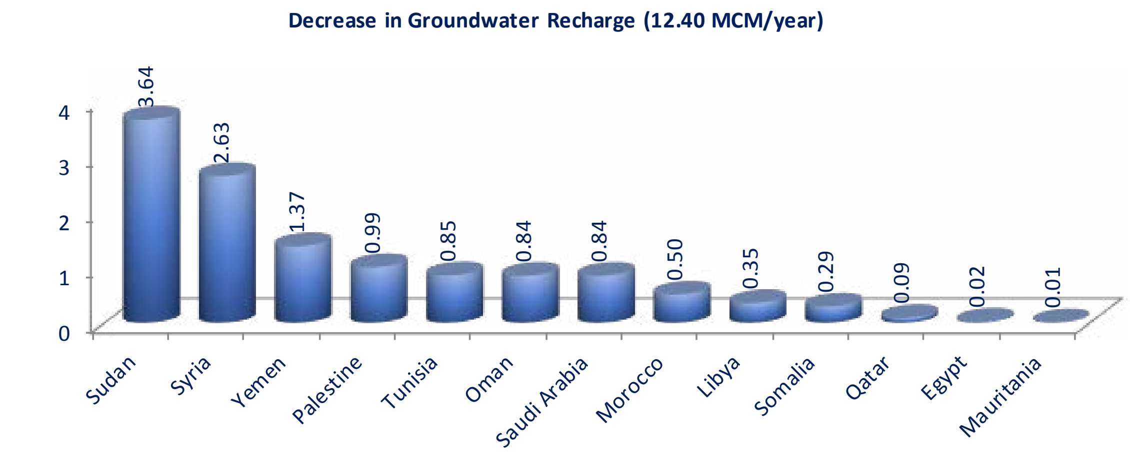


Figure 90. Decrease in Groundwater Recharge due to Urban Encroachment

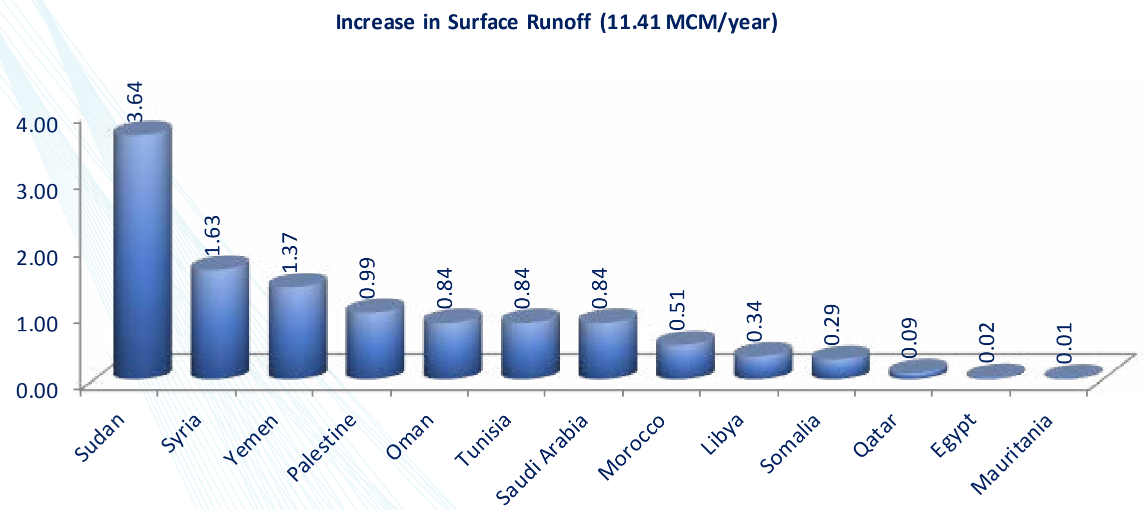


Figure 91. Increase in Surface Runoff due to Urban Encroachment

The domestic consumption for the inhabitants in the newly urbanized areas is estimated by assuming the daily water demand per capita (160 l/c/day) and the population density (15000 capita/km2). The landscaping demand is also taken into consideration as a part of for the domestic water demand, the landscape areas are assumed to represent 5% of the total newly urbanized area. The increase of the domestic water withdrawals due to urban encroachment is depicted in Figure 92. Table 8 in the Annex shows the detailed calculations for the domestic consumption due to urban encroachment.

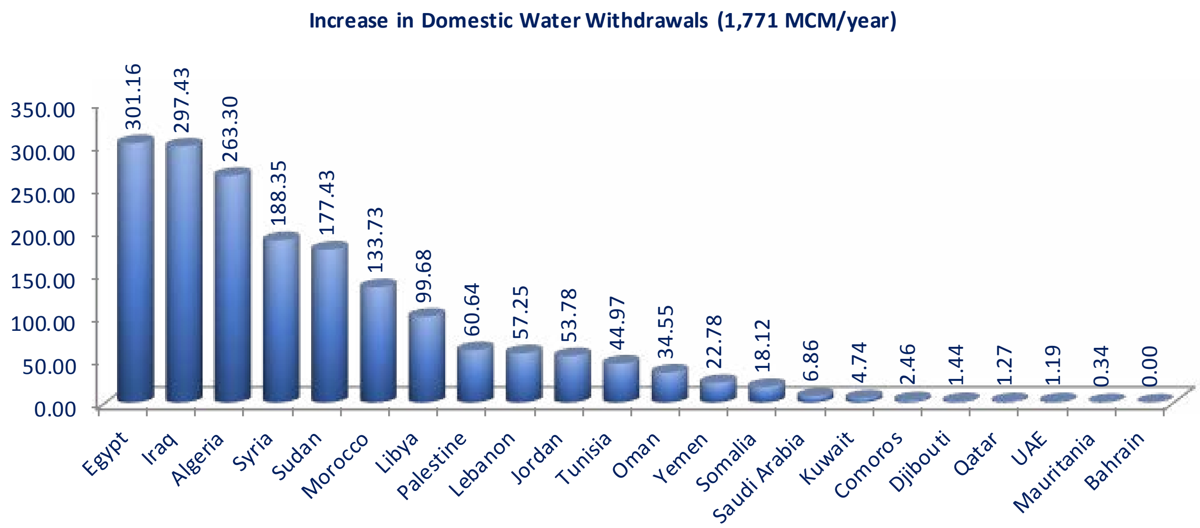


Figure 92. Increase in Domestic Water Withdrawals due to Urban Encroachment

3.2.2.2- Desert Encroachment

Desert encroachment, or merely desertification, occurs when hydrological conditions support an incremental increase in aridity (usually accompanying water stresses). Deteriorating economic and socio-economic circumstances along with neglecting environmental conservations speed up the process of transforming of green cover and water bodies into desert land. Figure 93 displays the status of desert encroachment on other land uses in the Arab Region. The figure shows that nearly 44,000 ha of beneficial land uses have been changed into deserts. Table 9 & Table 10 in the Annex shows the desert encroachment on each land cover and the desert encroachment areas per country.

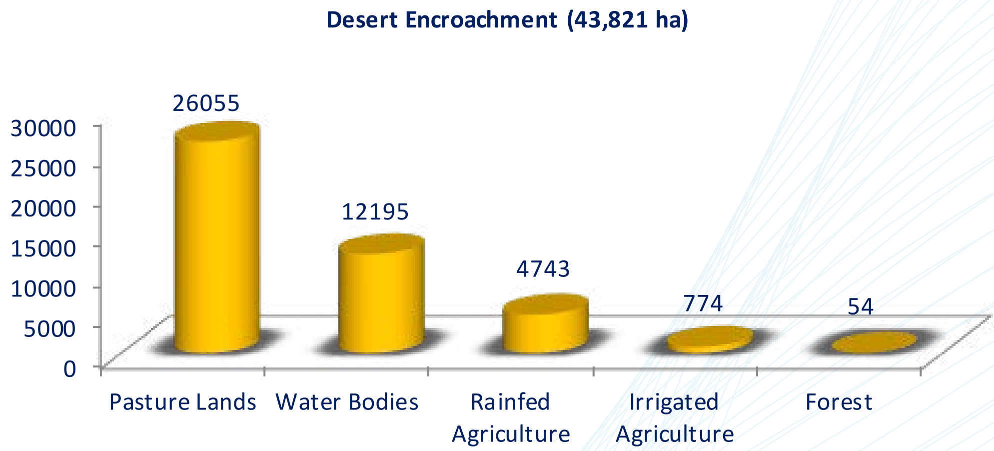


Figure 93. Desert Encroachment on Different Land Uses

4. Water & Services

Monitoring of progress in water services levels is achieved through checking two basic categories. These comprise: (i) indicators for evaluating water and sanitation coverage and accessibility levels (as per the MDG definitions), and (ii) indicators for assessing water infrastructure and services capacities.

4.1- Water Coverage and Accessibility

4.1.1- Country Reports

Basic indicators for improved drinking water coverage in the Arab region are provided in Figure 94. Country reporting shows that 79% of the total Arab population benefits from piped water connections on the premises of their dwellings. In general, 89% of the urban communities and 83% of the rural communities receive improved drinking water coverage. Safely managed Drinking Water coverage (one of the new SDG 6 targets) is estimated at about 82%. However, it is to be noted that not all countries have reported adequately on this indicator.

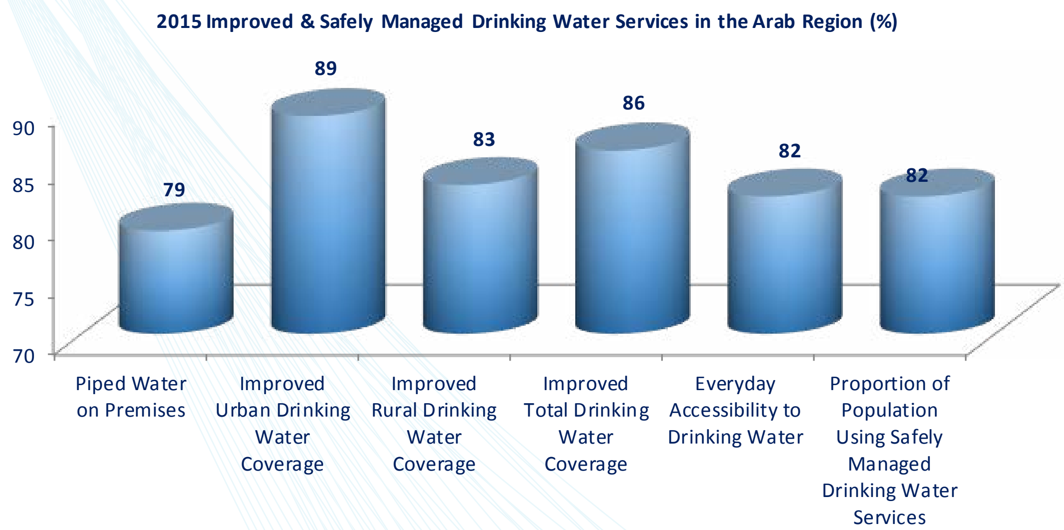


Figure 94. Percent of Population Enjoying Different Components of Improved Drinking Water Services

Figure 95 shows country reporting on Improved Drinking Water total coverage. Furthermore, country reporting confirms that 82% of the total population in the Arab Region is provided with everyday access to drinking water services. On a country basis, Figure 96 shows that, apart from Oman, all the gulf countries in addition to Egypt, Libya, Jordan, Morocco, Tunisia, and Yemen had achieved in 2015 above 95% everyday accessibility to drinking water services. However, in Yemen, the civil unrest have severe implications on drinking water supplies. Along wih Somalia and Palestine, those three countries have the least three percentages for everyday drinking water accessibility (below 50%).

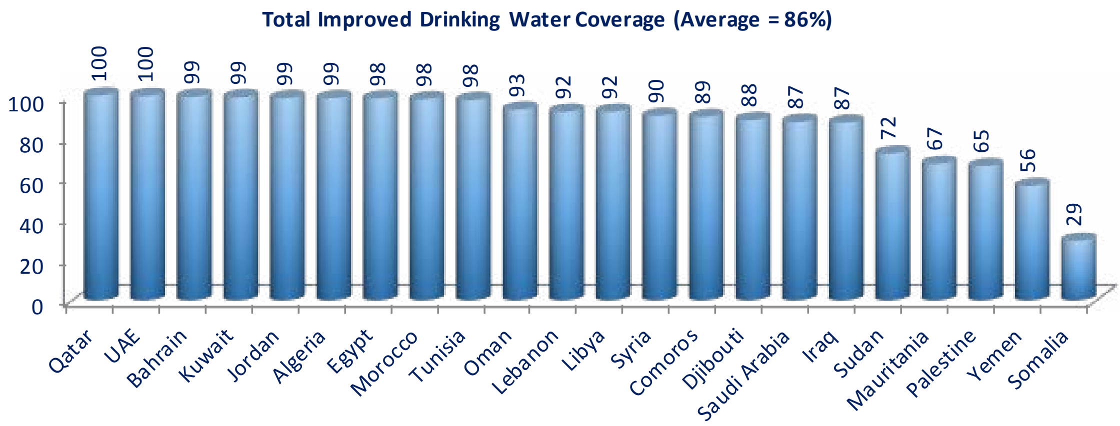


Figure 95. Improved Drinking Water Coverage in the Arab Region

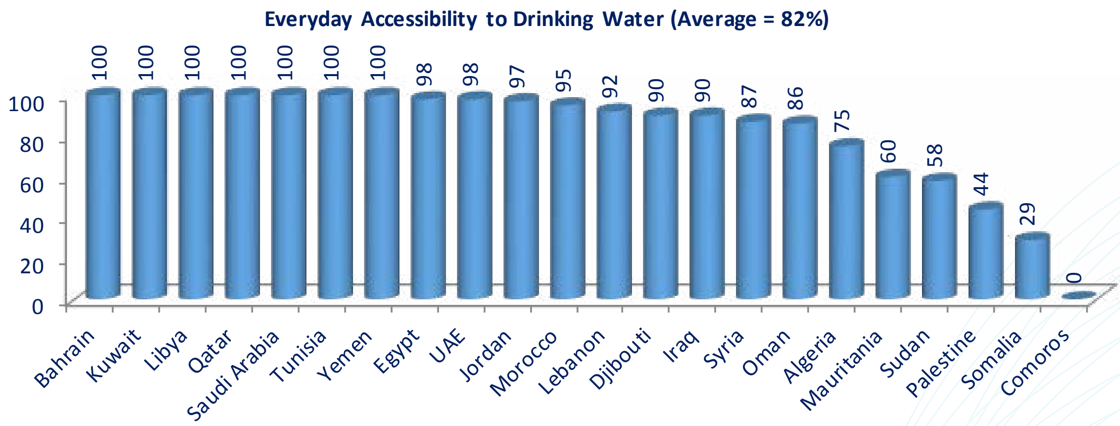


Figure 96. Everyday accessibility to Drinking Water

The status of progress in improved sanitation services coverage is summarized in Figure 97, as depicted from country reports. The figure shows that, on the average, 81% of urban populations, and 71% of rural populations enjoy improved sanitation coverage. Safely managed sanitation coverage (one of the new SDG 6 targets) is estimated at about 72%. However, it is to be noted that not all countries have reported adequately on this indicator. Figure 98 shows country reporting on Improved Sanitation total coverage.

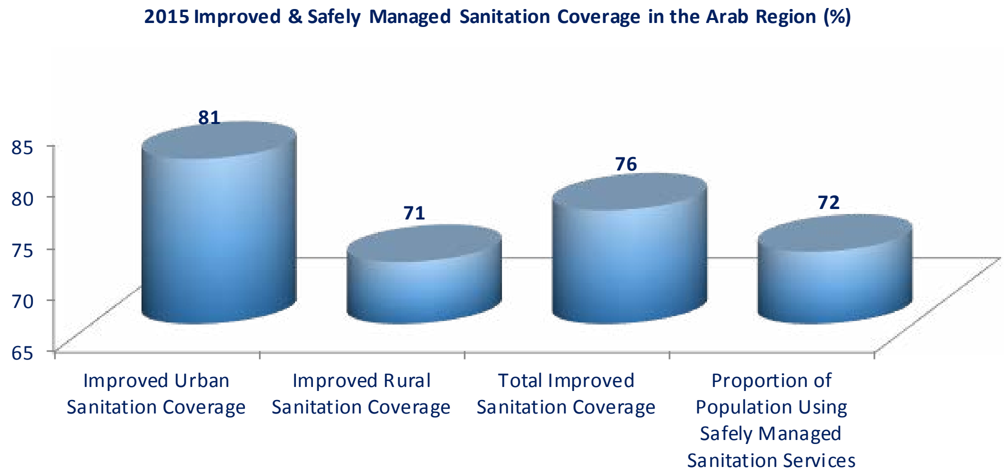


Figure 97. Percent of Population Enjoying Different Components of Improved Sanitation Services

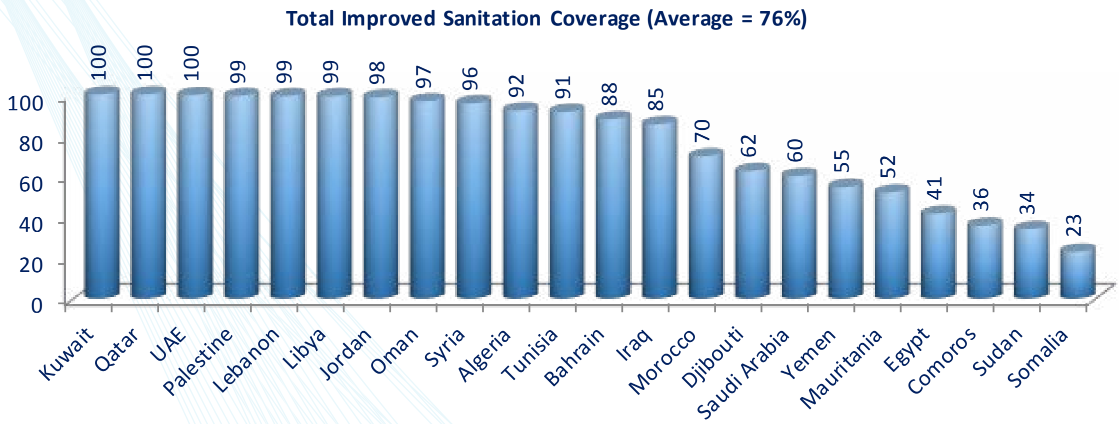


Figure 98. Improved Sanitation Coverage in the Arab Region

The status of progress in sanitation services is summarized in Figure 99, as depicted from country reports. The figure shows that, on the average, 81% of urban populations, and 71% of rural populations enjoy improved sanitation coverage. Moreover, 72% of the total population are considered as using safely managed sanitation services.

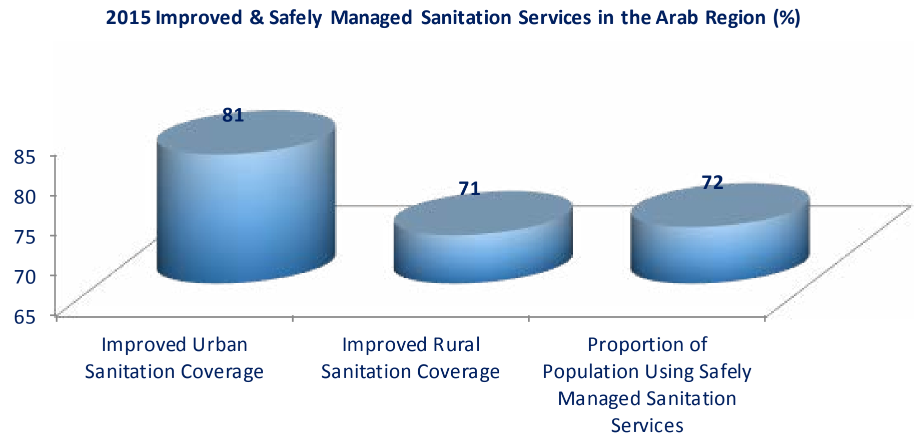


Figure 99. Percent of Population Enjoying Different Components of Improved Sanitation Services

4.1.2- JMP reporting on 2015 WSS MDGs Achievement Status

The Joint Monitoring Programme (JMP) for Water Supply and Sanitation (WSS), supported by WHO/UNICEF has been running for several years and providing valuable information for the status of water supply and sanitation, along with hygiene, for different regions and countries around the globe. The most updated reporting for the Arab Region – 2015 has been released in March 2018, and its main findings will be discussed in the current state of the water report. The following sections presents an assessment of the Arab Region's progress in achieving the WSS MDGs targets based on the JMP data which provides a consistent and standard data sets.

4.1.2.1- Drinking Water

The percentage of population with improved drinking water coverage has increased from 82% in 1990 (the baseline year) to 84% in 2015 as shown in Figure 100, and an extra 134 million people have gained access to an improved water supply source in that period, with 63 million still without improved drinking water coverage.

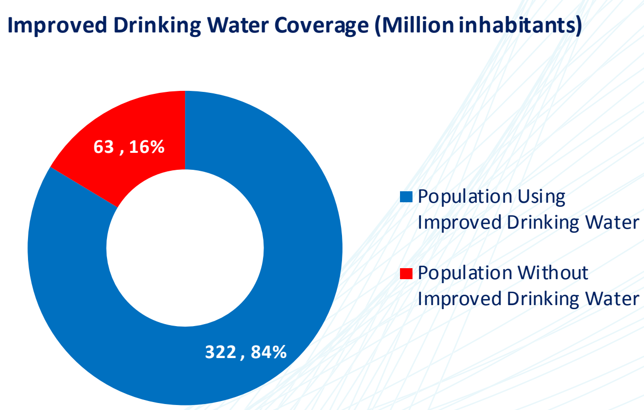


Figure 100. Improved Drinking Water Coverage

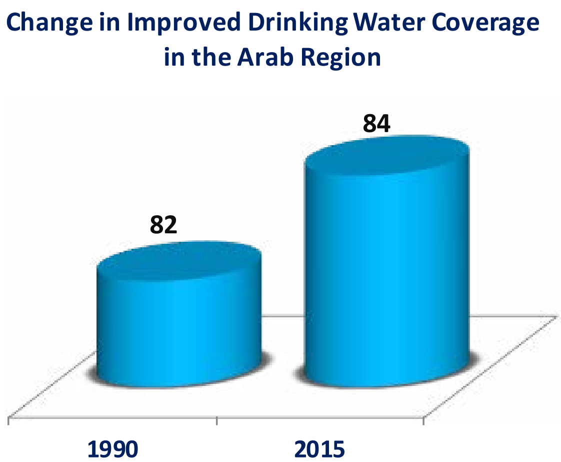


Figure 101. Change in Improved Drinking Water Coverage in the Arab region

The percentage of population without improved drinking water coverage has dropped from 18% in 1990 to 16% in 2015, but the number of those without improved sanitation has actually increased by about 22 million people. Drinking water coverage in the Arab region per country is presented in Figure 102.

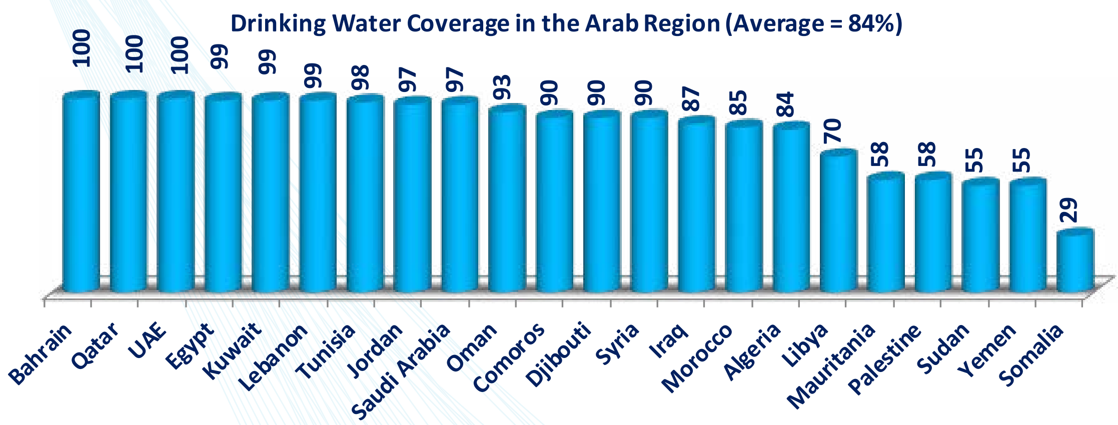


Figure 102. Drinking Water Coverage in the Arab region

The Arab Region as a whole was not on track to reach the MDG drinking water target, with the percentage of those without improved water supply access decreasing by 11%, as opposed to the target of 50%. Only 11 countries have met the MDG water supply target, namely, Bahrain, Comoros, Djibouti, Egypt, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Tunisia and UAE. Annex Table 11 shows the details regarding the water supply coverage for the Arab countries.

4.1.2.2- Sanitation Services

The percentage of population with improved sanitation has increased from 66% in 1990 (the baseline year) to 79% in 2015 as shown in Figure 104, and an extra 154 million people have received sanitation coverage in that period, with 79 million still without improved sanitation. The percentage of population without improved sanitation coverage has dropped from 34% in 1990 to 21% in 2015, however the total number of people without improved sanitation has actually increased by 1.7 million when comparing between the years 1990 and 2015. Improved sanitation coverage in the Arab region per country is presented in Figure 105.

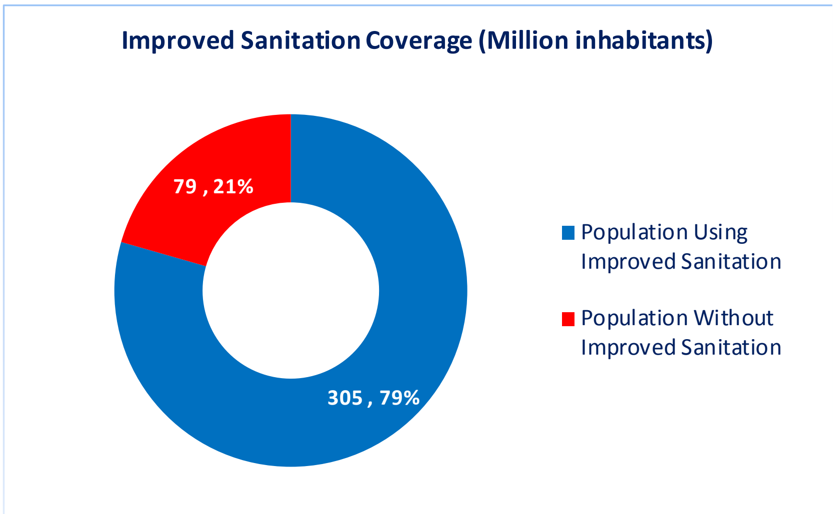


Figure 103. Improved Sanitation Coverage

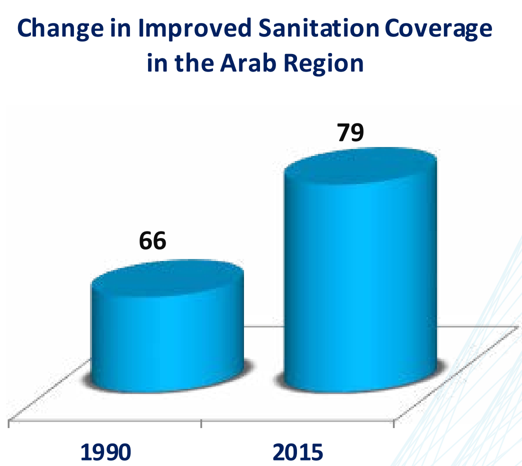


Figure 104. Change in Improved Sanitation Coverage in the Arab region

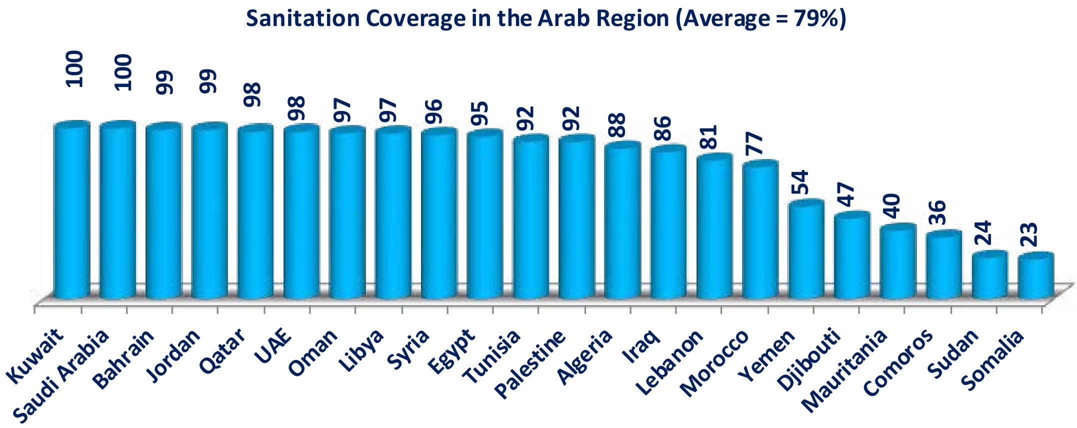


Figure 105. Sanitation Coverage in the Arab region

The Arab Region as a whole was not on track to reach the MDG sanitation target, with the percentage of those without improved sanitation access decreasing by 38%, as opposed to 50%. Only 10 countries have met the MDG sanitation target, namely, Egypt, Iraq, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Syria and Tunisia. Annex Table 12 shows the details regarding the sanitation coverage for the Arab countries.

4.2- Water Infrastructure

Indicators for assessing water infrastructure and services capacities will be reviewed in this section. Figure 106 shows the lengths of main networks providing water services. The numbers correspond to summation of reporting countries only. Nearly one million kilometers of drinking water networks do exist in the Arab Region. Lengths of sewage or wastewater collection networks are significantly less, summing up to 183 thousand kilometers or nearly 20% of the water supply networks. Irrigation networks are seen to span 216 thousand kilometers while drainage networks total length is 223 thousand kilometers which is more than irrigation networks. This reflects the nature of irrigation dependencies on groundwater which does not require long distance conveyance of irrigation water.

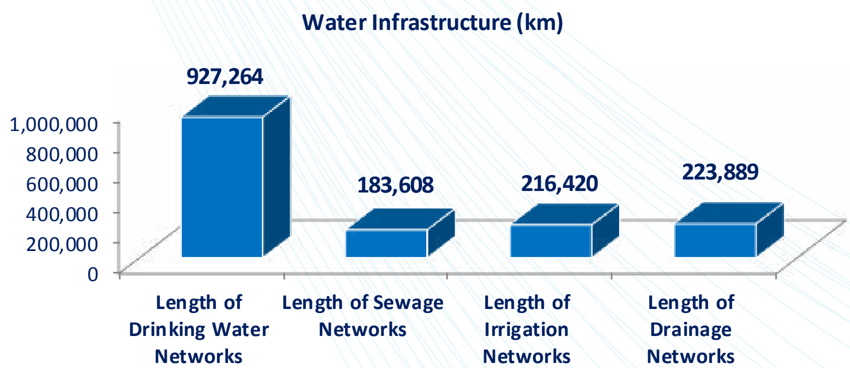


Figure 106. Lengths of Main Water Services Networks for the Arab Region

The capacities of different facilities, which provide water services, are shown in Figure 107. Drinking water capacities are reported as 36 BCM/y while the wastewater collection capacities are summed as 17 BCM. Municipal wastewater treatment capacity is estimated at 12 BCM/y and the industrial wastewater treatment capacity is 2 BCM/y which is 82% of wastewater collection capacity.

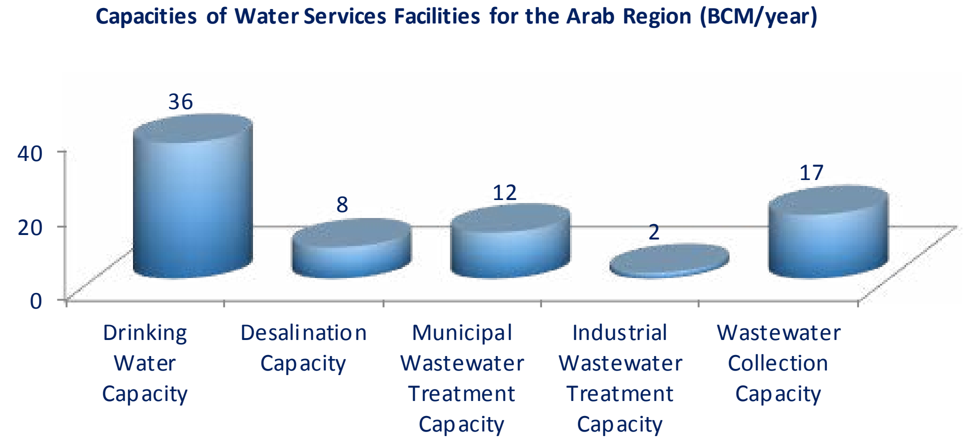


Figure 107. Capacities of Main Water Services Facilities for the Arab Region

Figure 108 shows that the dam storage capacities in the Arab Region adds up to 400 BCM while the maximum dam storage reached in 2015 was 218 BCM. Dam reservoir siltation is a frequently occurring problem.

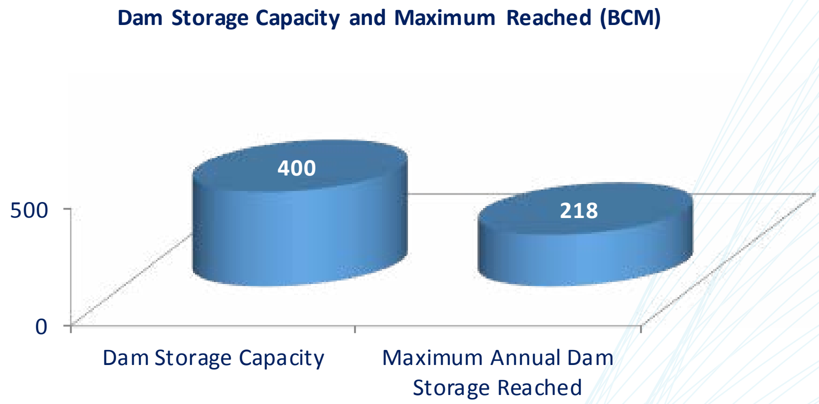


Figure 108. Capacities of Main Water Services Facilities for the Arab Region

5. Water & Energy

5.1- Hydropower Generation

Energy generated from flowing water or hydropower is mainly related to: (i) the available potential of a water body, and (ii) the installed capacity or hydropower generators in each country. Energy related to rivers may be generated through damming the watercourse then converting the potential energy into mechanical energy and finally electrical energy. In stream power generation is another alternative where the kinetic energy of the flow is converted into electrical energy without the need for building a massive dam structure. Hydropower may also refer to non-river-related cases where water is diverted from a water body (Lake or sea for example) into a depression where the difference in levels may be converted into electrical energy. Falls and head differences in other water and wastewater channels and pipelines also provide hydropower potential. Bio-gas generated at wastewater treatment facilities also provide another source of energy. Several problems may arise while exploiting the hydropower potential of a shared river. Upstream power generation may severely affect the power generation in the downstream. Evaporation and seepage losses from reservoirs associated with hydropower dams can also affect the water flows and availability for downstream users. Therefore, it is of great importance to assess the Hydropower related impacts, not just for all Arab countries, but for all countries that share a River Basin with them.

5.2- Hydropower Assessment Parameters

The installed hydropower capacity in the Arab Region is estimated as 9465 MW as depicted from Figure 109. The Arab region generates roughly 35,127 GWH per year as of 2015. Nearly 39% of the hydropower is generated in Egypt (13,545 GWh/y). Sudan and Syria generate about 46% of the total hydropower. Eleven countries contribute to the full power generation and are provided in Figure 110.

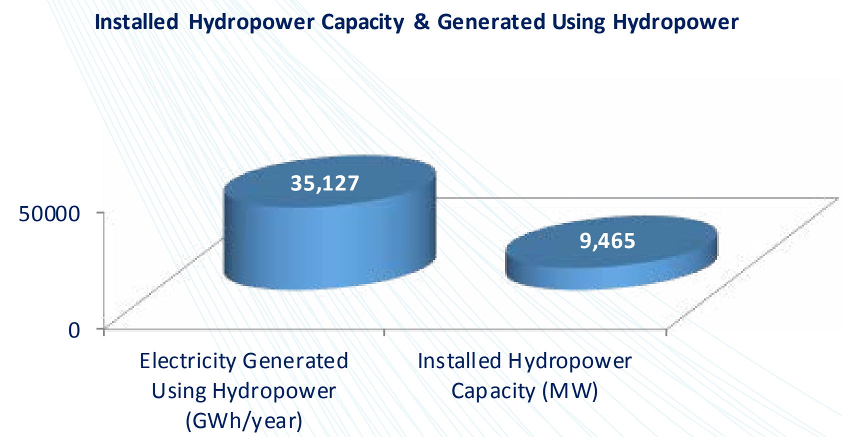


Figure 109. Installed Hydropower Capacity and Electricity Generated Using Hydropower

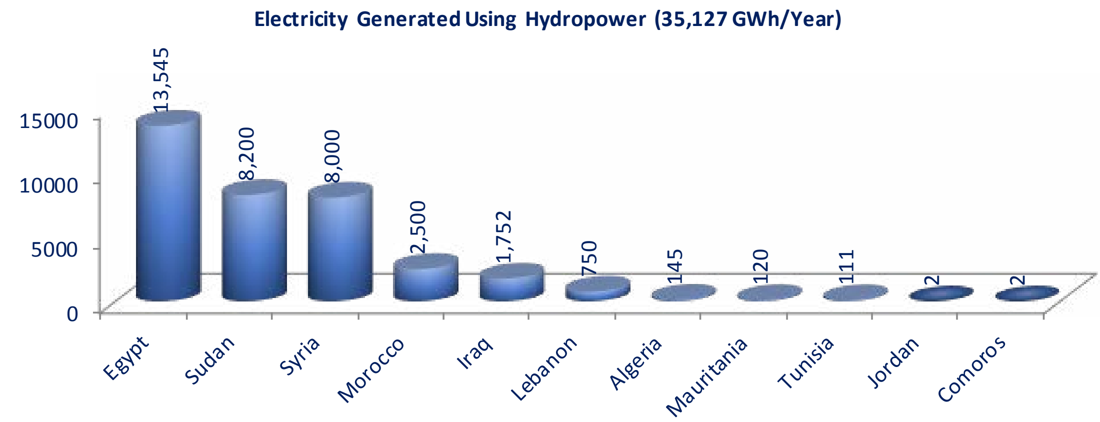


Figure 110. Hydropower Generation for Different Arab Countries (GWh/Year)

In Egypt, hydropower represents less than 8% of the total generated electricity. Considerable damage has seriously affected the generation facilities as a result of the political instability and foreign interferences in Syria. More than one half of electricity generation in Sudan is attributed to hydropower. Figure 111 displays the % contribution of hydropower as compared to the total energy generation.

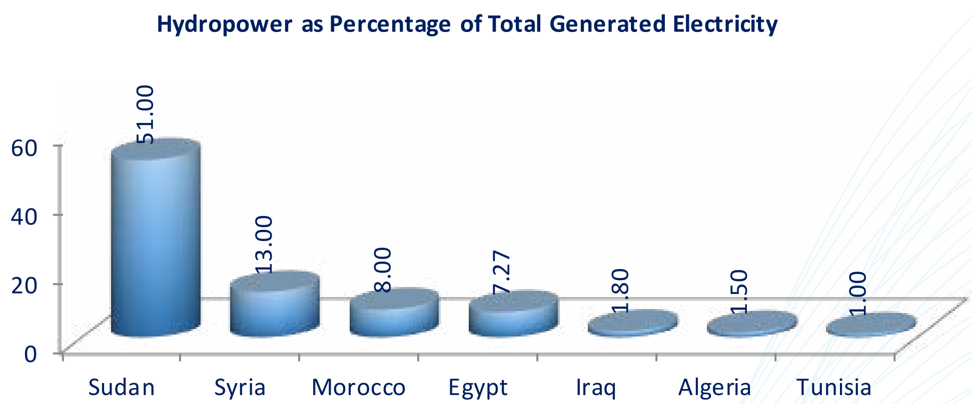


Figure 111. Hydropower Contribution to Different national Electricity Generation

The installed hydropower capacities for different countries is shown in Figure 112 It is also worth mentioning that the US-led war Iraq and its repercussions for the last decade has resulted in considerable impairment of Iraq's hydropower facilities. The water discharge utilized for hydropower generation is presented in Figure 113 as reported by countries. It is to be noted that it is expected to see double counting due to the fact that water maybe flowing through several hydropower plants installed in series on the same river, waterway or channel. This is clear in the case of Egypt where the Nile waters flow through the High Aswan Dam, the old Aswan Dam and several barrages and regulators along the way downstream.

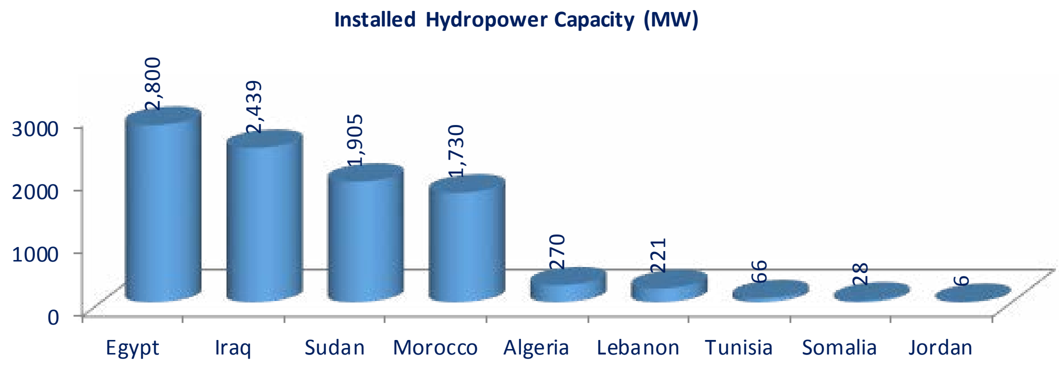


Figure 112. Installed Hydropower Capacities for Different Arab Countries

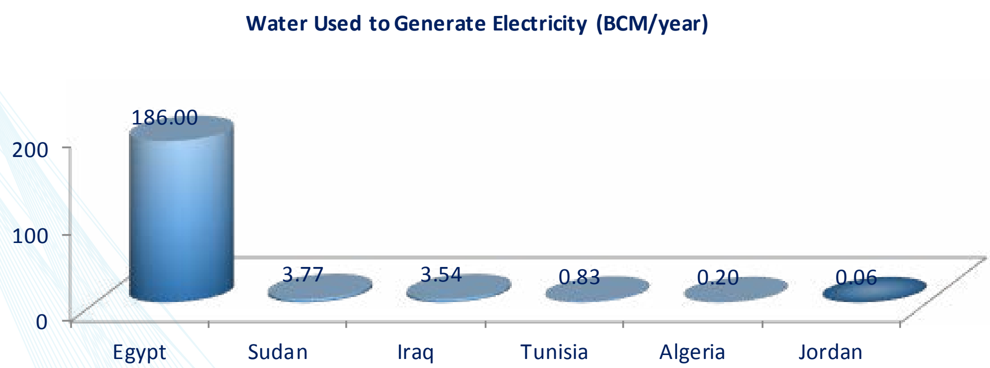


Figure 113. Water Discharge Required for Hydropower Generation in Selected Arab Countries

6. Water & Population

The Arab population has been steadily increasing from about 284 million capita in 2000 to about 396 million capita in 2015 as shown in Figure 114 This means that the population has grown by almost 40% in 15 years. Should we assume that the renewable water resources have remained constant through this period, then the direct consequence is that the share per-capita from these resources must have decreased by 28%.

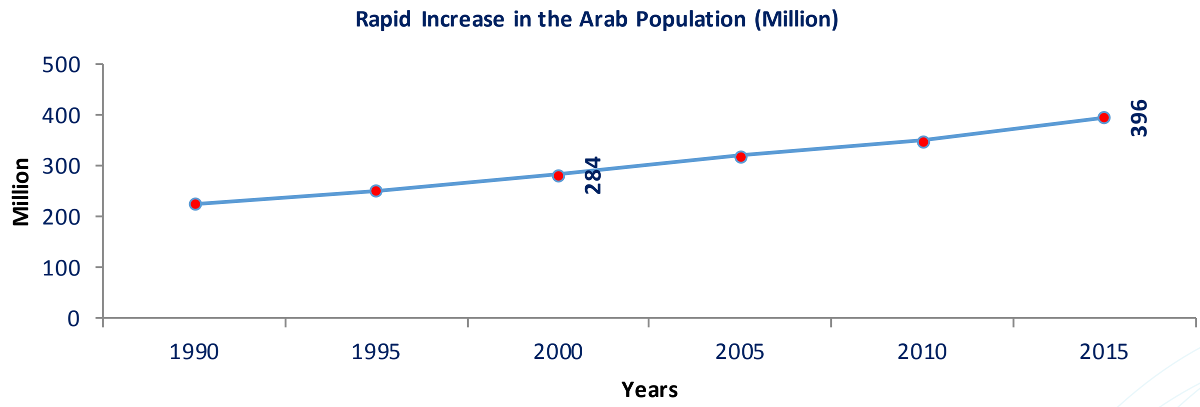


Figure 114. Escalating Population Growth in the Arab Region

2015 Population of different countries is given in Figure 115 The figure shows that nearly 23% of the Arab populations live in Egypt. The city of Cairo alone hosts about 18 million capita which is more than the total population of the 7 least populated Arab countries.

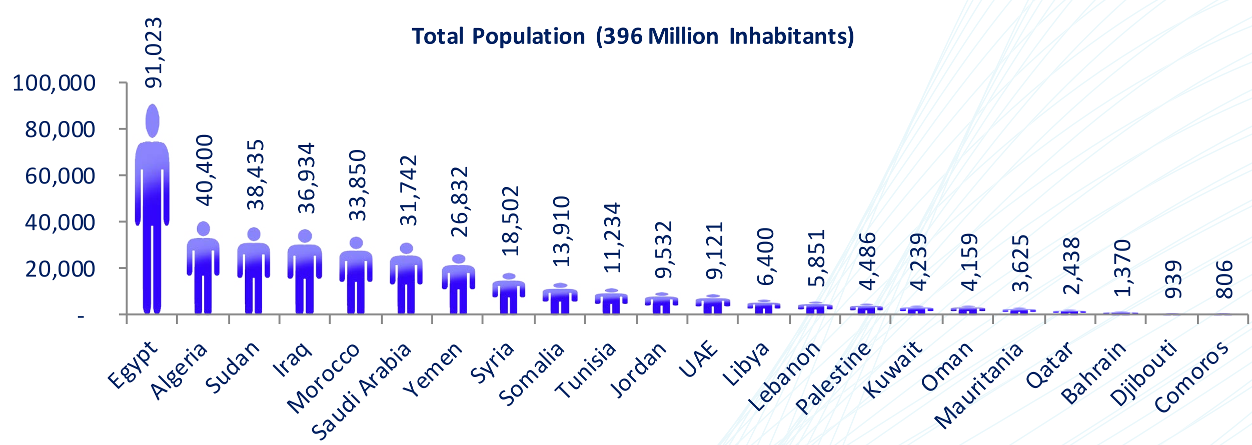


Figure 115. Escalating Population Growth in the Arab Region

Figure 115 to Figure 119 display the per capita shares of the different water resources indicators for the Arab Region. The indicators show that the Arab countries on average have a per capita share of 299 CM/cap/y of total internal renewable blue water resources, with 21 countries below the water scarcity limit of 1000 CM/cap/y.

Considering the external inflows from neighboring countries, the average per capita share increase to 575 CM/cap/y of total renewable blue water resources, with 17 countries below the water scarcity limit. 13 countries are below the "severe" water scarcity limit (500 CM/cap/y) of renewable blue water resources. The average per capita share of total renewable water resources (including both green and blue water) is equivalent to 1,959 CM/cap/y with 12 countries below the water scarcity limit. Somalia and Mauritania have shares as high as 11,000 to 10,000 CM/cap/y while Kuwait, Qatar, UAE, and Bahrain per capita shares reads below 100 CM/cap/y.

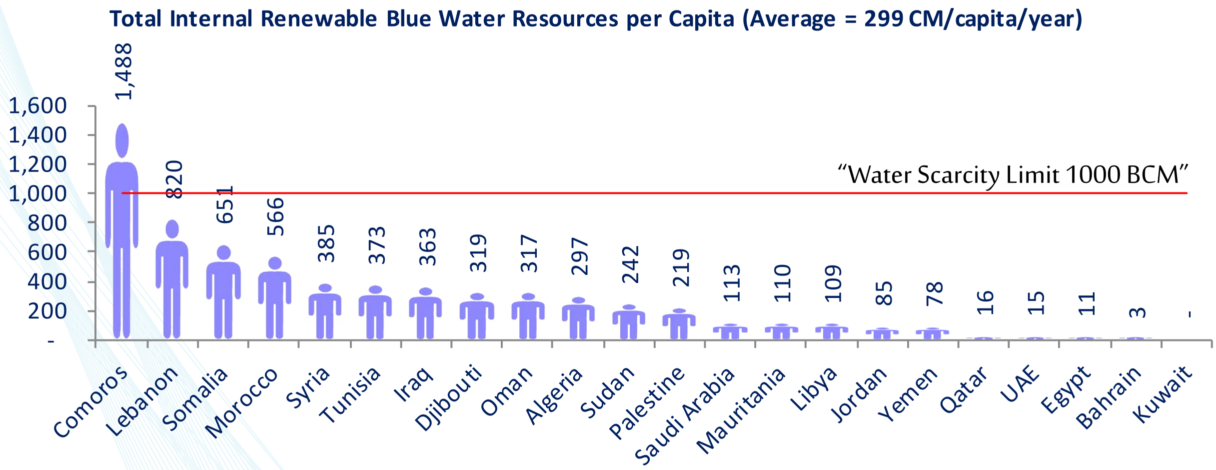


Figure 116. Per Capita Share of Internal Renewable Blue Water Resources

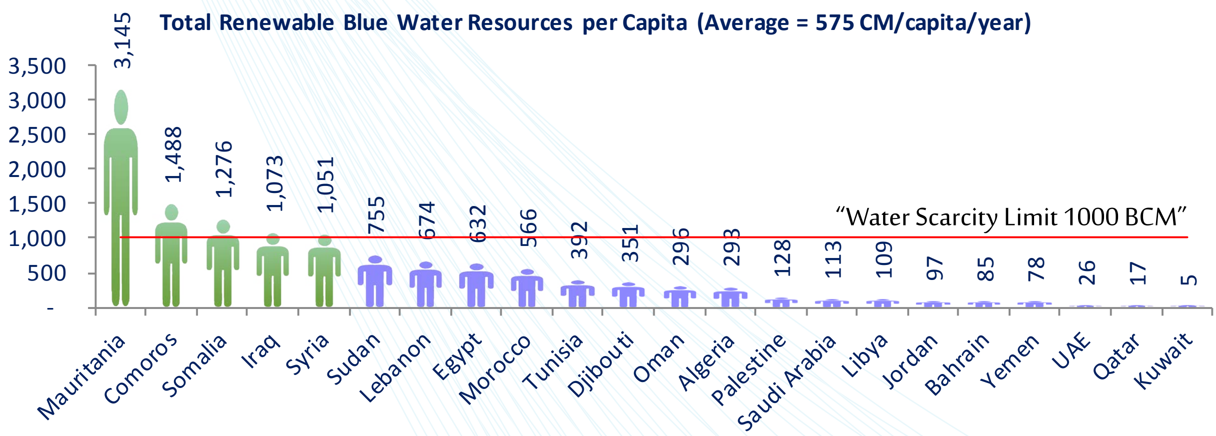


Figure 117. Per Capita Share of Total Renewable Blue Water Resources

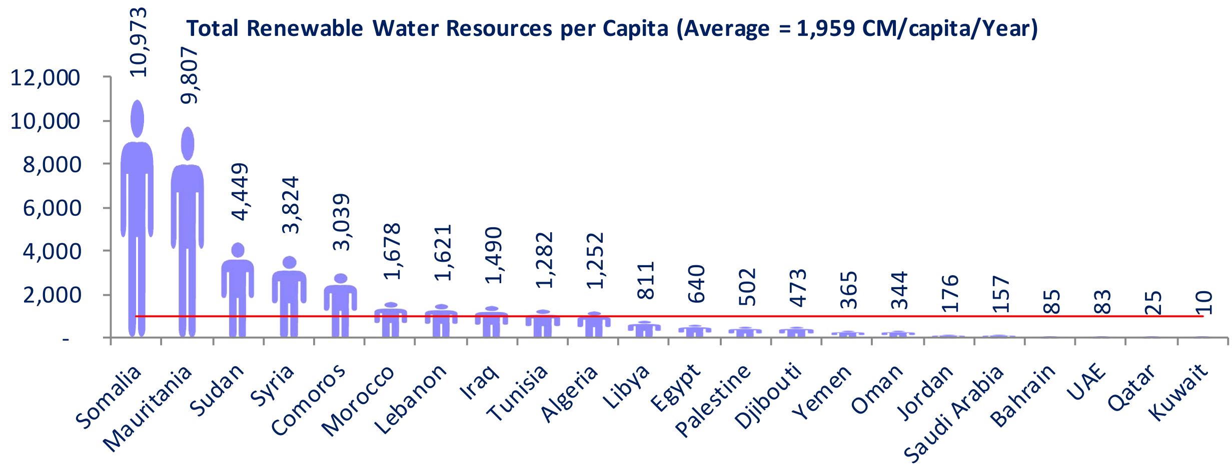


Figure 118. Per Capita Share of Total Renewable Water Resources

The average per capita share of total available water resources (including both conventional and non-conventional water resources) amounts to 2,124 CM/cap/y as shown in Figure 119, 10 countries are below the water scarcity limit. Relative to the total renewable water resources; Egypt and Libya could surpass the water scarcity limit, while United Arab Emirates, Saudi Arabia, Oman and Djibouti could surpass the severe water scarcity limit. This shows the potential of the use of non-conventional water resources..

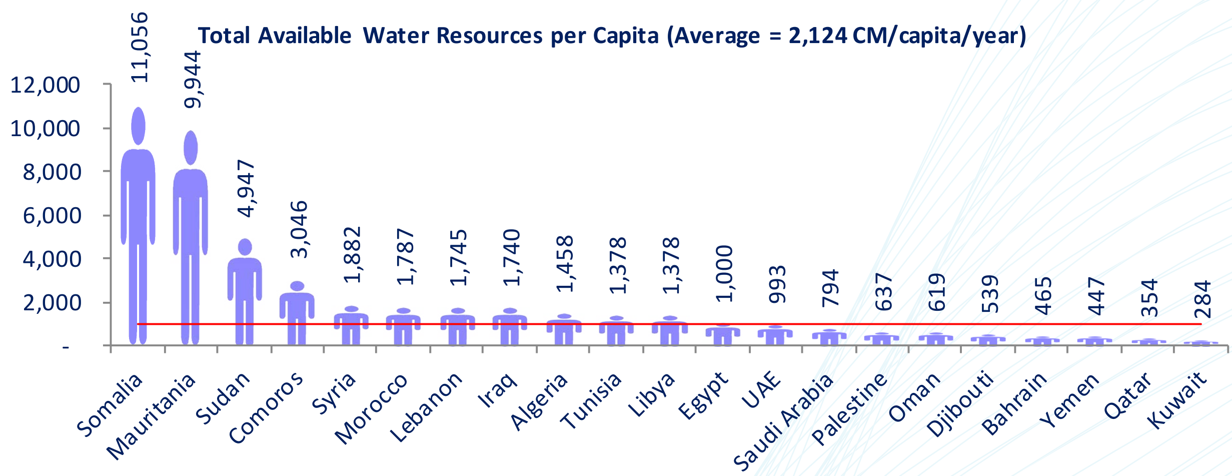


Figure 119. Per Capita Share of Total Available Water Resources

The figures above show clearly the alarming water resources situation in the Arab region. Except for two countries, Mauritania and Somalia, the whole region is suffering from water scarcity as referring to the per capita shares, which fall below the 1000 CM/cap/y scarcity limit. Figure 120 displays the sharp declination in per capita shares of renewable blue water resources over 15 years (2000 – 2015).

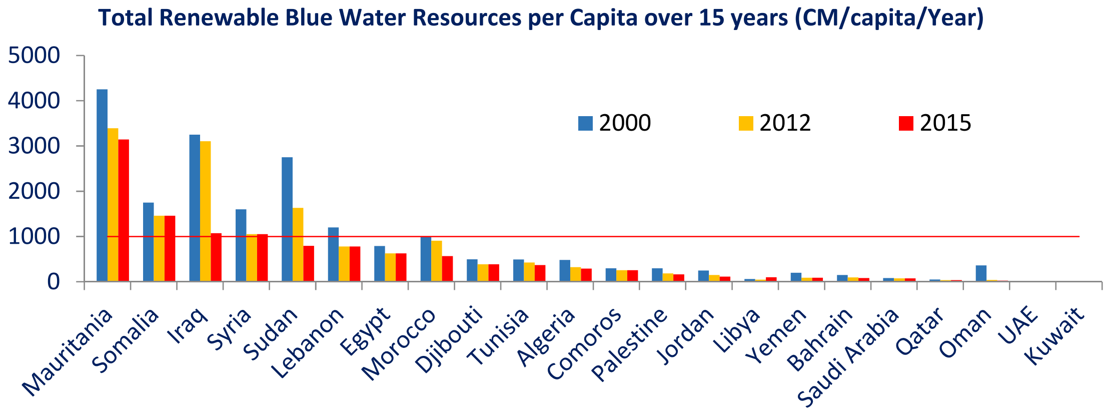


Figure 120. Per Capita Share of TRBWR Throughout 15 years (2000 – 2015)

On the other hand, the share of every Arab individual from the total country water withdrawals is shown in Figure 121. The average total withdrawals across the Arab region is 428 CM/cap/y. Only 2 countries (Syria and Iraq) have values higher than the scarcity limit. However, these numbers may need some revision to consider the serious impairment of infrastructure due to political unrest and foreign interferences.

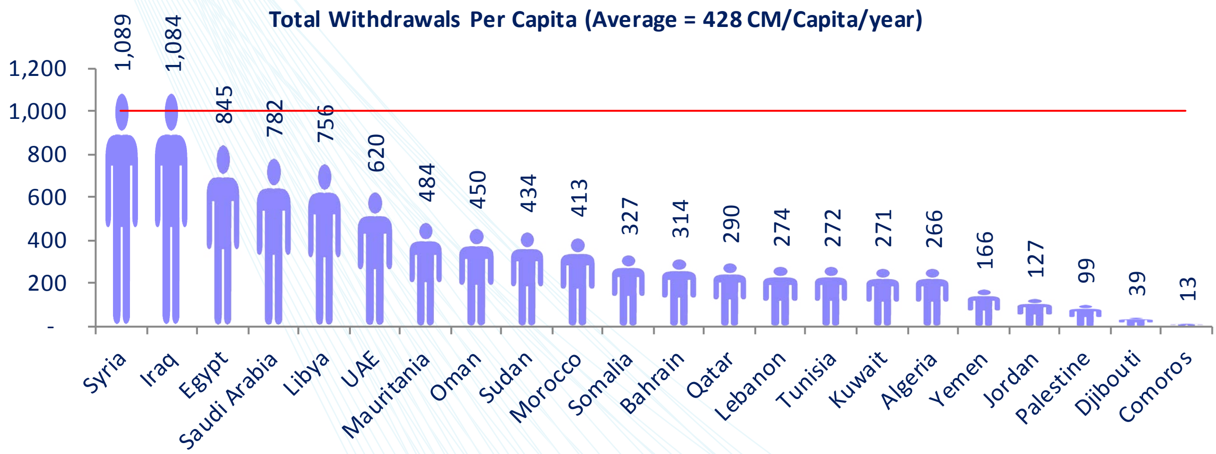


Figure 121. Per Capita Share of Total Withdrawals

Per capita shares of agricultural water withdrawals are highest in Iraq and Syria (880 and 830 CM/cap/y) while Egypt comes third (671 CM/cap/y). Saudi Arabia also ranks fourth with an average share of 656 CM/cap/y. In Palestine, this share is as low as 46 CM/cap/y reflecting severe restrictions by the occupying authorities. The average agricultural water withdrawals in the Arab region is 317 CM/cap/y as shown in Figure 122.

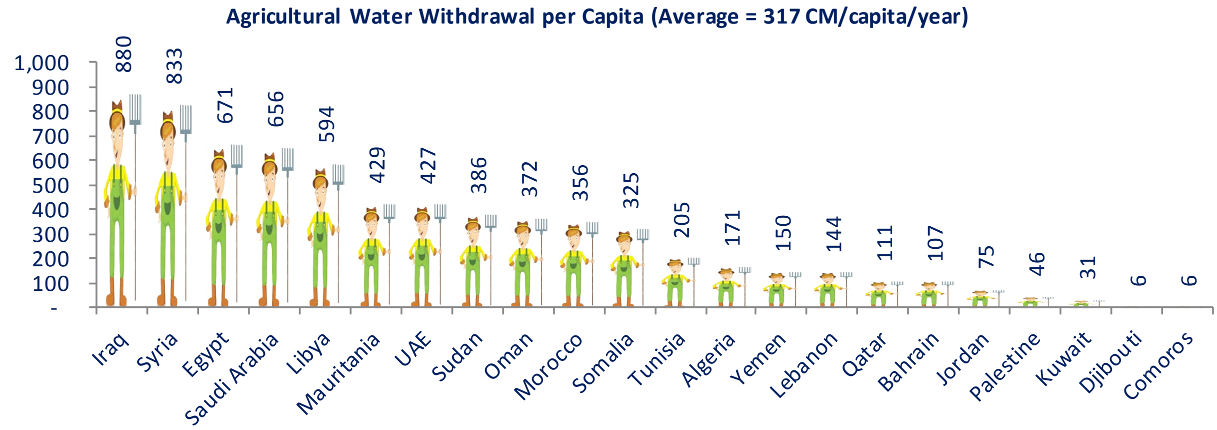


Figure 122. Per Capita Share of Agricultural Water Withdrawals

Industrial water shares are highest in Egypt (nearly 60 CM/cap/y) and lowest in Somalia, Comoros, and Djibouti (at or less than 1 CM/cap/y), The average industrial water withdrawals in the Arab region is 17 CM/cap/y as shown in Figure 123. On the other hand, domestic water shares are highest in the gulf countries of Kuwait, Bahrain, UAE, and Qatar (between 140 and 235 CM/cap/y). Somalia, Comoros, and Yemen have very low shares of less than 14 CM/cap/y) reflected limited infrastructure for water supply. The average domestic water withdrawals in the Arab region sum up to 83 CM/cap/y as shown in Figure 124.

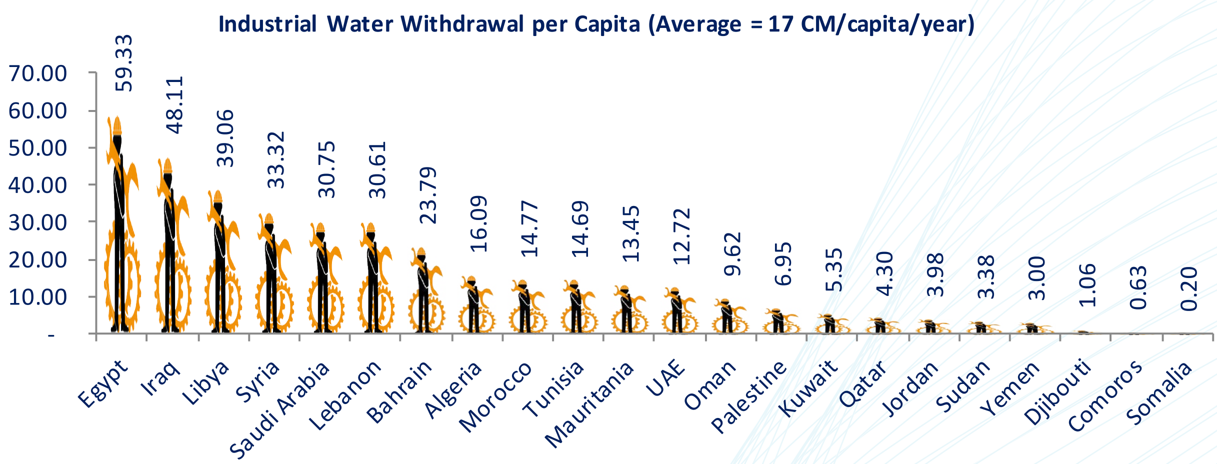


Figure 123. Per Capita Share of Industrial Water Withdrawals

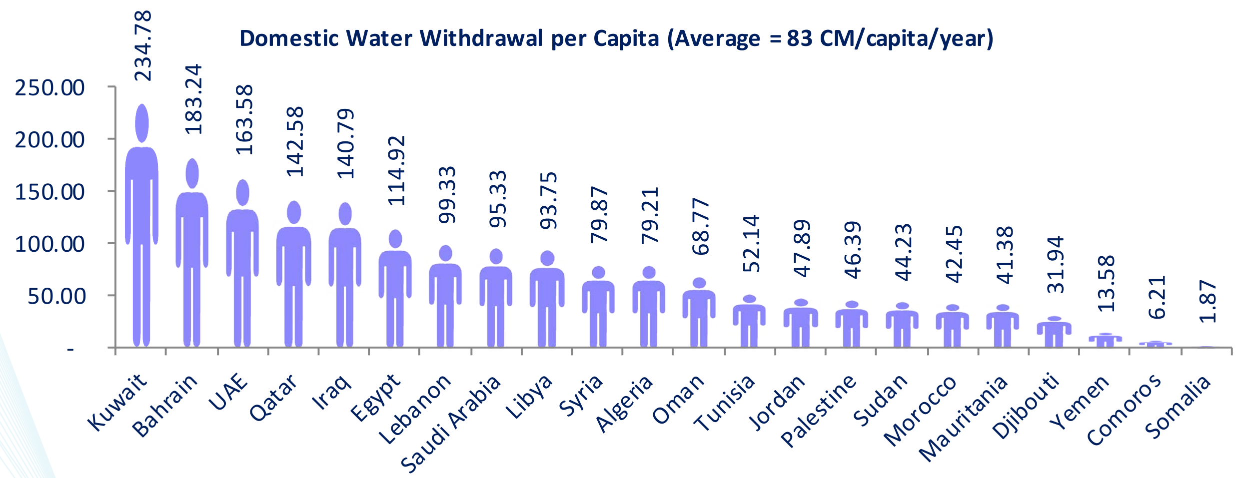


Figure 124. Per Capita Share of Domestic Water Withdrawals

Green water abstractions per person, as shown in Figure 125, are the highest in rainy countries, namely Somalia, Mauritania, and Sudan and are normally lowest in the gulf countries and Jordan. The per capita green water consumption in Somalia is about 9700 CM/cap/y while in Kuwait it amounts to 6 CM/cap/y. 16 countries are below the scarcity limit for green water consumption. The average per capita green water consumption in the Arab region is 1,319 CM/cap/y as shown in Figure 126.

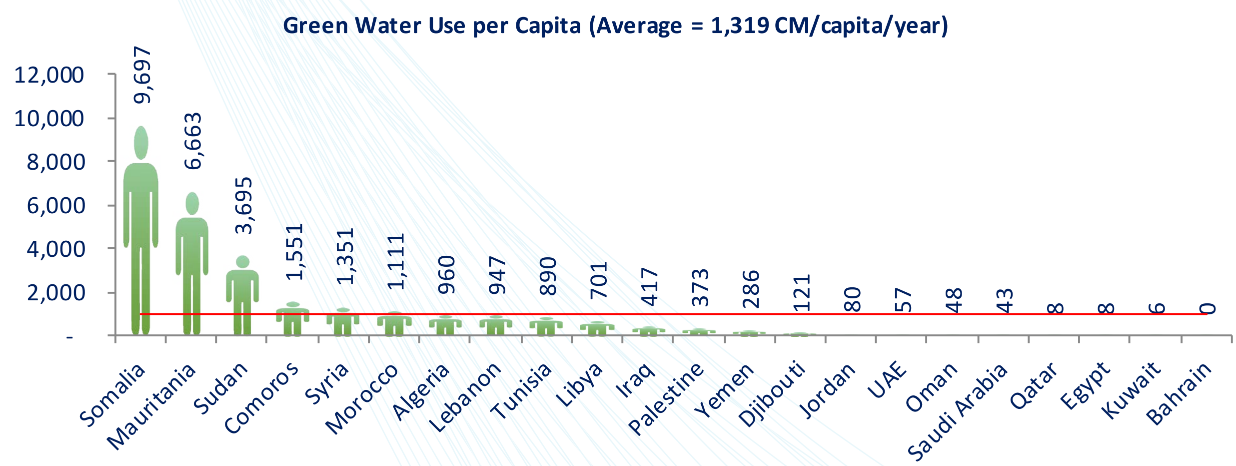


Figure 125. Per Capita Share of Green Water Resources

Furthermore, 11 Arab countries are recording a per capita share of total abstractions, which is below the 1000 CM/cap/y scarcity limit. Somalia, Mauritania, and Sudan are the only countries which exceed 2000 CM/cap/y of total abstractions as shown in Figure. The average per capita share of the total water abstraction in the Arab region is 1,724 CM/cap/y as shown in Figure 126.

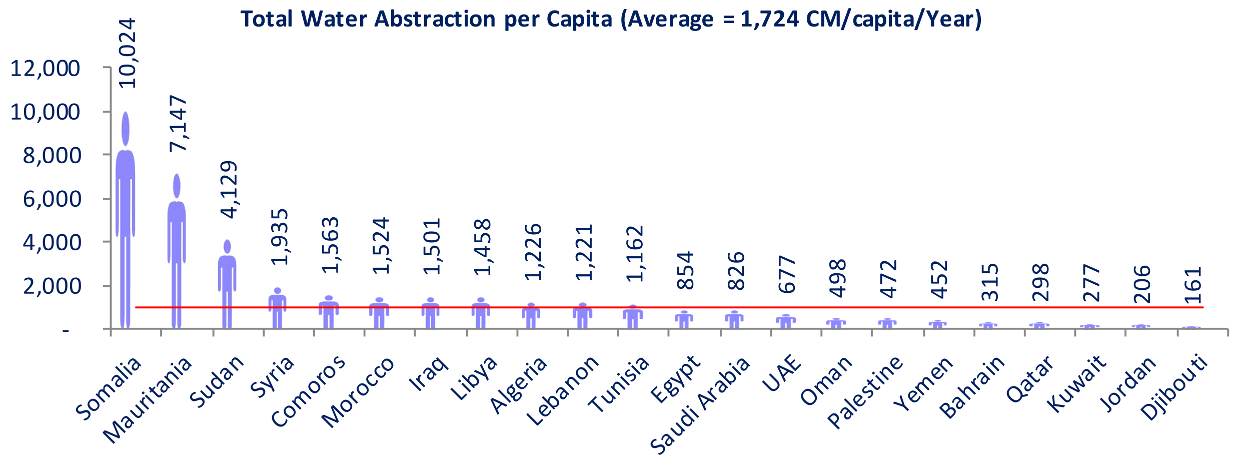


Figure 126. Total Water Abstractions per Capita

7. Water & Health

7.1- Waterborne Diseases

Five waterborne diseases are selected as indicators for health conditions related to biological contamination of water resources and epidemic outbreaks. These are; Dracunculiasis (Guinea worm), Cholera, Typhoid, Hepatitis, and Diarrhea. While the number of incidents infected by dracunculiasis in some Arab countries were in the order of hundred thousand in 1996, it dropped to the order of tens of thousands in 2006. The last reporting show rare cases less that ten. Figure 127 exhibits the reported incidents of the 2015 recorded incidents for Cholera, Typhoid and Hepatitis A. Figure 128 to Figure 132 displays the reported incidents per country.

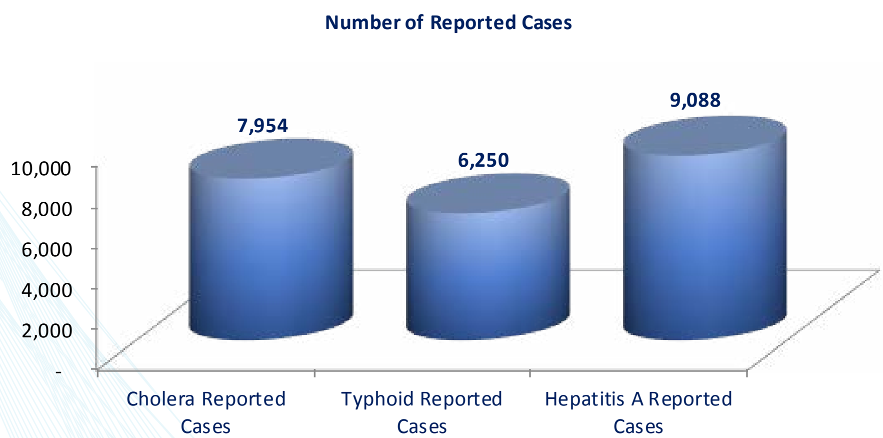


Figure 127. Number of Incidents Related to Main Waterborne Diseases

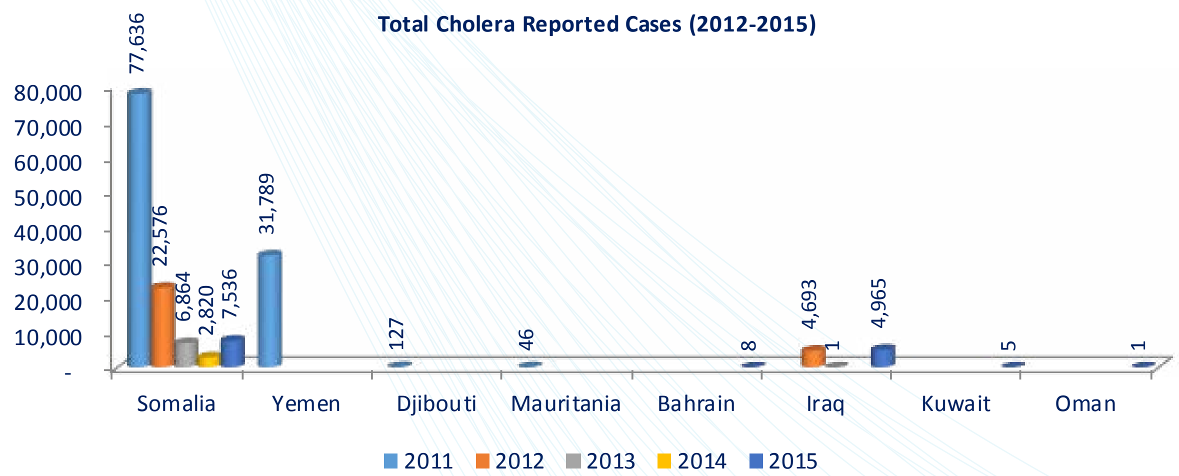


Figure 128. Reported Cholera cases in the Arab region from 2011 to 2015

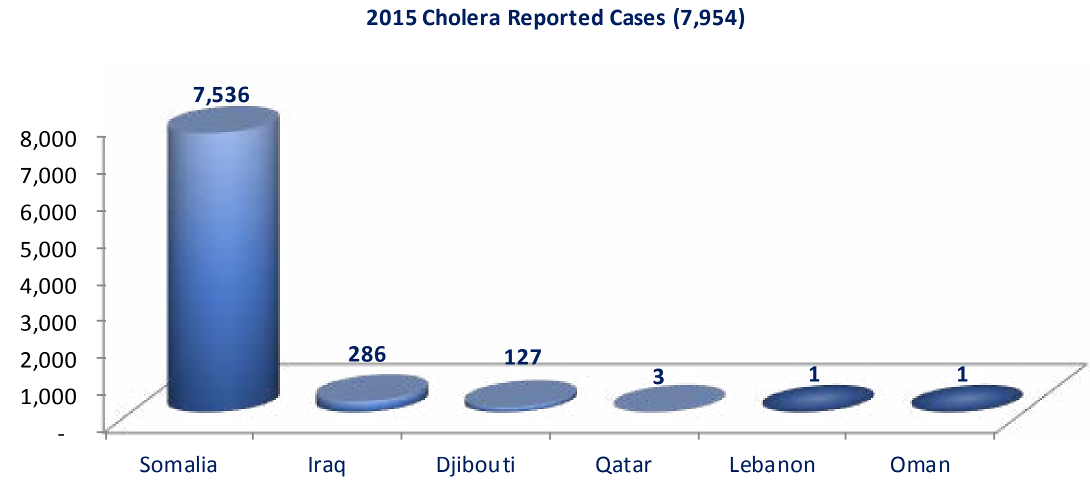


Figure 129. Number of Incidents Related to Cholera

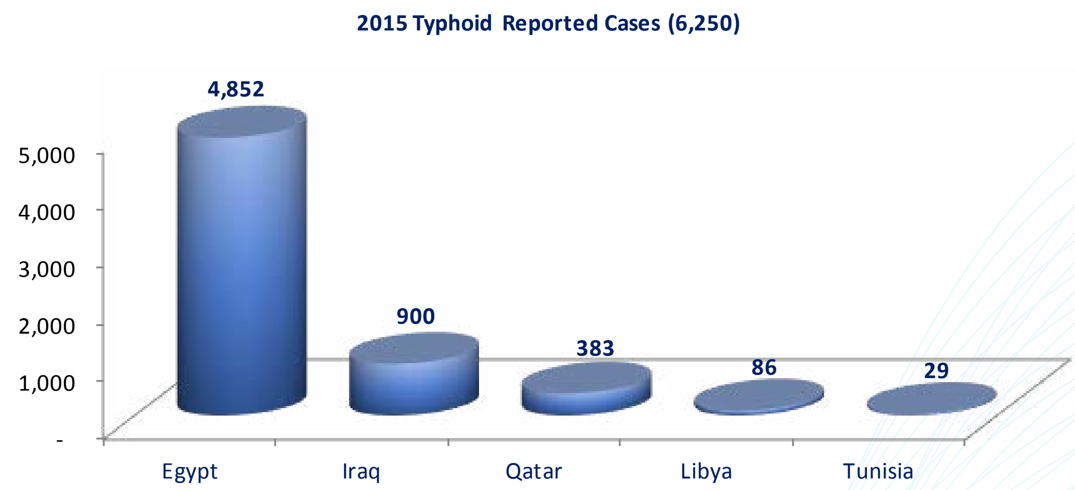


Figure 130. Number of Incidents Related to Typhoid

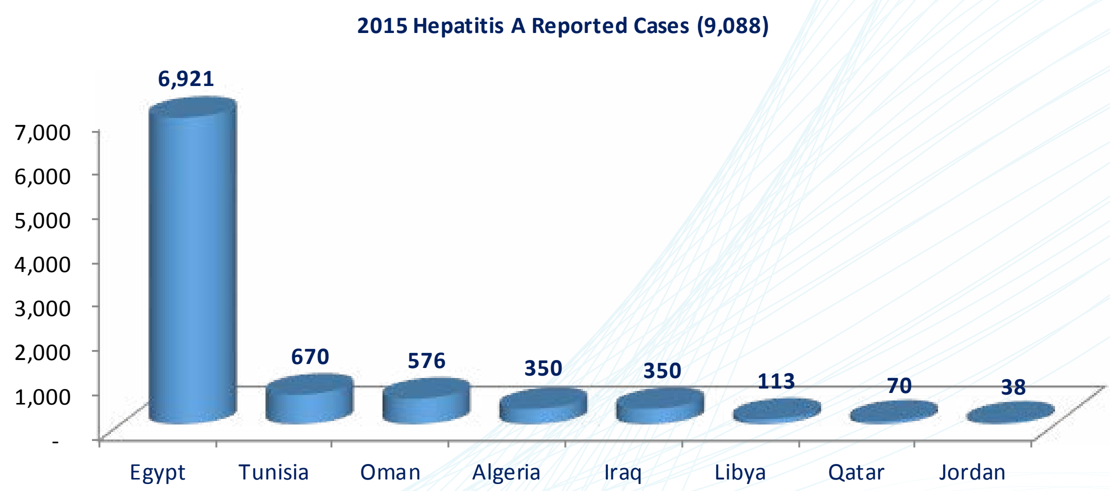


Figure 131. Number of Incidents Related to Hepatitis

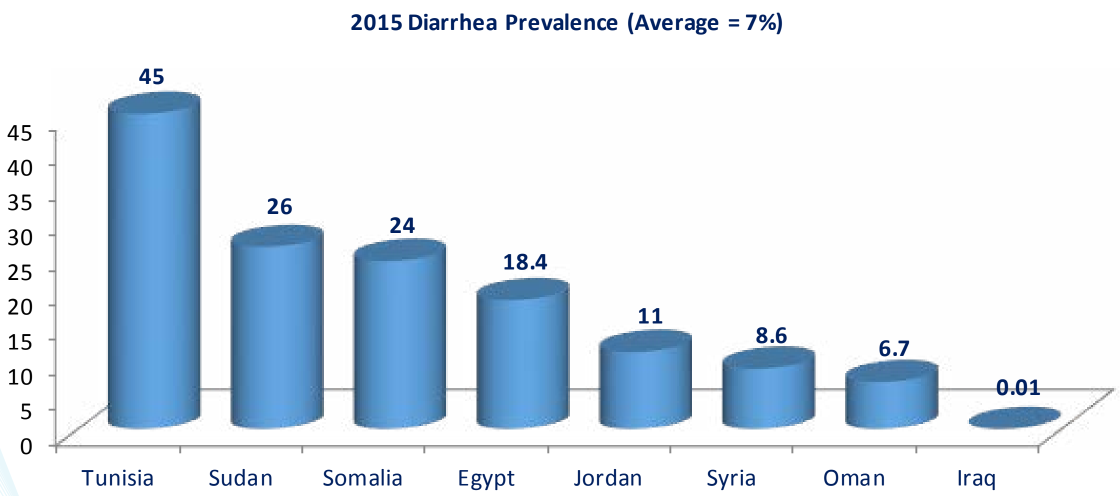


Figure 132. Diarrhea Prevalence in the Arab Region

It can be seen that an outburst of cholera has occurred in Somalia and Yemen in 2011. Ninety percent of the incidents have perished by 2015 in Somalia, while no reporting has been provided for Yemen.

7.2- Open Defecation

Unfortunately, open defecation is still practiced, despite being on a small scale, in some countries as shown by Figure. Almost 24.5 million People in the Arab region still practice open defecation in 2015.

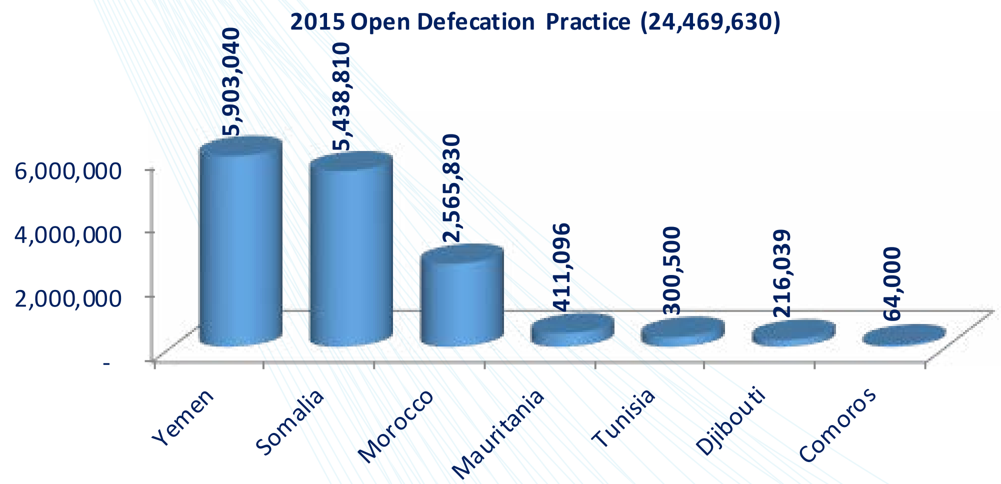


Figure 133. Open Defecation Practice in the Arab Region

8. Water & Quality

Reporting on the various water quality parameters reveals vast gaps between the different countries. Most of the parameters are not reported or seriously incomplete. The reporting on the national average of the total dissolved solids concentrations (TDS) of ambient water quality is given in Figure 134. There is a possibility that the countries may have not reported on ambient water quality and that some of the values could be for output potable water, desalinated water, or treated wastewater. High values such as in Bahrain may also be attributed to the source being brackish groundwater.

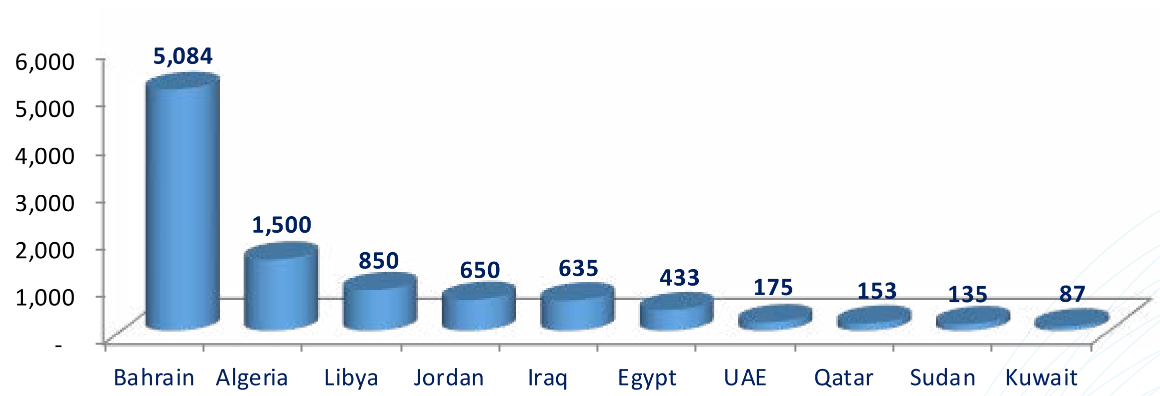


Figure 134. Reported Concentrations of Ambient Water Total Dissolved Solids

Reporting on the national average ambient water pH shows that the considered samples from Libya, Algeria, Kuwait and Bahrain are around the average value of 7. The other reporting countries display values near 8 as shown in Figure 135.

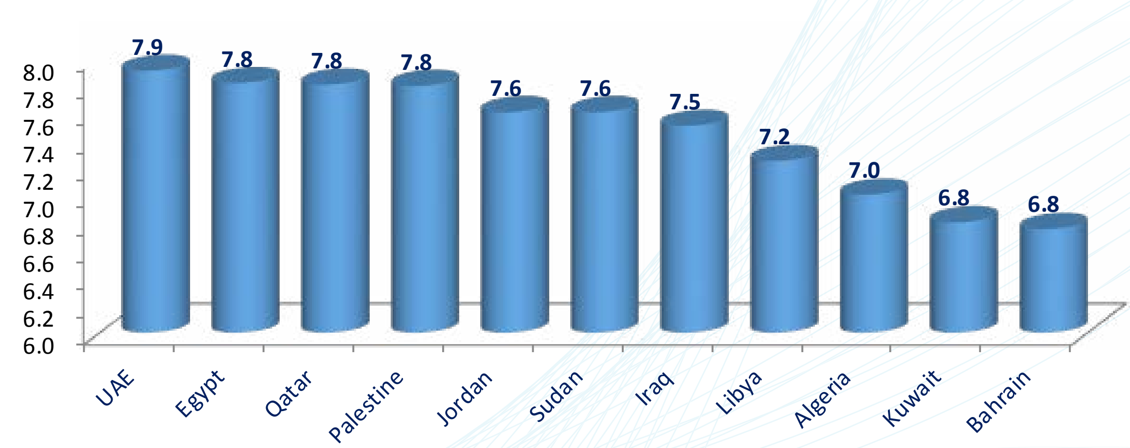


Figure 135. Average Ambient pH Values in the Arab Region

The water quality index for Egypt, Figure 136, shows percentage of samples in standards for ambient water quality below 80% for the Dissolved Oxygen and the Nitrogen concentrations. It also shows a percentage of samples in standards between 80% and 90% for total dissolved solids, and above ninety for pH and phosphorous concentrations. The reported water quality index averaging the five percentages of samples in the corresponding parameters amounts to 85.4%.

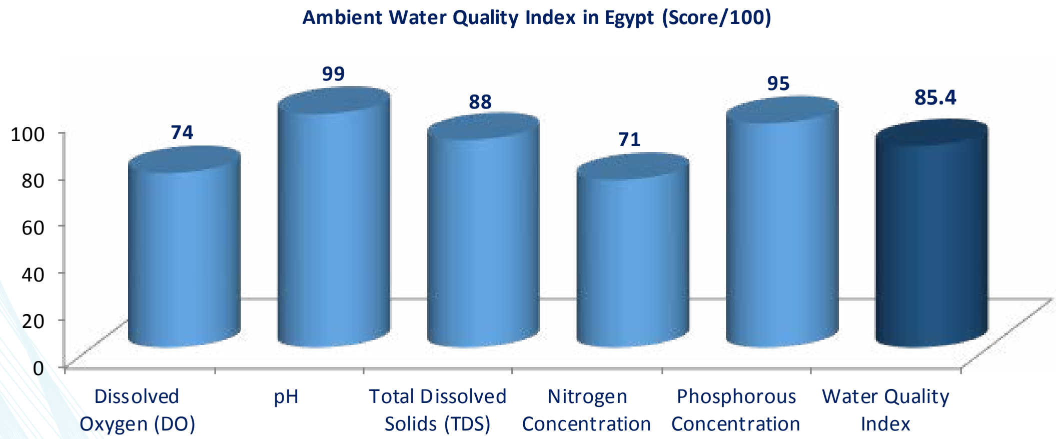


Figure 136. Ambient Water Quality Index in Egypt (% of samples in national standards)

9. Water & Ecosystems

9.1- Wetlands

Wetlands are areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Wetlands may support both aquatic and terrestrial species. Two general categories of wetlands are recognized: coastal or tidal wetlands and inland or non-tidal wetlands EPA. These wetlands are fully or partially supported by freshwater supplies.

Inland wetlands are most common on floodplains along rivers and streams (riparian wetlands), in isolated depressions surrounded by dry land, along the margins of lakes and ponds, and in low-lying areas where the groundwater intercepts the soil surface (sabkhas, etc.) or where precipitation sufficiently saturates the soil (vernal pools and bogs). Inland wetlands include marshes and wet meadows. The RAMSAR convention represents an international effort to preserve and revive wetlands. The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world".

9.2- Ecological Indicators

The number of wetlands sites in the Arab Region, which are internationally acknowledged by RAMSAR sums up to 157 site. Most of these sites belong to the African countries (134 site accounting for 85% of total number of wetlands) as shown in Figure 137. More than three quarters of the total wetland sites are hosted by the Maghreb countries (Algeria, Tunisia and Marocco).

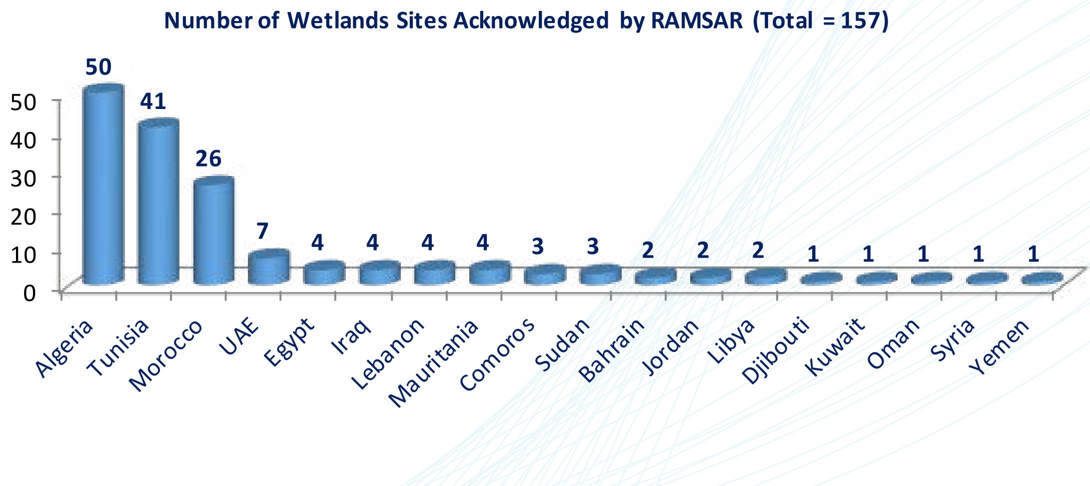


Figure 137. Number of Wetlands Sites Acknowledged by RAMSAR

These wetlands are spread over a total area of about nine million hectares. Figure 138 shows that one third of the total wetlands areas reside in the Algerian territories and provide several vital environmental services. Almost 2.5 million hectares of wetlands are prevailing in Sudan, while the wetlands in Mauritania cover nearly 1.25 million hectares. The northern lakes of Egypt also host some very vital aquatic ecosystems, and some are landmarks on main migratory birds routing.

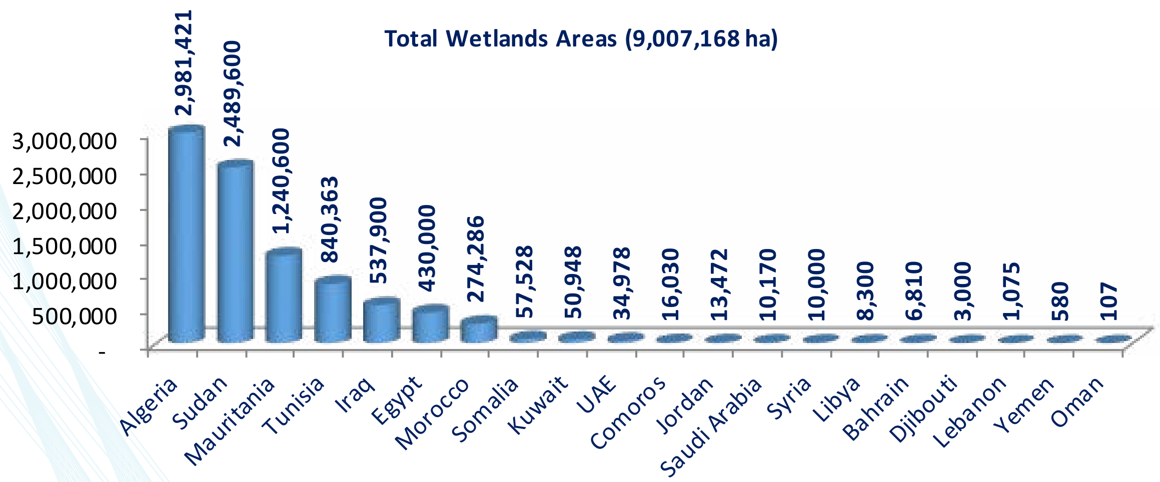


Figure 138. Total Areas of Wetlands in the Arab Region

The total number of endangered species that dwell partially or permanently in the water bodies inbounded in each country is displayed in Figure 139, following the respective country reporting. Due to missing data, it may be assumed that the actual numbers, in the region, are in excess of those reported.

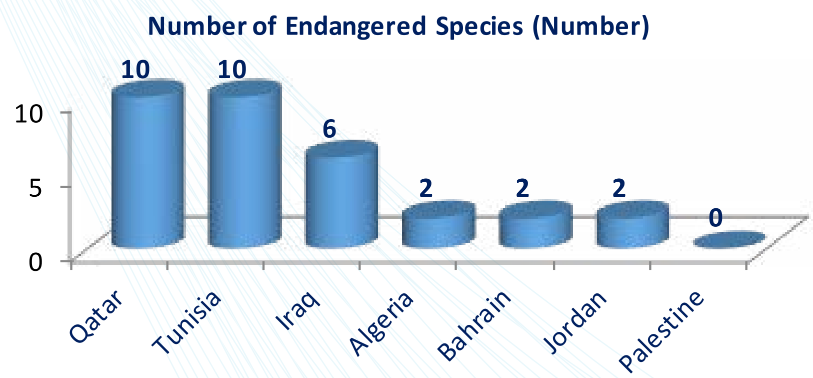


Figure 139. Number of Endangered Species in the Arab Region

The total number of invasive species that dwells partially or permanently in the water bodies inbounded in each country is presented in Figure 140. These may be related to marine or continental origins, ballast water, etc. A large number of species have been reported by most countries stressing the significance of this issue in disturbing natural ecological balances. More than one hundred species are reported by Morocco alone.

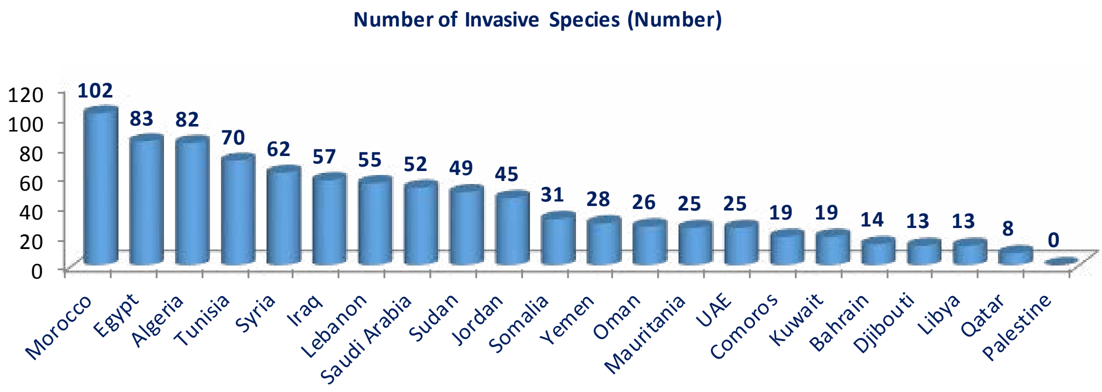


Figure 140. Number of Invasive Species in the Arab Region

10. Water & Climate

Changes in climate are depicted through monitoring temperatures (sea surface, land, and air), precipitation, wind patterns, extreme events, and many other parameters. Arab countries may be lacking many of the basic tools and infrastructure that allow for the establishment of an enabling environment that could actually monitor climate changes and scrutinize its different aspects. Nevertheless the impacts of the changing climate are widely displayed and experienced in the day to day realities in the Arab Region. Spreading desertification, devastating flash floods and prolonged droughts, changing daily average, maximum, minimum and seasonal temperature patterns, disrupted growing seasons by unexpected climate variations are few examples. In this section focus will be directed to flooding and drought events.

A drought event is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions. The abnormally low rainfall will be taken as 25% of the record monthly average. In other words, a period where rainfall has been consistently lower than 25% of the record average will be considered a drought event. Figure 141 shows the situation of droughts in two countries. In Algeria; 20 drought events during the last three years have been reported by country officials, while 2 drought events have occurred in Sudan.

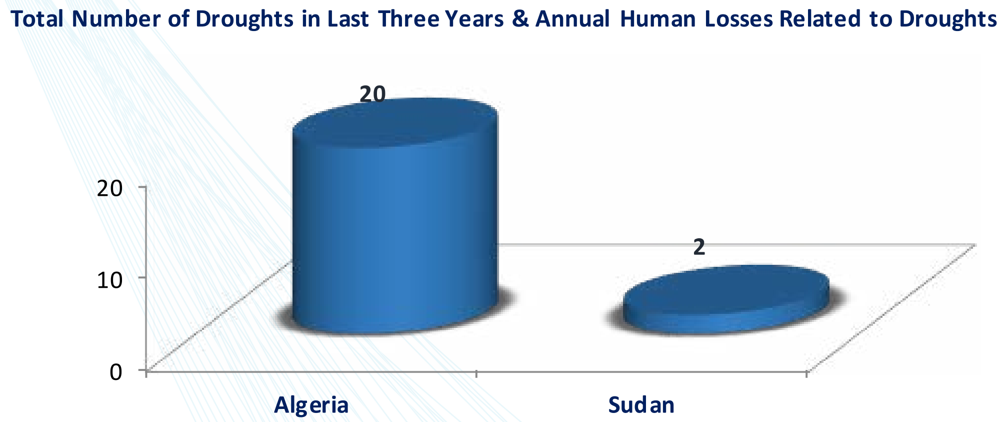


Figure 141. Number of Drought Events and Related Casualties for the Last Three Years

96 flood events has occurred in the last three years (2013-2015) in the Arab region as shown in Figure 142. 10 floods are reported for each of Somalia and Sudan resulting in an estimated economic loss of 0.43% and 0.08% of the national GPD (Figure 143) in both countries and casualties of 169 and 135 human life losses, respectively as given in Figure 144. The total number of casualties in the Arab region due to floods sums up to 665. Despite the fact that main flash flooding events have been in the news for the different Arab countries, no comprehensive reporting have been provided. The flooding events have cause a total economic loss of 839 million USD and representing on average about 0.13 % of GDP at the regional level. UNISDR reported an even larger average annual economic loss of about 5440 million USD per year for the period 2005 – 2014. The latter value represent the modeled assessment of the accumulated anticipated economic losses due to the flood damages that occurred. Table 13 in the Annex shows the details regarding the flooding events in the Arab region associated with the human and

economic losses.

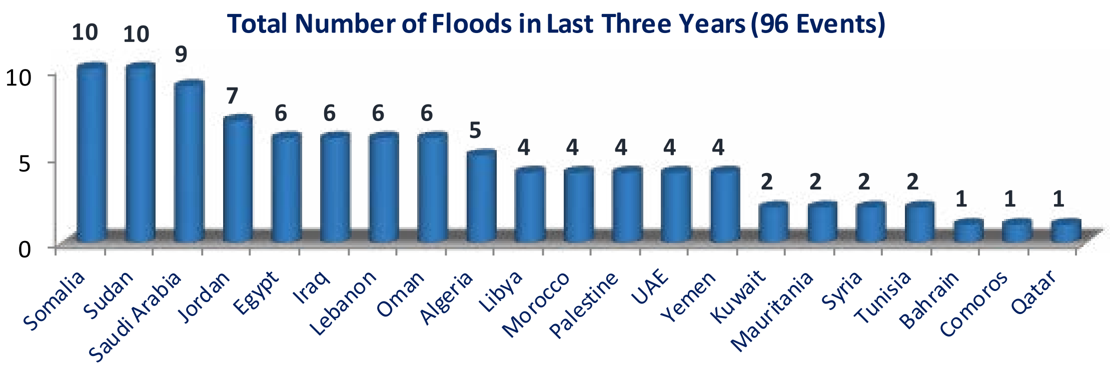


Figure 142. Number of Flooding Events for the Period 2013-2015

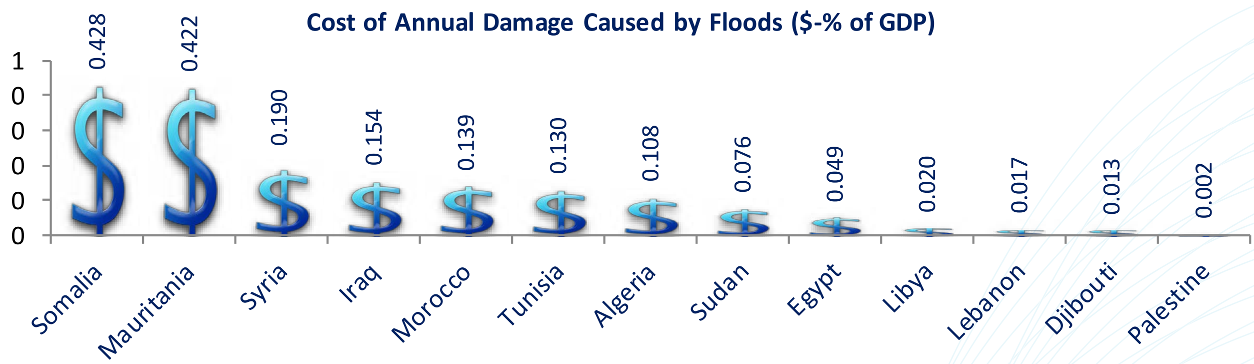


Figure 143. Cost of Annual Damage Caused by Floods & Droughts for the Last Three Years

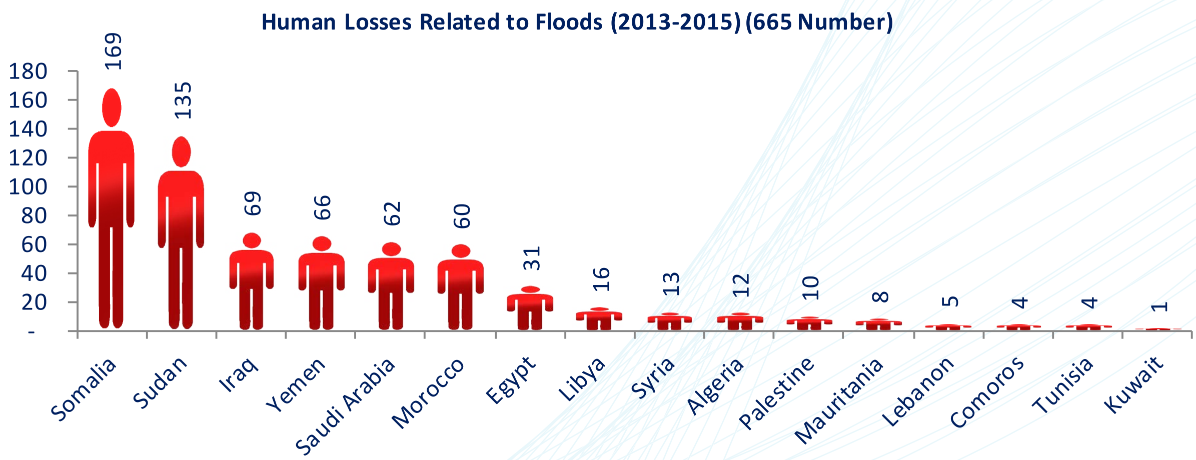


Figure 144. Casualties due to Flooding Events for the Period 2013-2015

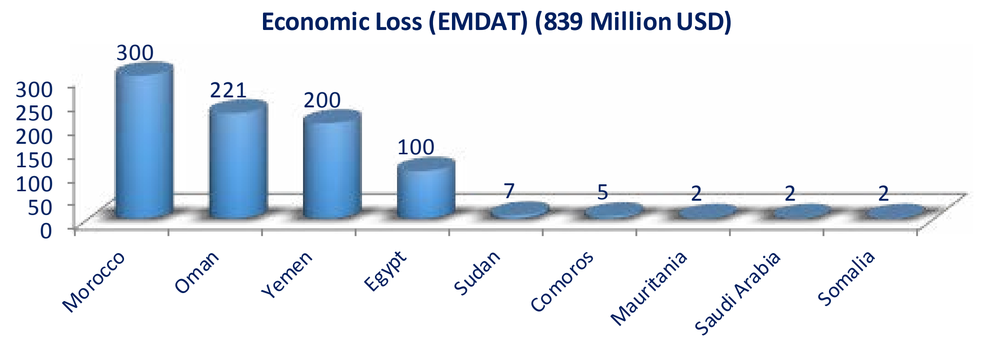


Figure 145. 2013-2015 Total Economic Loss due to Floods in the Arab Region (EM-DAT)

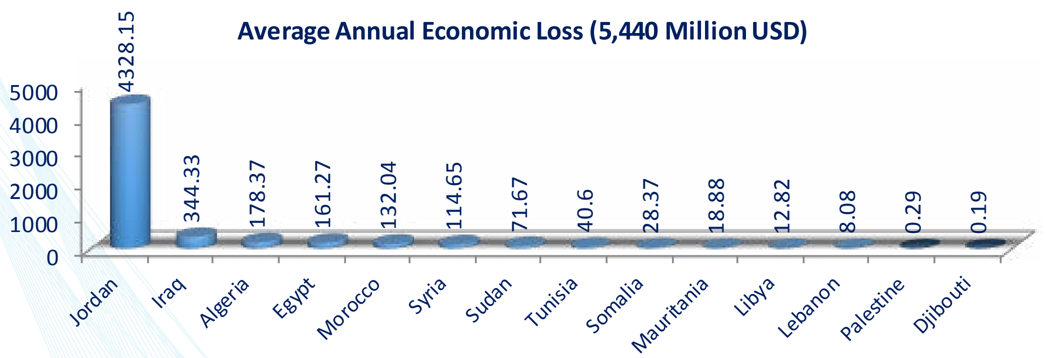


Figure 146. 2005-2015 Average Annual Economic Loss due to Floods in the Arab Region (UNISDR)

Unusual weather events have been consistently reported in Maghreb counties. Unusual hail events are reported by different countries. Figure 147 shows the number of reported abnormal weather events. 21 different hail events have been reported including 9 events in Algeria, 7 events in Libya and 4 events in the UAE. 18 Snow events have been reported in the Arab region. The pictures below show samples of some flooding events occured in the Arab countries.

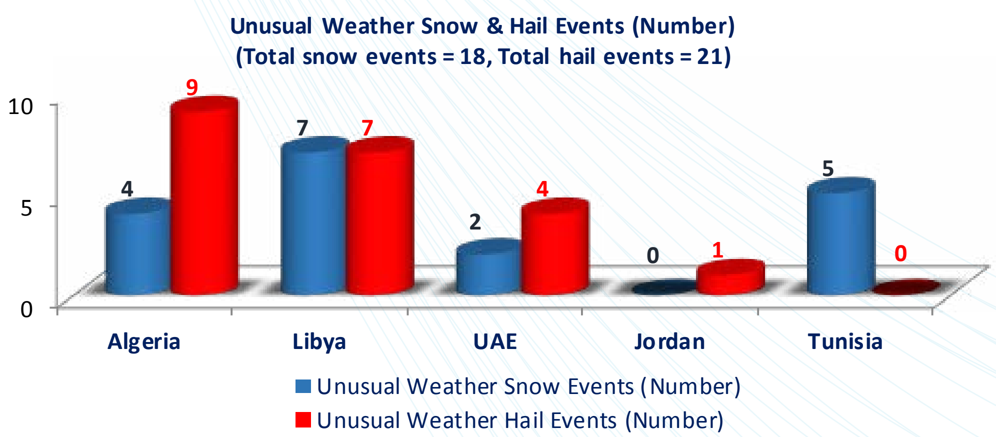


Figure 147. Number of Abnormal Weather Events Including Snow Events

Algeria 11/08/2013

Bahrain 20/11/2013

Egypt 25/10/2015

Iraq 08/11/2015

Jordan 05/11/2015

Kuwait 28/10/2015

Lebanon 07/01/2013

Libya 08/11/2013

Mauritania 07/10/2013

Morocco 25/11/2014

Oman 12/06/2015

Palestine 09/01/2013

Qatar 20/11/2013

Saudi Arabia 17/11/2015

Somalia 12/08/2013

Sudan 4/8/2015

Syria 11/12/2013

Tunisia 06/09/2013

UAE 20/11/2013

Yemen 19/05/2014

11. Water & Socio-Economics

While almost every aspect of socioeconomics is related directly or indirectly to water, few indicators will be assessed in this section. Two main categories are discussed; "water productivity" and "tariffs and affordability". Water productivity is related to the economic (and other) returns per drop of water (for example, how much will be the revenue from selling peanuts grown and harvested using one cubic meter of water. Similarly, what will be the value of selling peanut butter per cubic meter of irrigation water). Affordability is a measure of a population's ability to afford to purchase a product indexed to the population's income. The GDP is defined as the monetary value of all the finished goods and services produced in a country in a specific time period.

11.1- Water Productivity

Water productivity may be measured by estimating the revenues pertaining to each water use as per each unit of water withdrawn. The agricultural water productivity, for example, is defined as the economic value added from agriculture (in US$) per cubic meter of water withdrawn by agriculture: In other words, it is the gross agricultural domestic product (GDP) divided by the total agricultural water abstractions (including irrigation withdrawals and rain fed agriculture green water consumption).

On another hand, the importance of job creation has to be emphasized through a different indicator; the Employment in Agriculture "Job per Drop" is defined as the ratio of total labor employed in Agriculture to the total agricultural withdrawals (including irrigation withdrawals and rain fed agriculture green water consumption).

Figure 148 & Figure 149 show the agriculture and industrial water productivities for different Arab countries. The highest agricultural water productivity values are reported for Comoros and Kuwait (6.03 & 4.52 $/m^3, respectively). These values are significantly higher than the main food producing countries. Egypt, Sudan and Syria report values in the range of 0.34 to 0.6 $/m^3. Iraq is reporting 0.27 $/m^3. This implies that Comoros may be growing crops (or other agricultural produce) which have an added value of 24 times more than those grown in Syria. Table 13 in the Annex shows the estimated agricultural GDP.

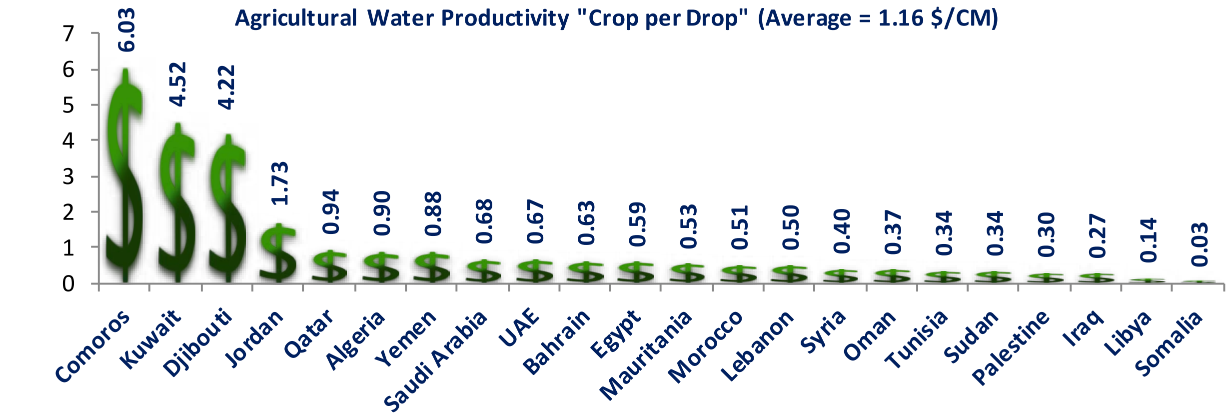


Figure 148. Agricultural Water Productivity

The industrial water productivity is highest for the gulf countries, where these productivities have almost three orders of magnitude higher. This is mainly attributed to the consideration of the oil & gas sector under the industrial sector. Qatar and Kuwait report values of about 8,865 and 2,824 $/m^3$. UAE & Oman report in the range of 1,000 $/m^3$, and Saudi Arabia & Bahrain report values in the range of 300 $/m^3$. Other oil producing counties follow, while Lebanon, Syria & Egypt have an average industrial productivity of 42, 35 and 25 $/m^3$ respectively. As productivity of oil & gas as defined by this indicator is highly affected by fluctuations in their prices and consumes less water. As the oil & gas sector is highly dependent on the natural availability of the resource in the country, it is advisable to separate its contribution to GDP from the industrial sector GDP. Table 13 in the Annex shows the estimated industrial GDP.

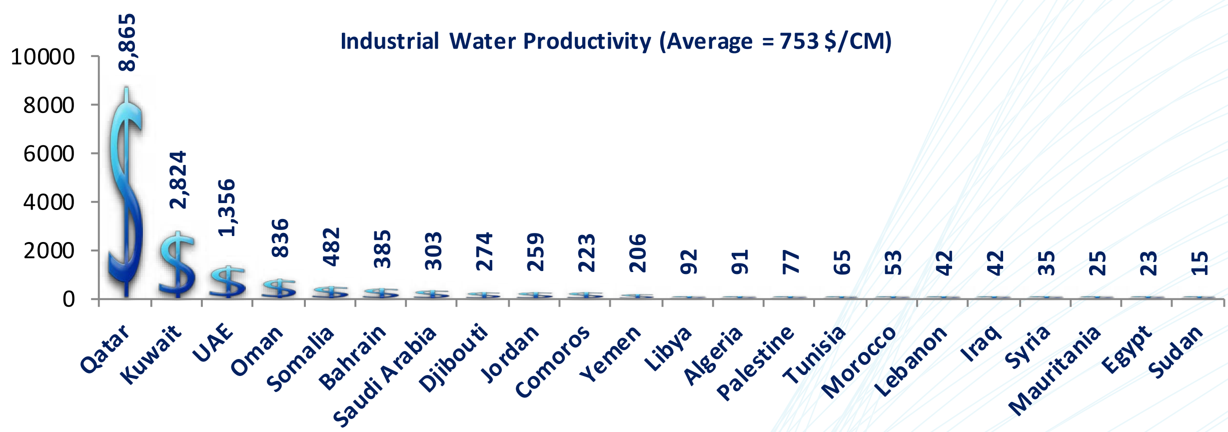


Figure 149. Industrial Water Productivity

Employment in agriculture and industry are shown in Figure 150 & Figure 151 representing "jobs per drop". Djibouti and Comoros show the highest jobs offered per drop of water in agriculture (15,586 & 2,257 jobs per cubic meter of agriculture water). Egypt and Sudan, two countries with high dependency on agriculture, have only 111 and 54 jobs per million cubic meter of water. Syria has the least number of jobs per drop in the agricultural sector at 21. Table 14 in the Annex shows the amount of labour in agriculture, while Table 16 in the Annex shows the estimated employment in the agricultural and industrial sectors.

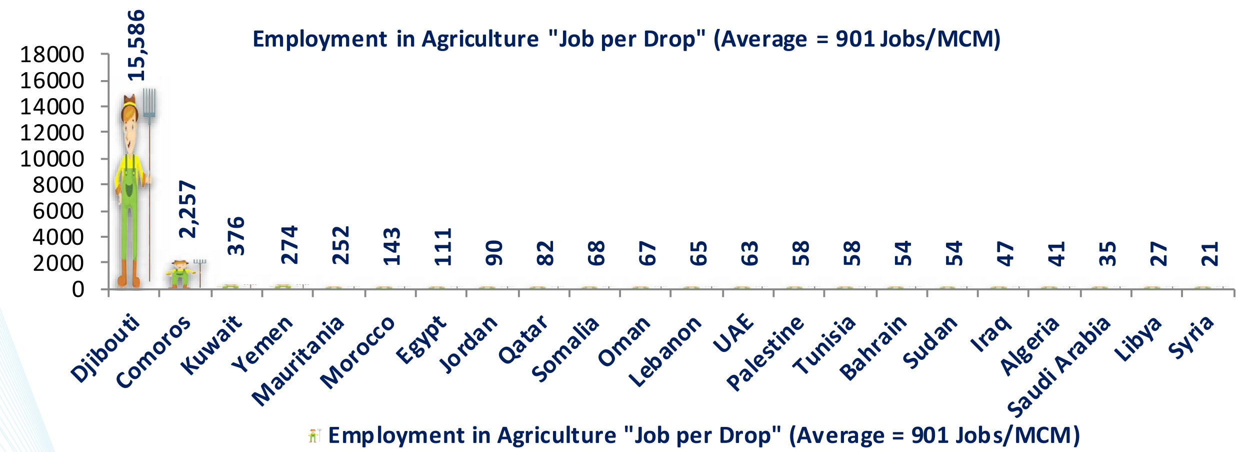


Figure 150. Employment in Agriculture per Drop of Water

Qatar is the highest county in the industrial employment per drop at 96,575 followed by Somalia at 67,914. Syria, Egypt and Iraq are the countries with the least number of jobs per million cubic meter of industrial water at 1,809, 1,224 and 1,127 respectively.

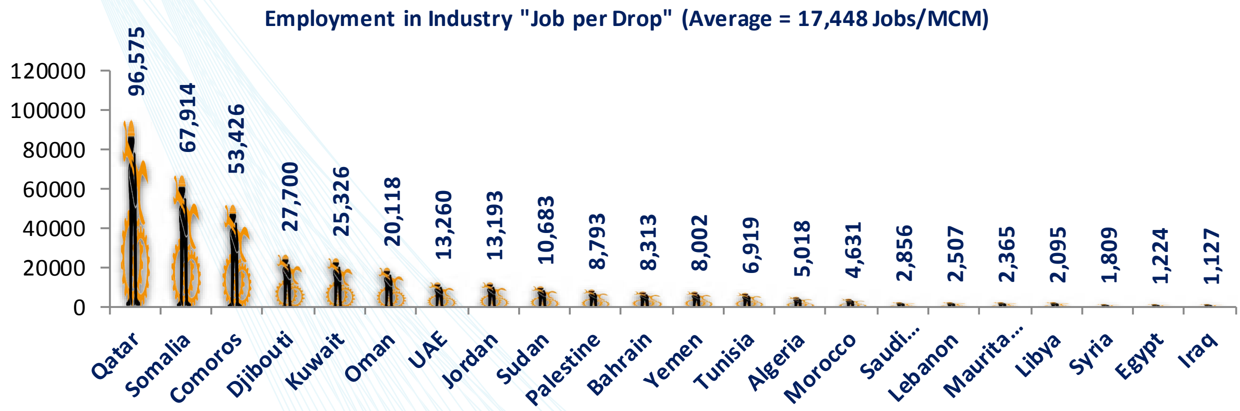


Figure 151. Employment in Industry per Drop of Water

11.2- Tariffs and Affordability

Water and Sanitation charges as percentage of average household income are defined as the monthly charge for 10 cubic meters of Water compared to the monthly household income. The household Income is estimated as five times the Gross National Income (GNI) per Capita. The average water tariffs for different Arab countries is shown in Figure 152. The water tariff is estimated as more than 1 $\$/m^3$ in Jordan, nearly 8.5 $\$/m^3$ in UAE, and about 0.1 $\$/m^3$ in Algeria. The sanitation tariff in at the highest in Saudi Arabia at 1.25 $\$/m^3$ and goes down to as low as 0.01 $\$/m^3$ in Iraq. The Water and Sanitation charges as percentage of household income is given in Figure 154. The figure shows that the Egyptian citizens pay 0.27% of their household income as water and sanitation tariffs. The Saudi citizens pay 0.11% of their household income as water and sanitation tariffs. People in Mauritania pay about 2.8% of their income in water and sanitation bills, which is the highest in the Arab region.

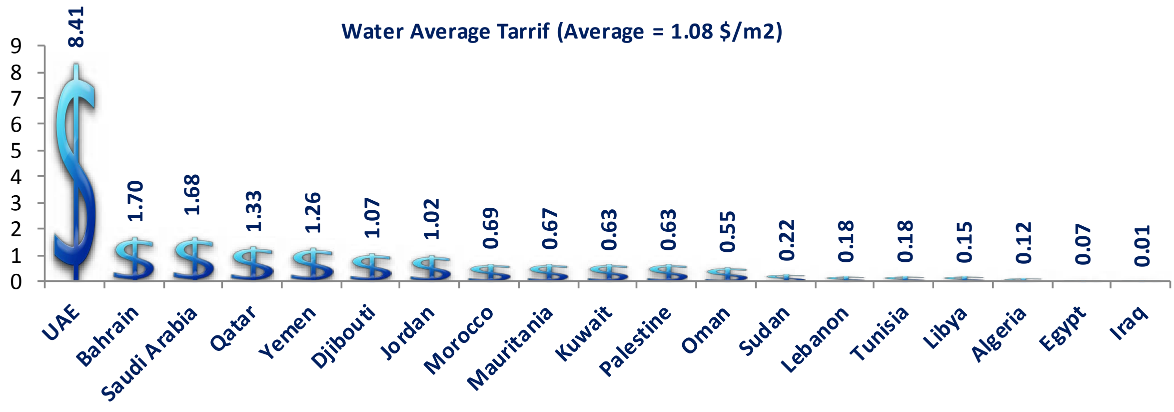


Figure 152. Average Water Tariff

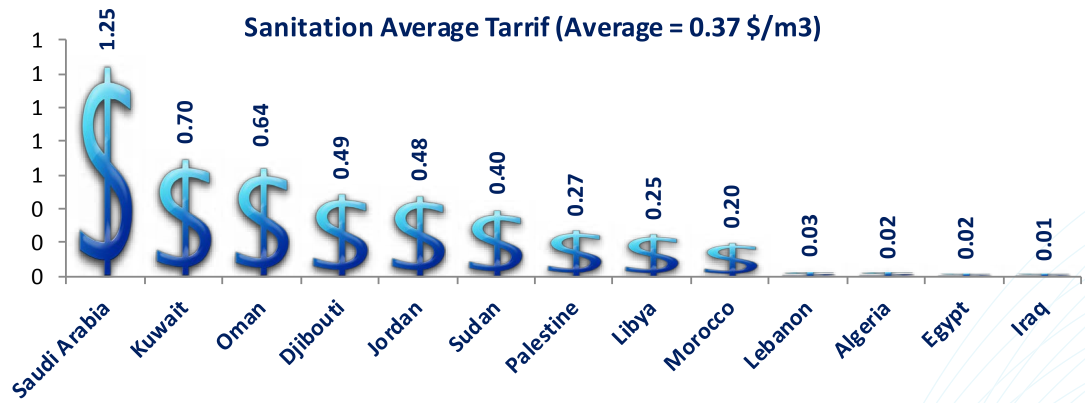


Figure 153. Sanitation Average Tariff

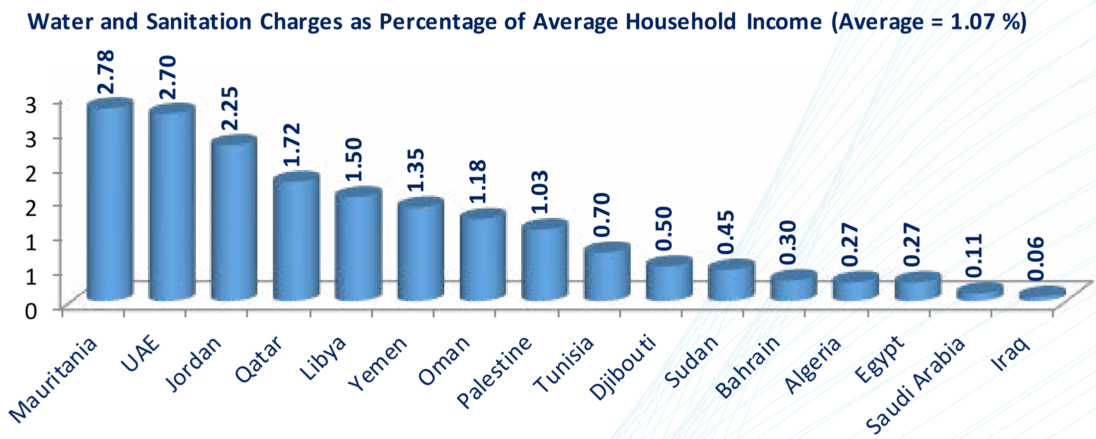


Figure 154. Water and Sanitation Charges as Percentage of Household Income

12. Water & Finance

How much finance is directed to water related programs in a country seems to be an important indicator for the priority ranking for water programs in a nation. The absolute dollar value may not adequately reflect the previous target since it will vary significantly between prosperous and developing countries as well as the size of those countries (population and economy). The relative value of expenditures as compared to the total national expenditures may be a more representable indicator.

12.1- Percent of National Budget Directed to the Water & Sanitation Sector

The percentage of national budget directed to the water & sanitation sector is defined as the percentage of national budget directed to all water related projects, labor, and services (including sanitation). It includes all water use sector, and is not limited to drinking water and Sanitation. This indicator is plotted in Figure 155 for reporting Arab countries. The reporting shows variations ranging from 18.4% of the national budget being devoted to water related programs in Kuwait, to 0.0001 % of the national expenditures in Palestine.

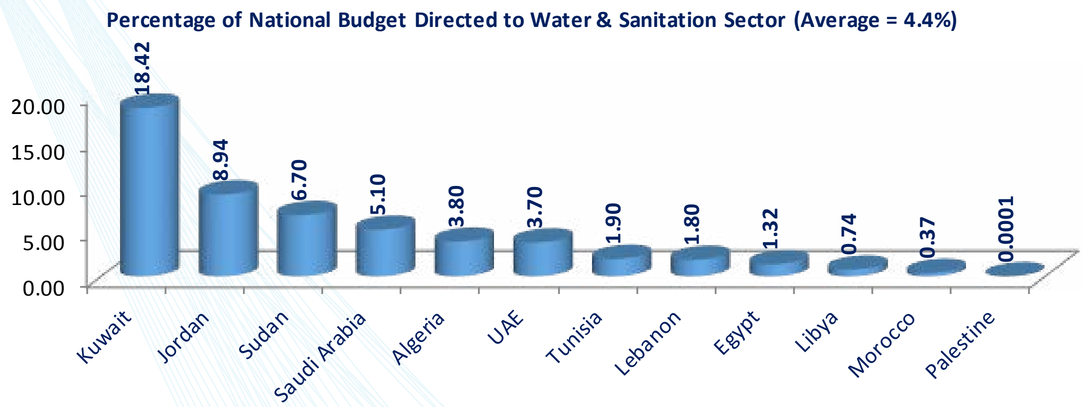


Figure 155. Expenditures for Water and Sanitation Sector as Percentage of National Budget

12.2- Percentage of GDP Directed to Sanitation & Hygiene

The percentage of GDP directed to sanitation & hygiene is defined as the percentage of national budget directed to sanitation & hygiene related projects, labor, and services from the country's GDP. This is more representative of the political will in each country to support water programs and it's related to the global commitment to the sanitation goal. This indicator is plotted in Figure 156 for the reporting Arab countries. The reporting shows that Jordan spending for the sanitation sector is as high as 10.9% of the GDP where the sanitation related expenditures were as low as 0.06 % of the national GDP in Sudan. A full spectrum of all countries would have been more helpful in supporting a comprehensive analysis.

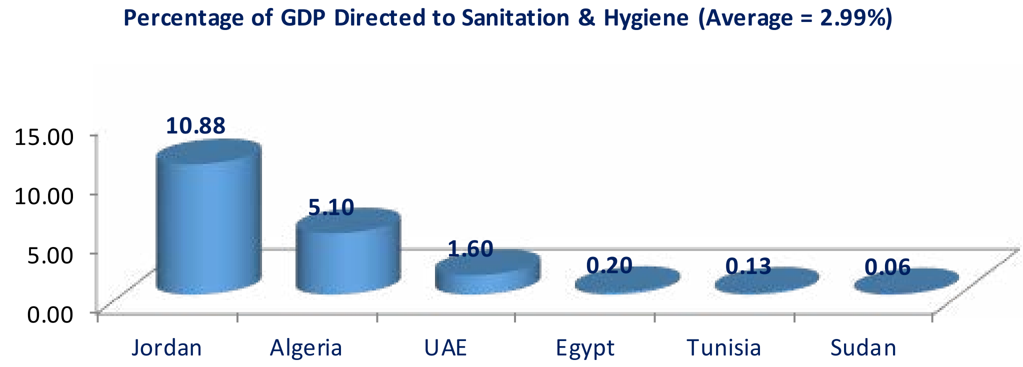


Figure 156. Nation Expenditures for Water Related Programs as Percent of GDP

12.3- Cost Recovery for Operation and Maintenance

Operation & Maintenance Cost Recovery for Drinking Water and Sanitation is defined as the sum of all tariffs collected from all subscribers to drinking water and Sanitation services in one year divided by the total operation and Maintenance cost of drinking water and Sanitation for the same year. This indicator is plotted in Figure 157 for the reporting Arab countries. The plot shows that Jordan and Tunisia are able to recover 83% and 81%, respectively, of their annual O&M costs related to water supply and sanitation services. Egypt and UAE were collecting nearly 75% of their expenditures, while Kuwait and Iraq are scoring 11% and 9%.

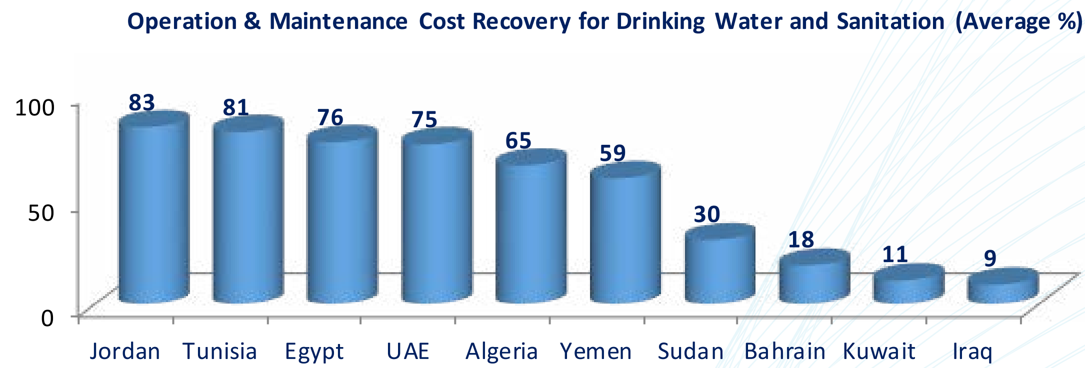


Figure 157. O&M Cost Recovery for Water Supply and Sanitation

12.4- Total Investment in Water and Sanitation

The Total Investment in Water & Sanitation is defined as government spending in water resources infrastructure development, planning & management, as well as drinking Water and Sanitation treatment and reuse. It should mainly represent the budget allocated for the ministries in charge of water resources, water supply and sanitation. Figure 158 shows such indicator for some of the reporting countries.

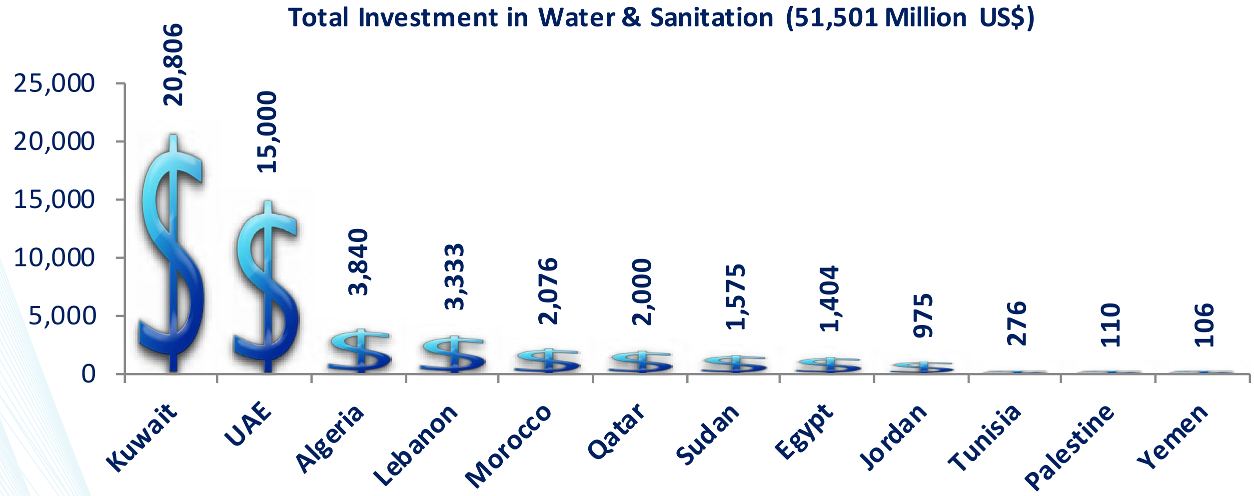


Figure 158. Total Investment in Water and Sanitation

13. Water & Trade

An important link relating water to economics and trade is the amounts of water embedded in traded goods, which is generally referred to as "Virtual Water" and is defined as the volume of freshwater needed or withdrawn in order to generate the final product, measured at the place where the product was actually produced. Hoekstra and Chapagain (2001) provided reference tables that provide the approximate volume of water needed to produce one kilogram of different crops, animal meat, and industrial products. Accordingly, the virtual water (as volume) needed to generate a certain product can be estimated by multiplying these reference values (or any similar values provided in the national and global literature) by the total annually produced amount of the same product. In the same manner, it is possible to estimate the amount of water embedded in imported and exported products. In the forthcoming discussion, the emphasis will be attributed to food and food products including both plant and animal origins. The virtual water consumption for different crops used for the Arab countries in this report is shown in Figure 159. The figure shows that the production of one ton of Coffee, red meat and tobacco require nearly 20,000 m3, 10,500 m^3 and 9,000 m^3 of water, while one ton of vegetables consumes 195 m^3 of water. Table 17 in the Annex shows the details regarding the virtual water in different agricultural products.

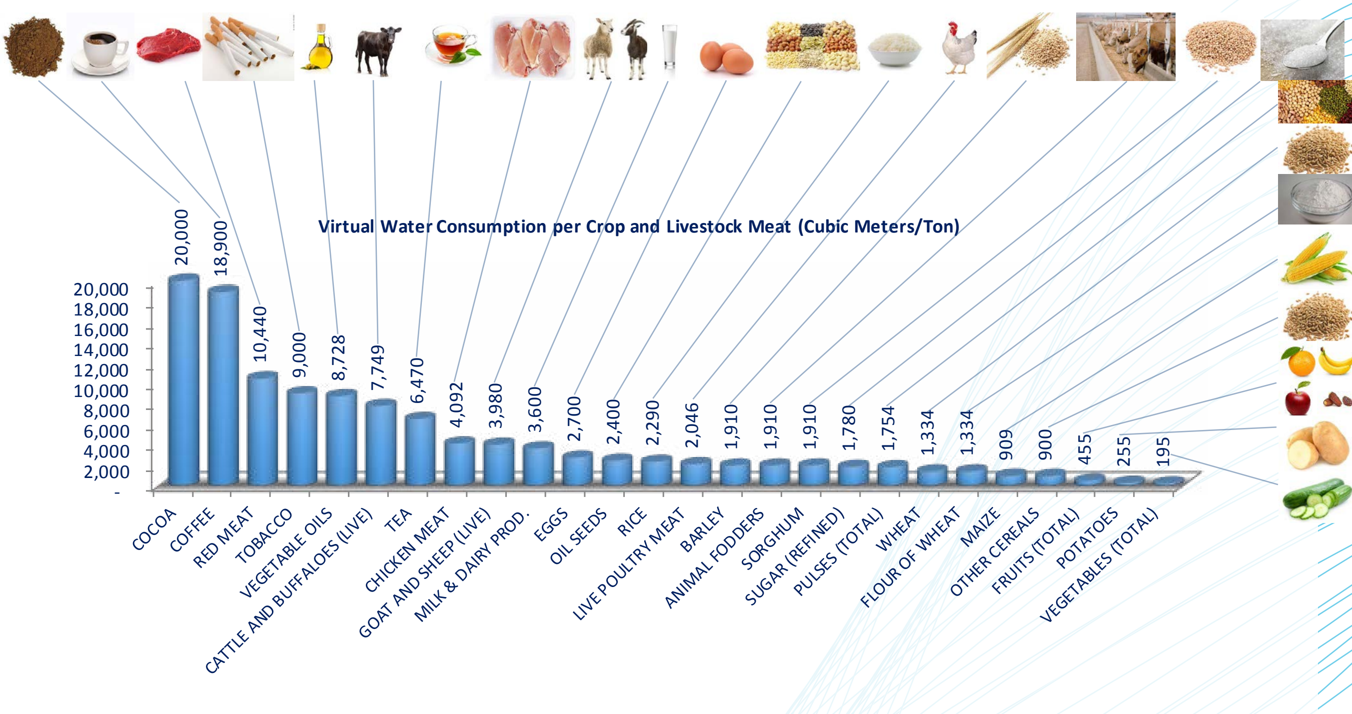


Figure 159. Virtual Water Consumption per Crop

The total amounts of imported and exported agricultural and animal products in 2015 for the Arab countries is displayed in Figure 160. The food imported by all Arab countries sum up to about 128 million Metric Ton (MT) of different agricultural and animal products. The summation of the food exported by each country is equal to nearly 18 million MT. Accordingly, the net mass of imported food for the Arab countries is equivalent to about 110 million MT. Table 18 & Table 19 in the Annex shows the value of food imports and exports for the Arab countries.

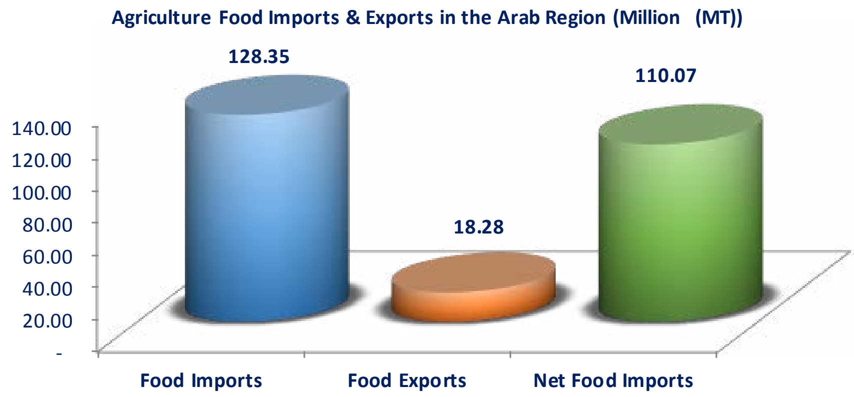


Figure 160. Imported and Exported Agriculture Food Products in 2015 for the Arab Region

The equivalent volume of virtual water, which is embedded in these food products, is shown in Figure 161. The figure shows that the Arab countries imported food products with an equivalent virtual water volume of 288 BCM in 2015. The Arab countries exported 33 BCM of agricultural water embedded in agriculture food products. In other words, should the Arab countries reach self-sufficiency in food, there must be an additional volume of 255 BCM made available for local food production and the 33 BCM used for agriculture food exports should be redirected for local food production.

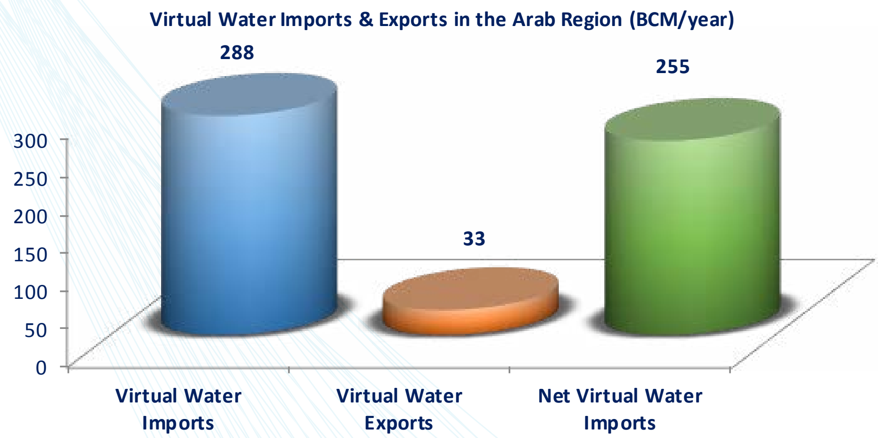


Figure 161. Imported and Exported Virtual Water Agricultural Food Products in 2015 for the Arab Region

13.1- Food Imports by Arab Countries

Total food imports are shown in Figure 162 with a sum of about 70 billion USD, it shows that Saudi Arabia and Egypt are the two countries with the highest amount of food imported equivalent to about 28 billion US dollars. The imported food by volume is illustrated in Figure 163. The values align with the monetary values as Saudi Arabia imports about 25 million metric tons of food, while Egypt imports about 23.6 million metric tons of food. Algeria comes third in food imports at about 12 million metric tons. Those three countries import more than half of the amount of food imported by all Arab region countries. The total volume of imported food from the Arab countries is 128.4 million metric tons. Annex Table 10 shows the imported amounts of agricultural products for the Arab countries. Annex Table 20 shows the imported amounts of agricultural products for the Arab countries.

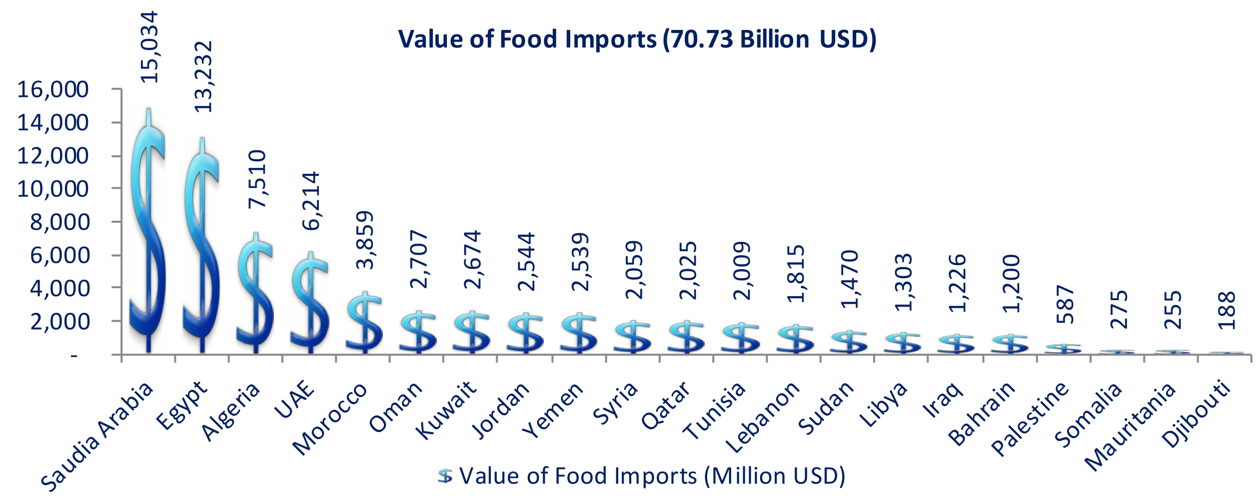


Figure 162. The Monetary Bill for Food Imports by the Arab Countries

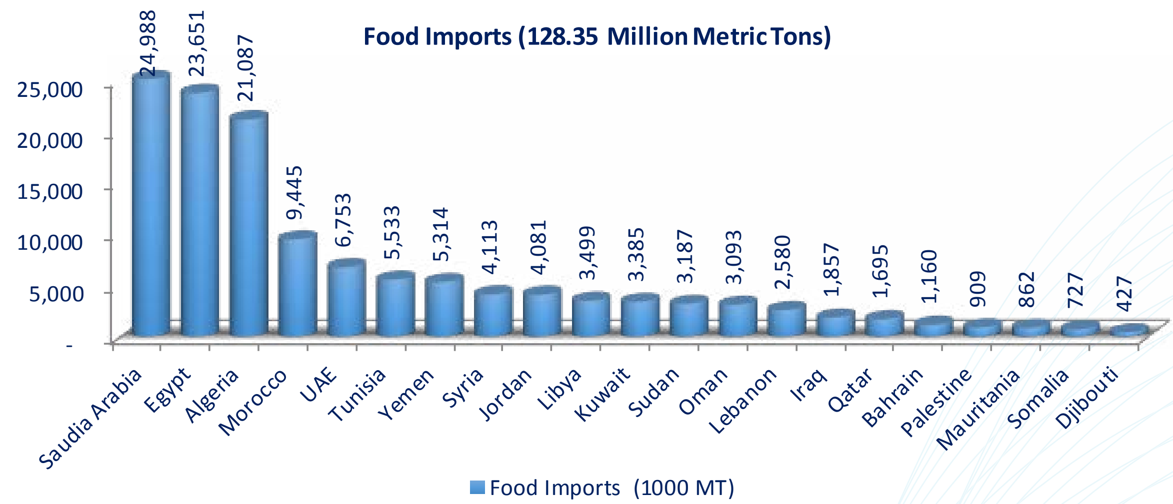


Figure 163. Volume of Food Imports by the Arab Countries

13.2- Virtual Water Imports of Food Products

The total volume of virtual water embedded in food products imports in 2015, for each individual country, is plotted in Figure 164. Saudi Arabia together with Egypt and Algeria show the highest dependence on food imports. Saudi Arabia imports about 60 BCM/y of virtual water for food, while Egypt and Algeria agricultural food products imports were nearly 50 and 45 BCM/y, respectively.

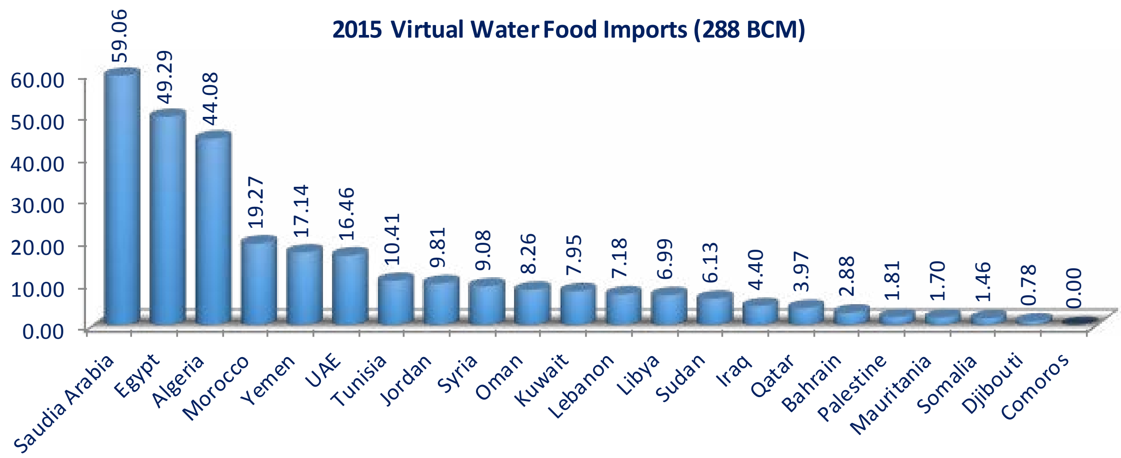


Figure 164. Virtual Water Agricultural Food Imports by Country

The main categories of agricultural and livestock products imported by the Arab countries are shown in Figure 165. About half of the imported virtual water for food serves three products; wheat, dairy products, and vegetable oils. Wheat represents nearly 20% of the total virtual water food imports (55.3 BCM/y) while dairy products (and milk) represent 16.7% of the total imports (48.2 BCM/y). Imported vegetable oils amounts to 36.6 BCM/y (12.5% of total virtual water food imports). Meat and related animal fodders contribute to nearly 41 BCM/y (nearly 15% of total imported virtual water). Finally, Tobacco represents 4.29 BCM/y of the total virtual water imports (almost 1.5% of the total imported virtual water). Annex Table 21 shows the imported amounts of agricultural products virtual water for the Arab countries.

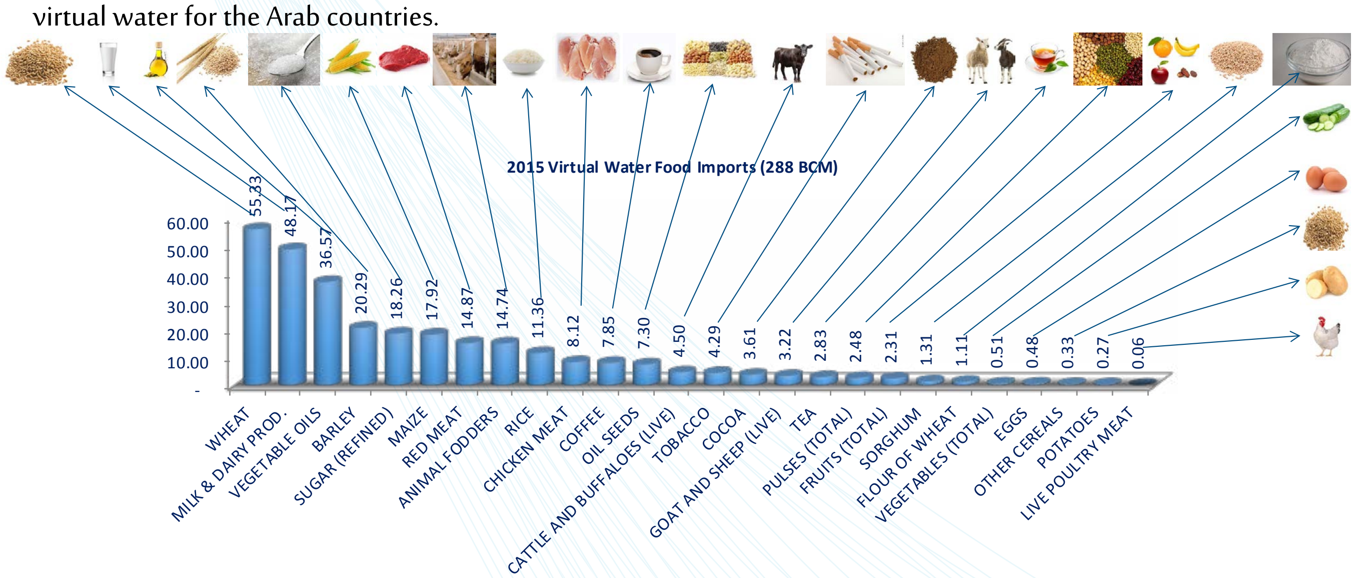


Figure 165. Agricultural and Livestock Virtual Water Country Imports

Figure 166 shows the volume of virtual water embedded in imported animal virtual water imports animal fodders and barley for each country in the Arab region. Saudi Arabia imports the highest amount at 15.3 BCM of virtual water, which represents about 44% of the total amount imported by the Arab countries. The total imported volume of animal fodders and barley animal fodders and barley virtual water was 35.03 BCM. Figures (Figure 166) through (Figure 170) show the virtual water imports for selected agricultural products.

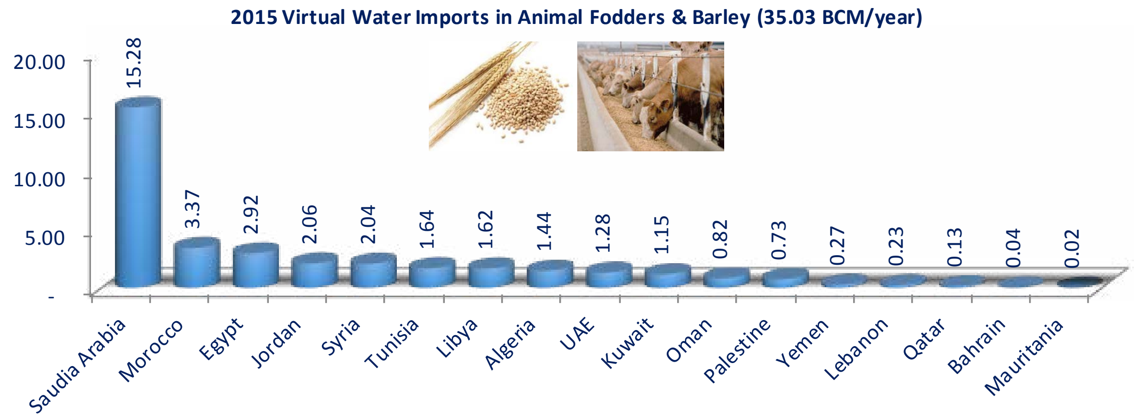


Figure 166. Virtual Water Imports in Animal Fodders and Barley for the Arab Countries

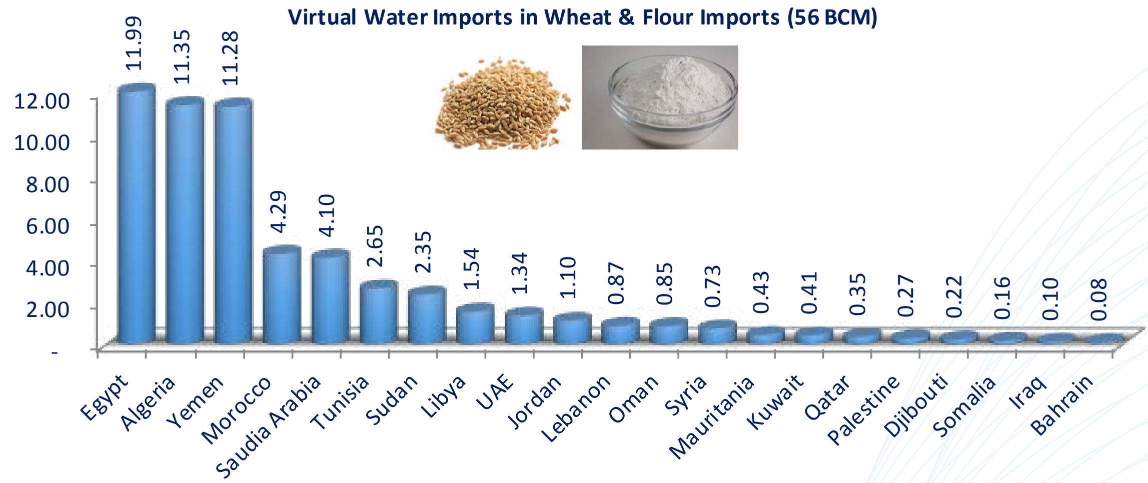


Figure 167. Virtual Water Imports in Wheat & Flour for the Arab Countries

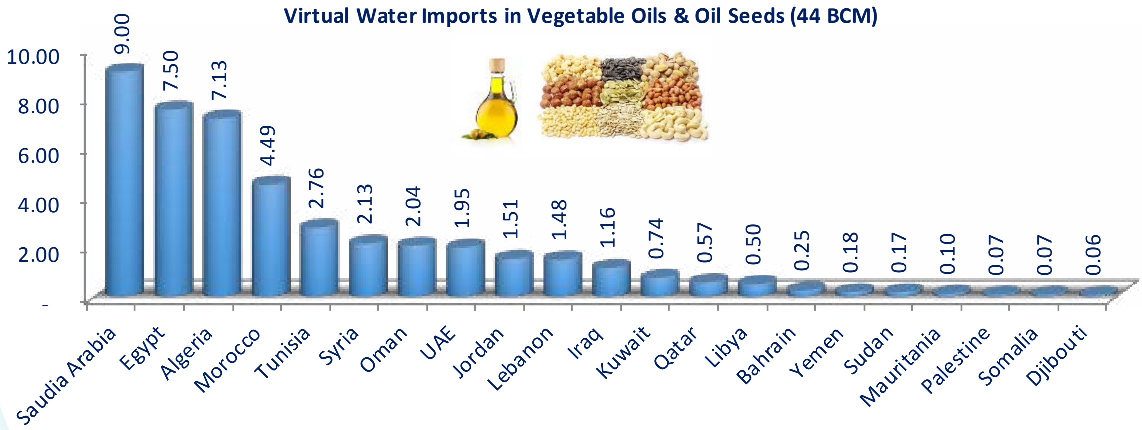


Figure 168. Virtual Water Imports in Vegetable Oils & Oil Seeds for the Arab Countries

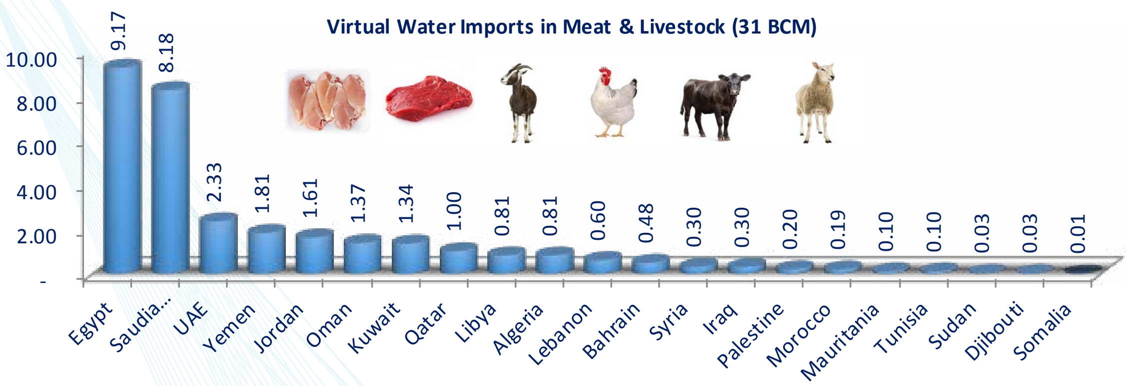


Figure 169. Virtual Water Imports in Meat & Livestock for the Arab Countries

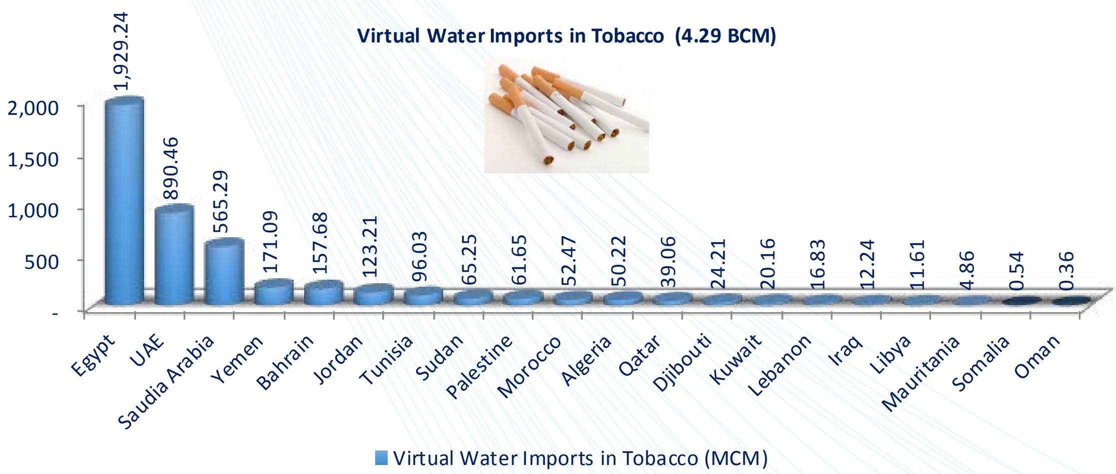


Figure 170. Virtual Water Imports in Tobacco for the Arab Countries

13.3- Food Exports from Arab Countries

As of 2015, the dollars bill for food exports reached nearly 16 billion USD as shown in Figure 171. Egypt is the number one country in exporting food with a total value of about 3.3 billion USD followed by the United Arab Emirates with2.7 Billion USD. The imported food by volume is illustrated in Figure 172. The values align with the monetary values as Egypt exports about 5.5 million metric tons of food, while the United Arab Emirates exports about 2.6 million metric tons of food. The total volume of exported food from the Arab countries is 18.2 million metric tons. Annex Table 22 shows the exported amounts of agricultural products for the Arab countries.

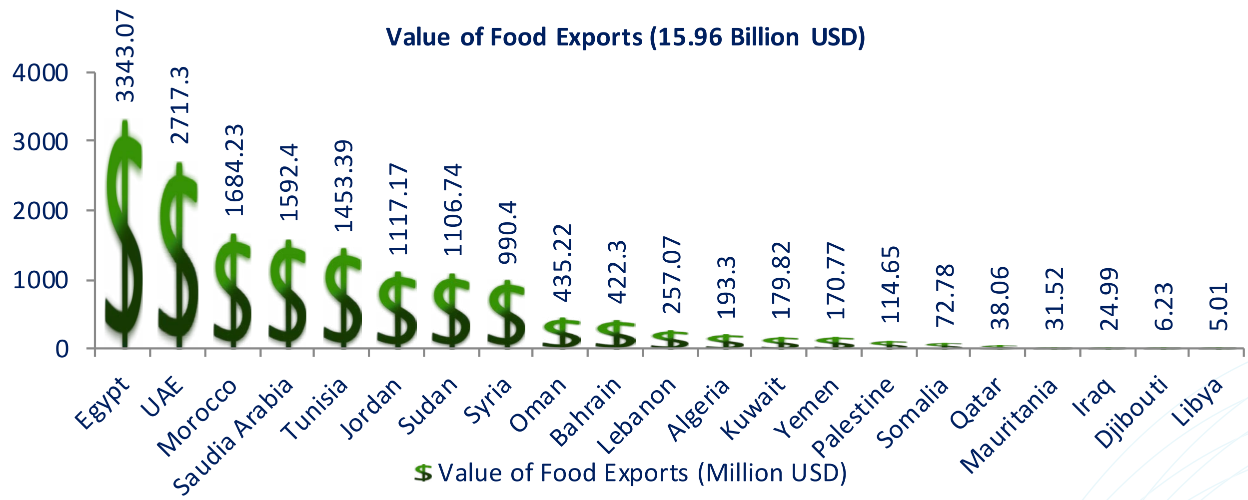


Figure 171. The Monetary Bill for Food Exports from the Arab Countries

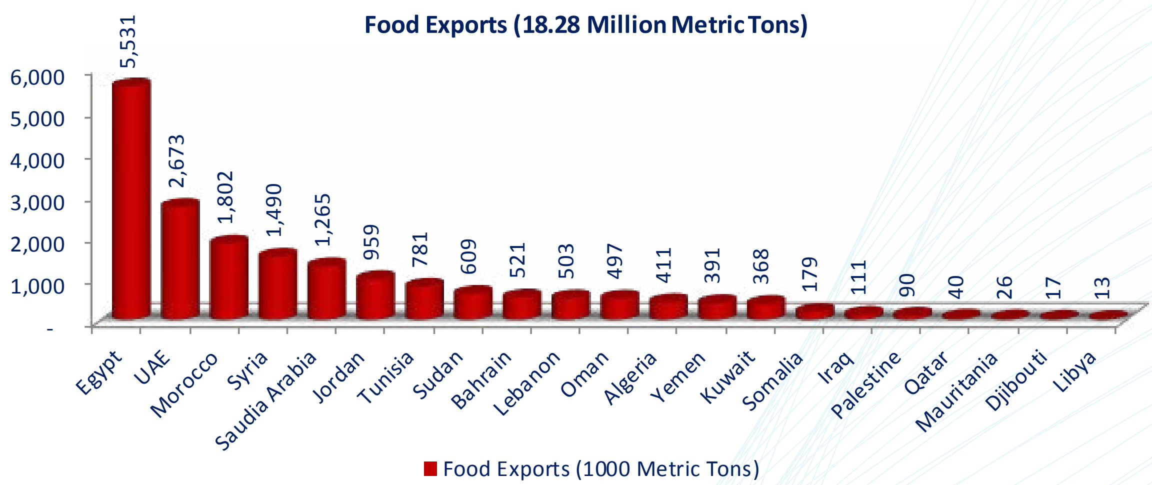


Figure 172. Volume of Food Exported from the Arab Countries

13.4- Virtual Water Exports of Food Products

The total volume of virtual water embedded in food products exports, for each individual country, is plotted in Figure 173. Egypt, United Arab Emirates, and Saudi Arabia reported the highest virtual water food exports. Egypt is exporting food products with an embedded volume of virtual water equivalent to 7.84 BCM/y. United Arab Emirates and Saudi Arabia have reported values of 4.56 and 4.3 BCM/y, respectively.

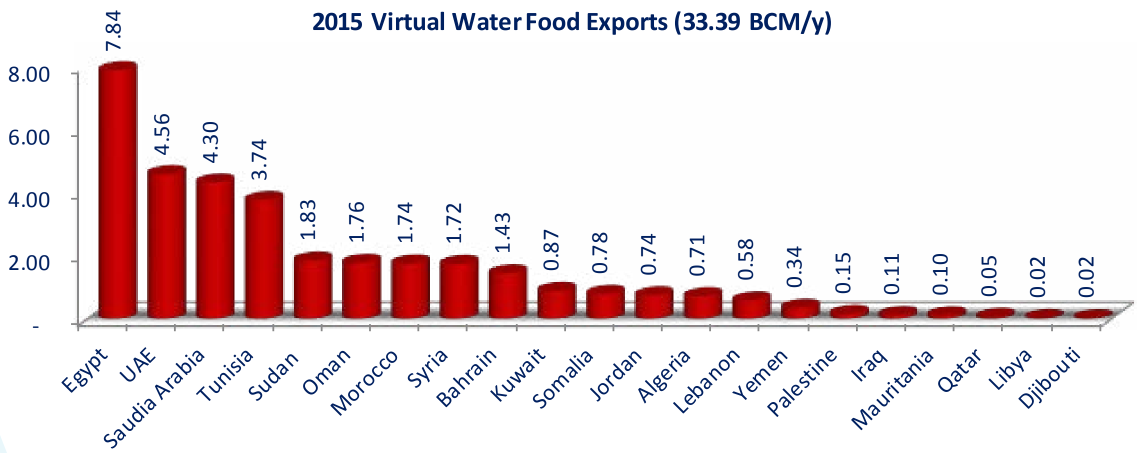


Figure 173. Virtual Water Food Exports by Country

54% of the exported virtual water for food serves 2 products; dairy products (29%) and vegetable oils (25%). Dairy products represent nearly 29% of the total virtual water food exports (9.56 BCM/y) while vegetable oils represent 25% of the total exports (8.45 BCM/y). Exported Sugar amounts to 3.91 BCM/y (12% of total virtual water food imports). Fruits contribute to nearly 1.99 BCM/y (nearly 6% of total imported virtual water). The total amount of the 2015 virtual water food exports amounts to 33.39 BCM as shown in Figure 174. Annex Table 23 shows the exported amounts of agricultural products virtual water for the Arab countries. Figure 175 and Figure 176 show ranking of the Arab countries by virtual water exports for selected agricultural products.

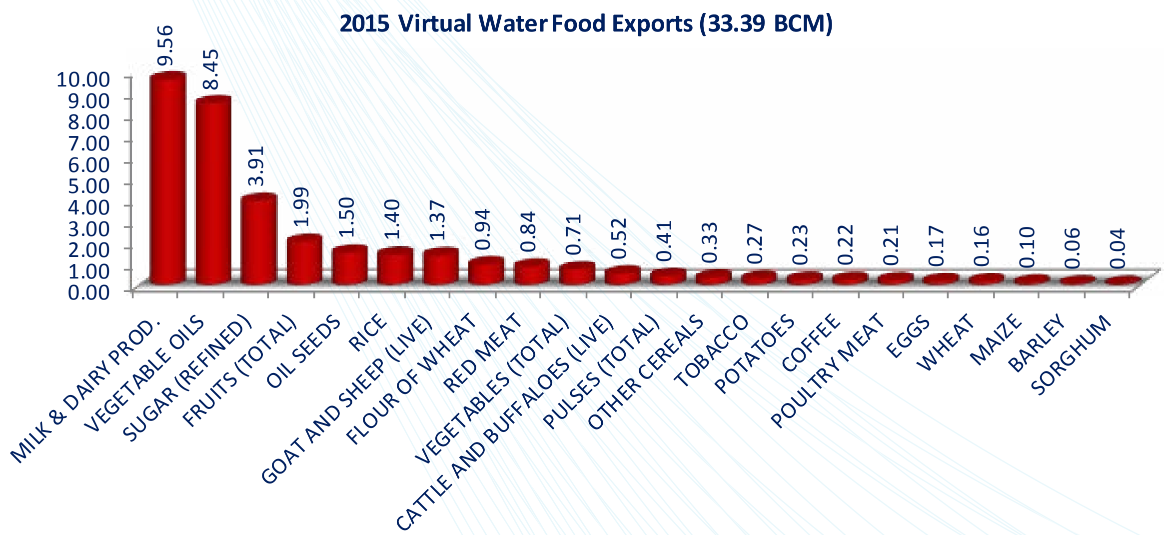


Figure 174. Agricultural and Livestock Virtual Water Country Exports

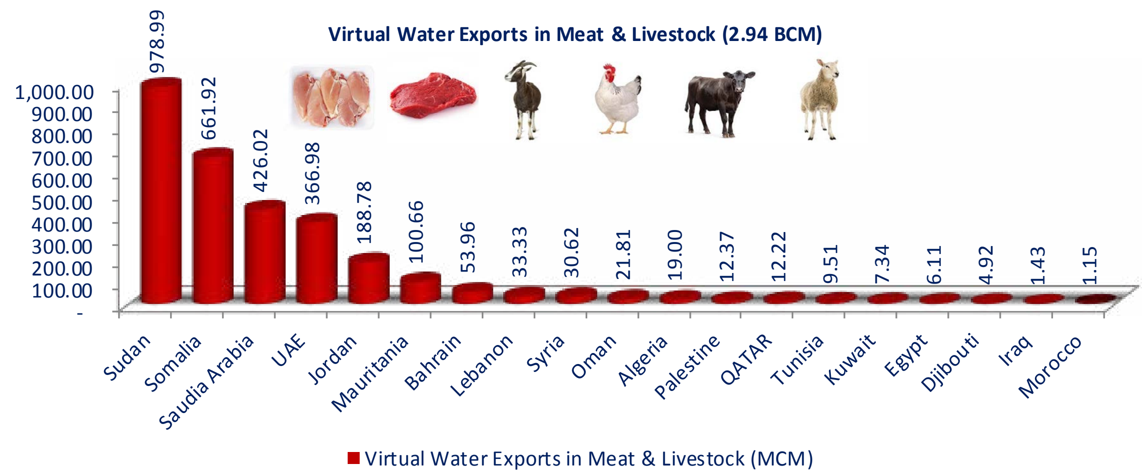


Figure 175. Virtual Water Exports in Meat & Livestock for the Arab Countries

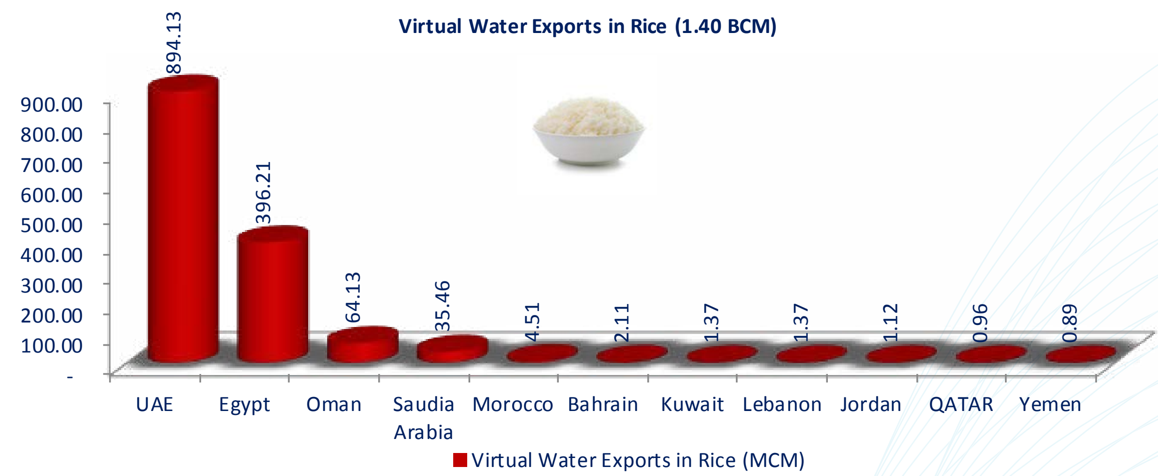


Figure 176. Virtual Water Exports in Rice for the Arab Countries

13.5- Virtual Water in Food Trade & Local Production from 2012 to 2015

A Comparison and evaluation of the situation of virtual water for food trade and local production is shown in Figure 177. The water used for local food production increased from 282 BCM/y in 2012 to 324 BCM/y in 2015 which represents about 5% increase per year. These values have significant implications on the water and food security of the Arab Region. The virtual water food imports have also increased from 274 BCM to 288 BCM, while virtual water food exports have decreased from 55 BCM/y in 2012 to 33 BCM/y in 2015. Table 24 & Table 25 in the Annex shows the local food production along with the virtual water embedded in the local food production for the Arab countries.

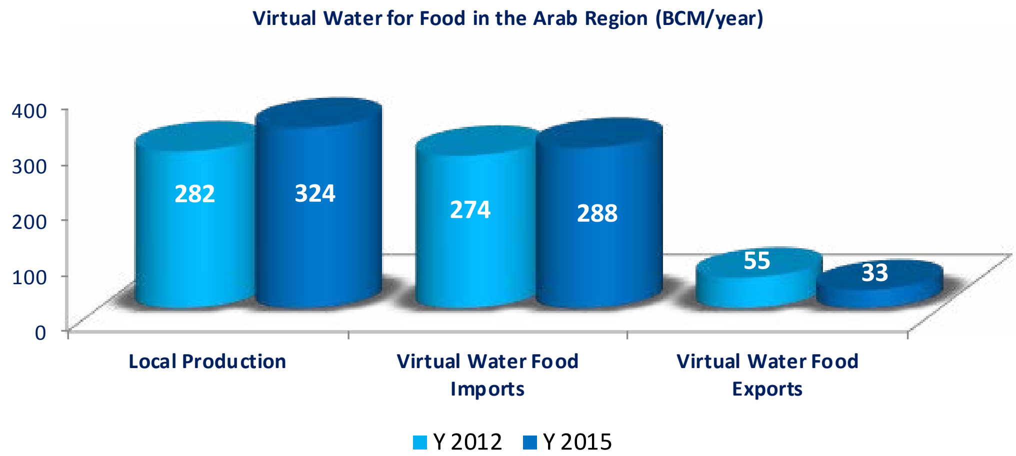


Figure 177. 3 Years Development in Virtual Water for Food in the Arab Region (2012 to 2015)

The virtual water for local production consumption is shown in Figure 178. It shows that milk, red meat, and wheat consume the highest amounts of virtual water at 97.5, 34.2 and 36.9 BCM/y respectively.

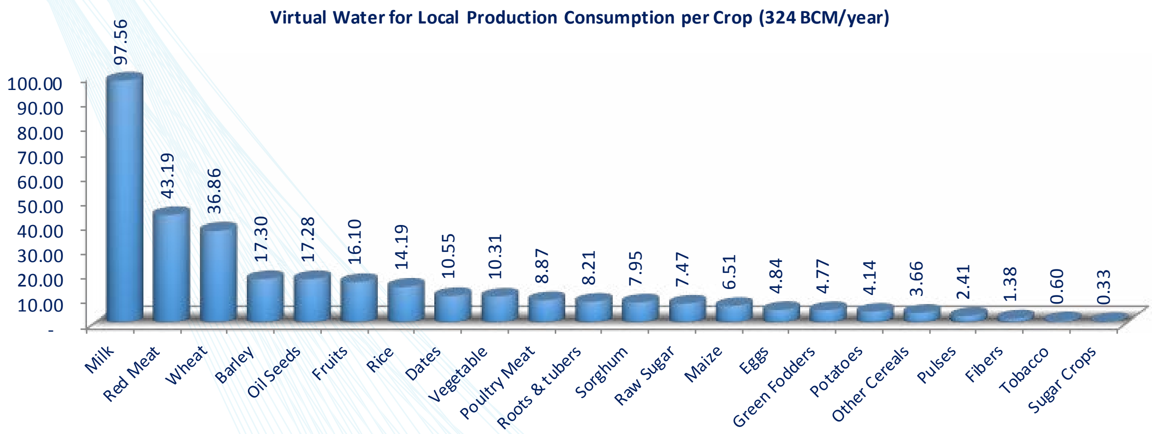


Figure 178. Virtual Water for Local Food Production in the Arab Region

Figure 179 shows the local livestock virtual water consumption for the 3 years between 2012 and 2015. Cattle consume 61% of the virtual water. Figure 180 shows the virtual water consumption per year, presenting the previous figures together reflects the lifetime time of the livestock head as being 3 years.

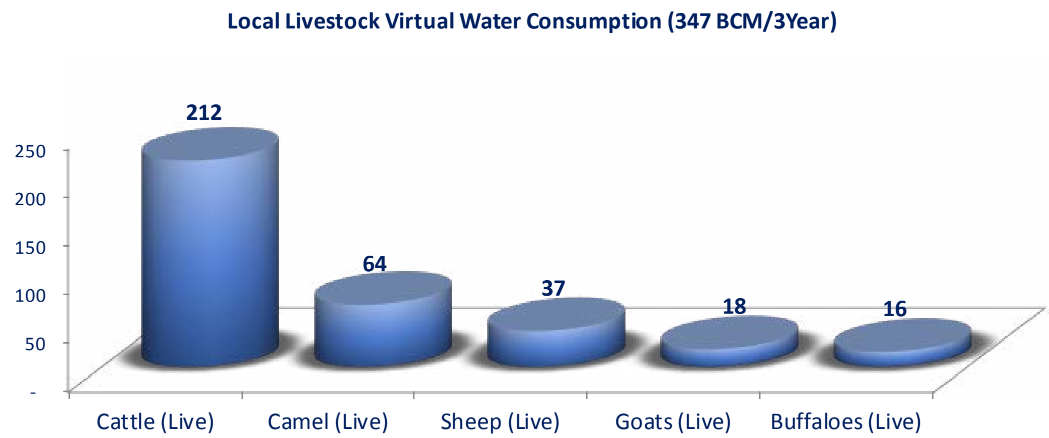


Figure 179. Local Livestock Virtual Water Consumption (3 years lifetime)

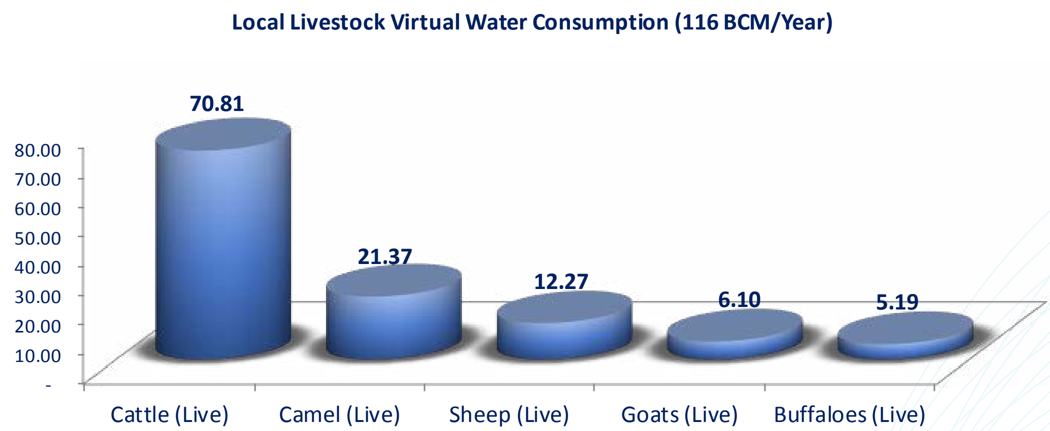


Figure 180. Local Livestock Water Consumption (1 year)

The bottled water industry reports a total country bottled water exports from the Arab countries equivalent to 0.31 million cubic meters as compared to a total import of 0.62 million cubic meters, as shown in Figure 181.

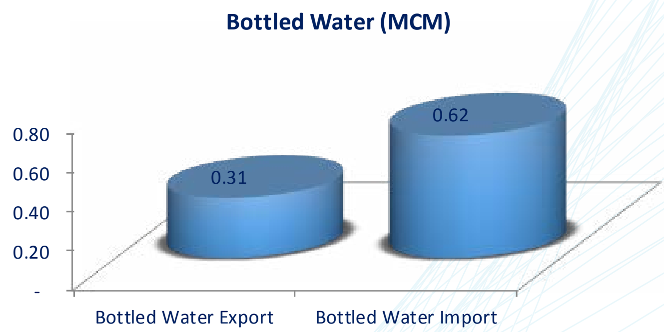


Figure 181. Bottled Water Export and Import

14. Water & Governance

The term governance evolves whenever a group of people are involved in accomplishing an end result. Governance is concerned with regulating the tripartite relation between decision makers, stakeholders, and financing entities. It also regulates the inter-relationships between the three levels; political, organizational and operational and revolves around defining authority, decision-making and accountability.

The degree of implementation of an integrated water resources management plan in a country and its various aspects are of major concern for discussion in this chapter. Sustainability of services and changes in water use efficiencies is another concern. Finally, the discussion will include the situation of stakeholder participation in the water sector.

14.1- National Integrated Water Resources Management (IWRM)

A national plan dedicated entirely to water resources, with more than 3 entities involved, and with all water use sectors addressed could qualify as a national IWRM plan, if it also ensures the engagement of the civil society as a consulting partner during the development of integrated water resources management plans. The Degree of integrated water resources management implementation is an indicator which reflects the extent to which integrated water resources management (IWRM) is implemented. It takes into account various users and uses of water with the aim of promoting positive social, economic and environmental impacts at all levels, including transboundary, where appropriate.

A national Water Monitoring, Evaluation, and Reporting system is defined as a system of indicators that covers all areas related to water and is adequately and continuously assessed and reported according to clear pre-set definitions. Figure 182 shows a plot of this indicator.

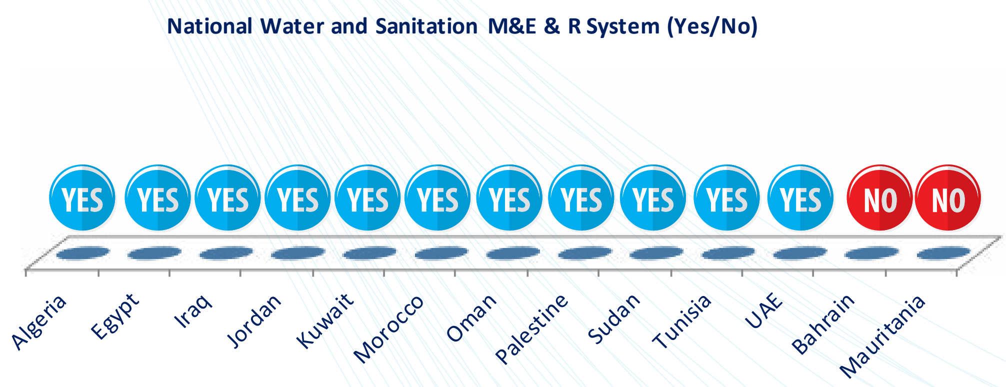


Figure 182. Existence of System for Monitoring, Evaluation and Reporting for WSS

The number of officially authorized surface water permits for beneficial usage by individuals or entities reported is plotted in Figure 183 showing a total of 1696 permits. The total annual authorized volumes associated with all reported authorized water Surface water permits with a total of 49.05 BCM/y as displayed in Figure 184. The volume is not equivalent to the same permits as the courtiers reporting on both are not all the same. Figure 185 is showing the percentage of surface water permits to surface water withdrawals, values under 100% means that the country's surface water withdrawals are exceeding the licensed surface water volumetric rights. As for Sudan, the total withdrawals from blue water have been reported in the Water & Uses section as 13.86 BCM/y, their volumetric water rights for surface water permits is 14.0 BCM and is reflected as 101% of the annual blue water withdrawals, which means that all the surface water withdrawals volume in Sudan are in the licensed volumes of the permits.. The average percentage of surface water permits volumetric water rights to surface water withdrawals for the reported countries is 53.8%, which indicates that on average (for the reported countries) about 46.2% of the surface water withdrawals are not licensed. However, this is not representative for the whole region.

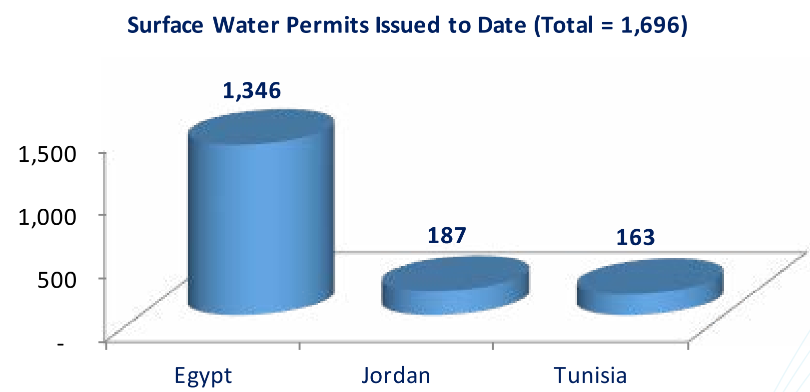


Figure 183. Total Amounts (in million MT) of Imported and Exported Food Products in 2015 for the Whole Arab Region

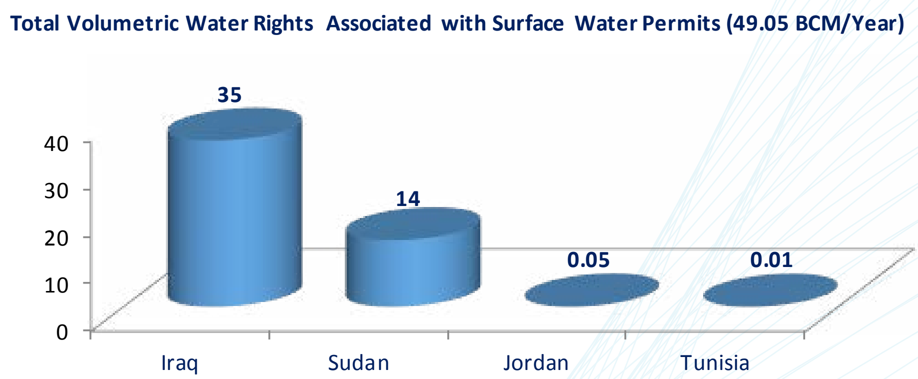


Figure 184. Total Volumetric Water Rights for Surface Water Permits

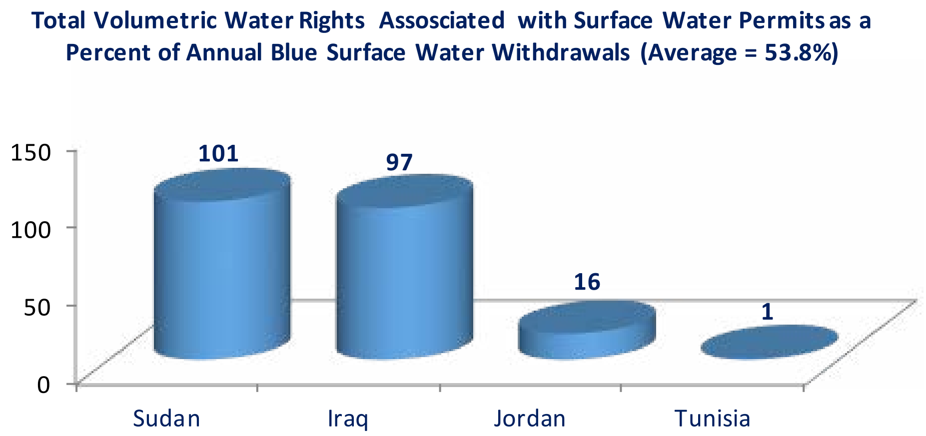


Figure 185. Total Volumetric Water Rights for Surface Water Permits as Percent of Blue Surface Water Withdrawals

The number of officially authorized permits for registered shallow or deep wells for beneficial usage by individuals or entities is plotted in Figure 186 which shows that total number of licensed wells is 341 thousand wells. About 150 thousand wells are officially permitted in Saudi Arabia, while this number is about 80 thousand and 50 thousands in Iraq and Egypt respectively. The total annual authorized volumes associated with all authorized well permits are shown in Figure 187 which sums up to 8.45 BCM for the Arab region in 2015. However the reported licensed volume of abstraction is not necessarily equivalent to the reported number of permits due to the discrepancies in the countries reporting on both. 5.2 BCM of extractions from groundwater wells are permitted in Egypt as the highest country, while 1.4 BCM of extractions are authorized in Sudan. The total volumetric water rights associated with well permits as a percent of annual blue groundwater abstractions is given in Figure 188. The 2015 total blue groundwater abstraction, from renewable and non-renewable, summed up to 64.61 BCM as stated in the Water & Uses section which is more than 7 times the reported licensed groundwater abstractions. Values under 100% mean in Figure 188 that the country's groundwater withdrawals are exceeding the licensed groundwater volumetric rights. Palestine is the only reported country with ground water withdrawals in the permitted licensed groundwater wells volumetric rights. On average only 40% of the reported abstracted groundwater volumes are licensed. The number of unlicensed wells is shown in Figure 189 which displays that nearly 110 thousand wells are unlicensed in UAE while about 50 thousands wells are unlicensed in each of Iraq and Egypt. The total number of unlicensed wells for the reporting countries is about 205 thousand.

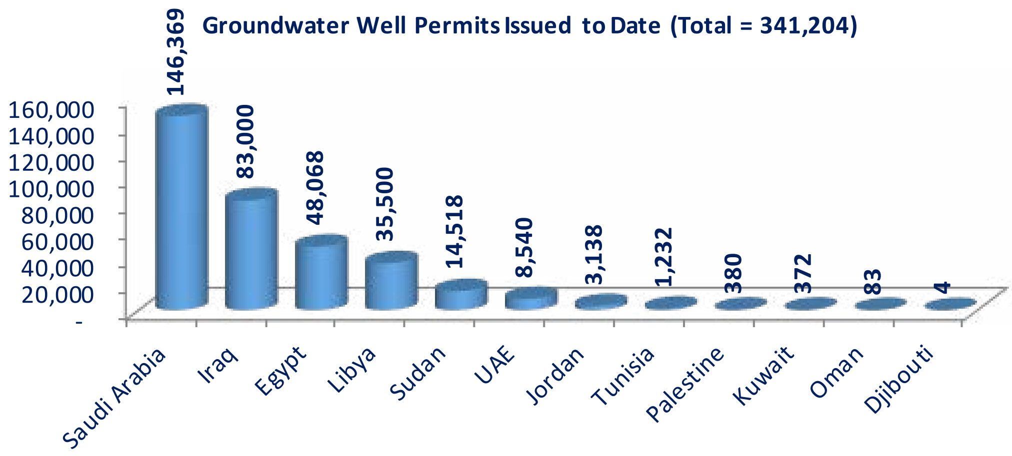


Figure 186. Groundwater Well Permits

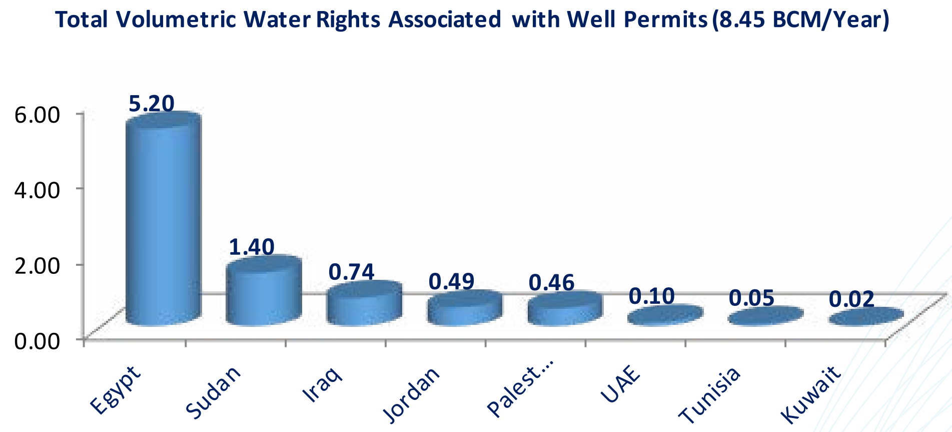


Figure 187. Volumetric Water Rights Associated with Well Permits

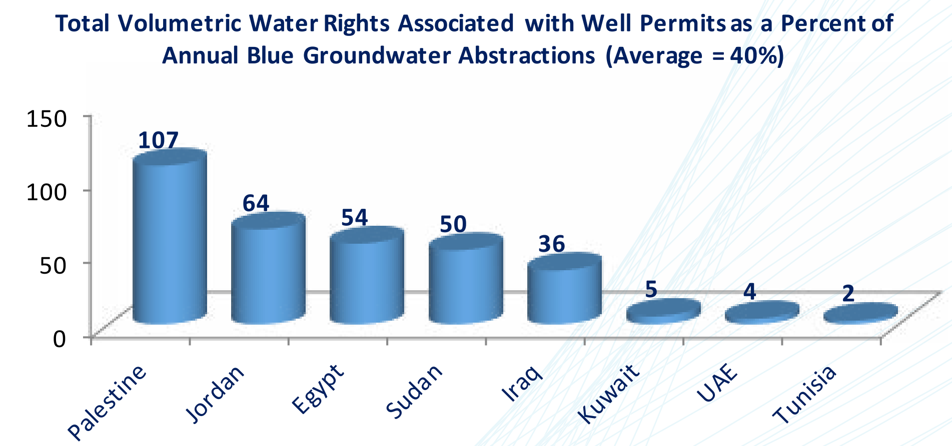


Figure 188. Volumetric Water Rights as Percent of Blue Groundwater Abstractions

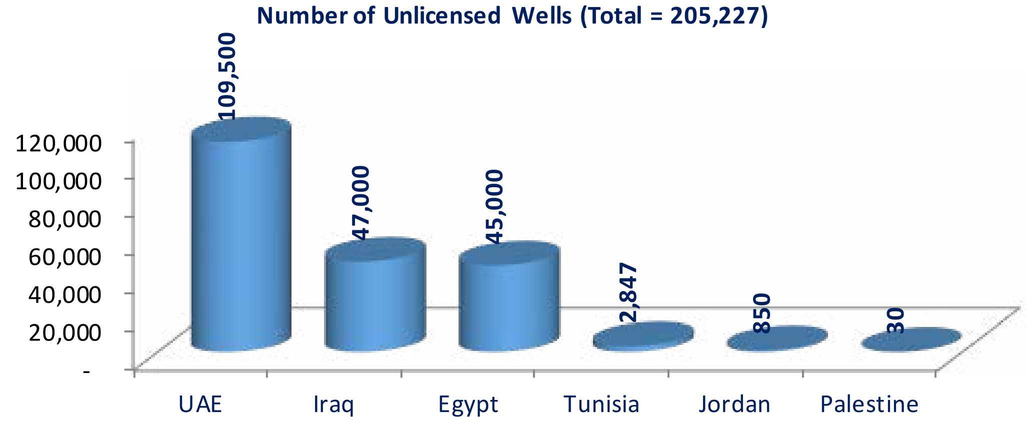


Figure 189. Number of Unlicensed Groundwater Wells

14.2- Sustainability of Services and Water Use Efficiencies

The number of drinking water meters installed as a Percentage of the total covered households is an indicator which is shown in Figure 190. It shows that all of the households are being metered in Bahrain, Jordan, Kuwait and Palestine.

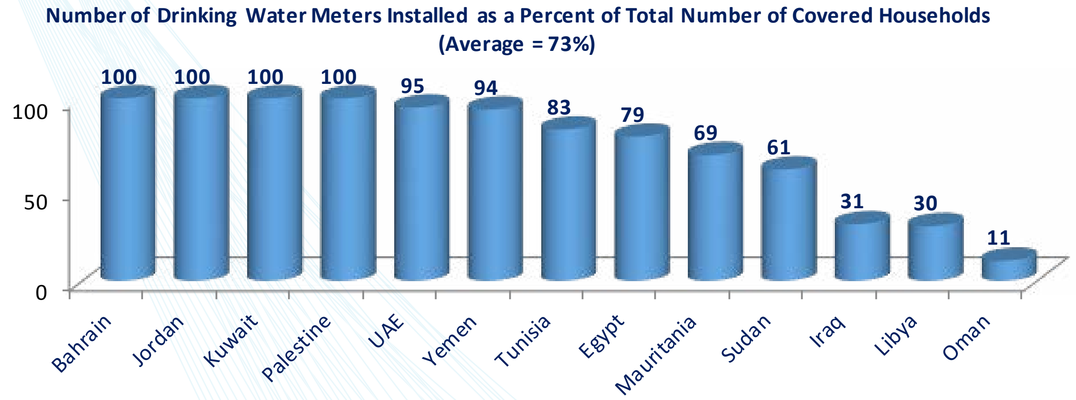


Figure 190. Installed Drinking Water Meters as Percent of Covered Households

The number of installed surface irrigation and groundwater meters as percent of total licensed permits is given in Figure 191 & Figure 192 , respectively. All permitted surface and groundwater usage in Jordan are being metered. Only 5 countries out of 22 Arab countries have reported on metering of groundwater wells, while only 2 countries have reported on metering of surface water irrigation withdrawals (Jordan and Sudan).

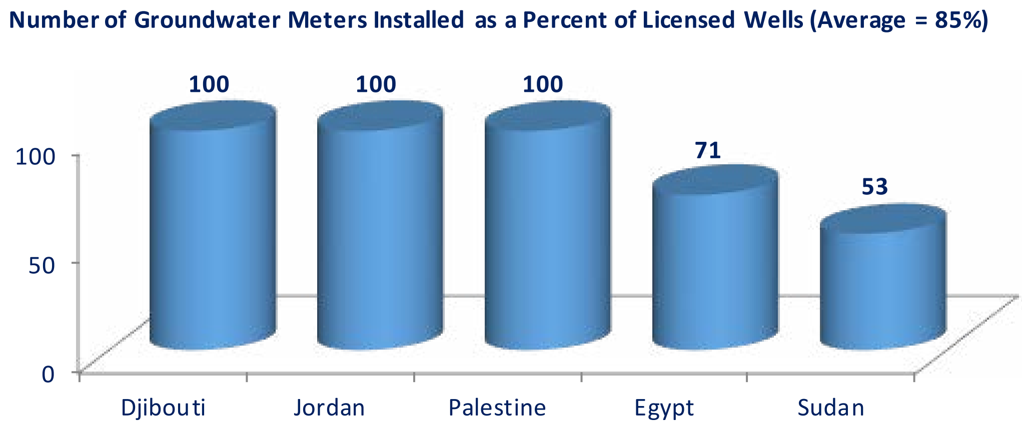


Figure 191. Installed Groundwater Meters as Percent of Licensed Wells

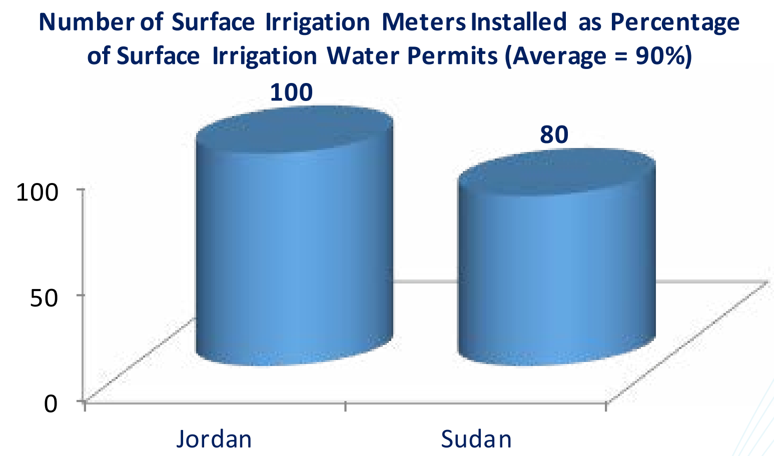


Figure 192. Installed Surface Irrigation Water Meters as Percent of Irrigation Water Permits

The overall water use efficiency is defined as the ratio of the difference between the total withdrawals from original sources (surface water, renewable and non-renewable groundwater, and desalinated water) and the wastewater and drainage flows to the withdrawals from original sources expressed as a percentage. Figure 193 shows the physical irrigation water losses summing up to be about 9.79 BCM/y. It is not clear though if these, possibly, "on-farm" losses are reused again to contribute to an improved overall water use efficiency or not. The physical domestic water losses refer to the amount of domestic water lost due to leakage in the piped conveyance system, it is displayed in Figure 194 and summing up to about 5.88 BCM/y. The highest physical domestic and commercial water losses by volume occur in Egypt and Iraq, however for the physical domestic water losses as percentage of the withdrawals for domestic water use as shown in Figure 195, Comoros, Palestine, Somalia and Syria are the highest four countries with physical domestic losses relative to their domestic withdrawals ranging from 35% to 40%. Moreover, the commercial water losses: is an indicator referring to the unaccounted water due to theft, lack of metering or uncollected bills and is calculated by subtracting the sum of the total accounted for water (metered volumes) and the physical losses from the total withdrawals by the domestic sector. The commercial losses summing to 3.22 BCM/y for the Region are shown in Figure 196.

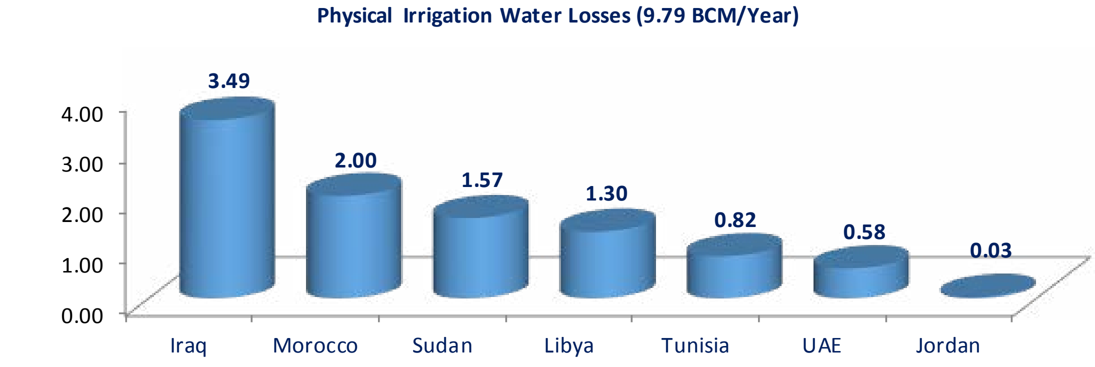


Figure 193. Physical Irrigation Water Losses

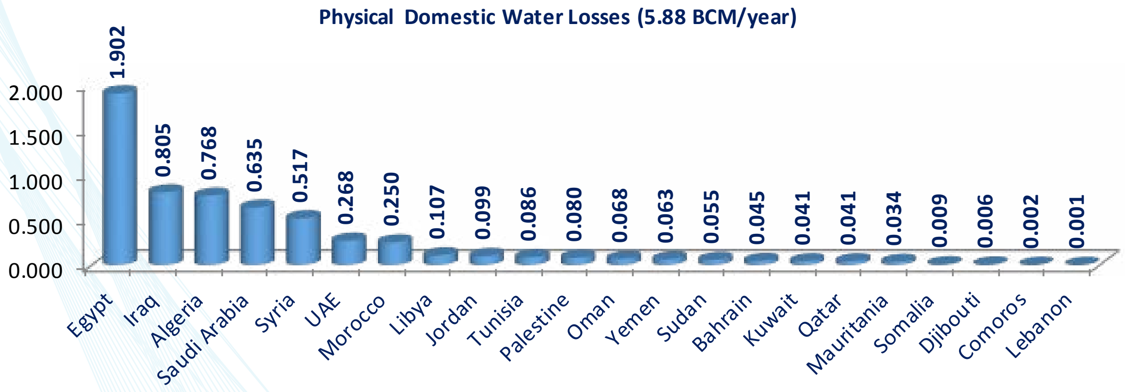


Figure 194. Physical Domestic Water Losses

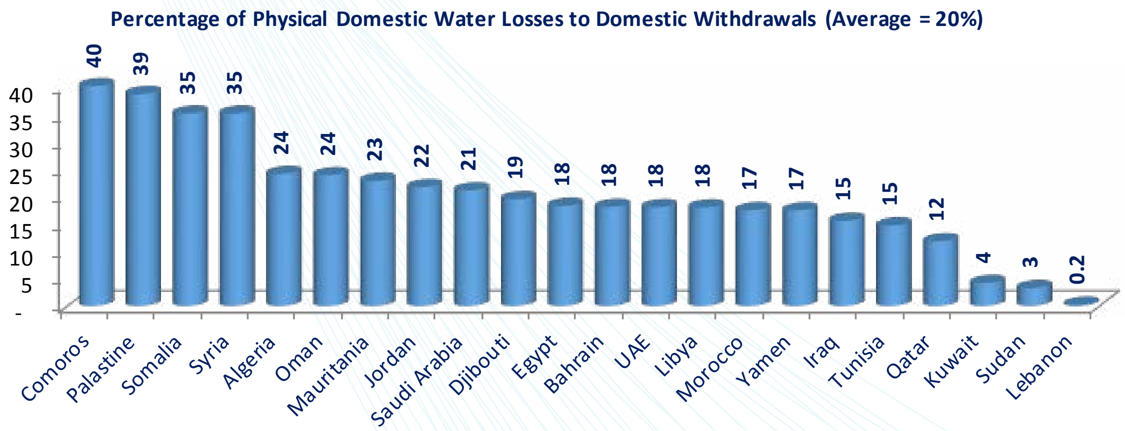


Figure 195. Percentage of Physical Domestic Water Losses to Domestic Water Withdrawals

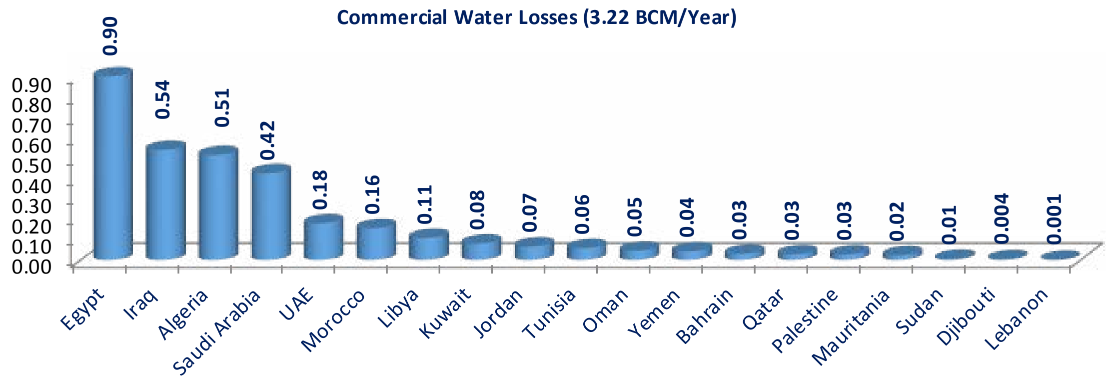


Figure 196. Commercial Water Losses

Figure 197 displays the overall water use efficiencies showing an average water use efficiency of 73% for the Arab Region. Six countries are demonstrating efficiencies higher than 80 %. These are Egypt, Iraq, Libya, Saudi Arabia, Tunisia, and UAE. Furthermore, only UAE is reporting a value higher than 90% which is the best in the region.

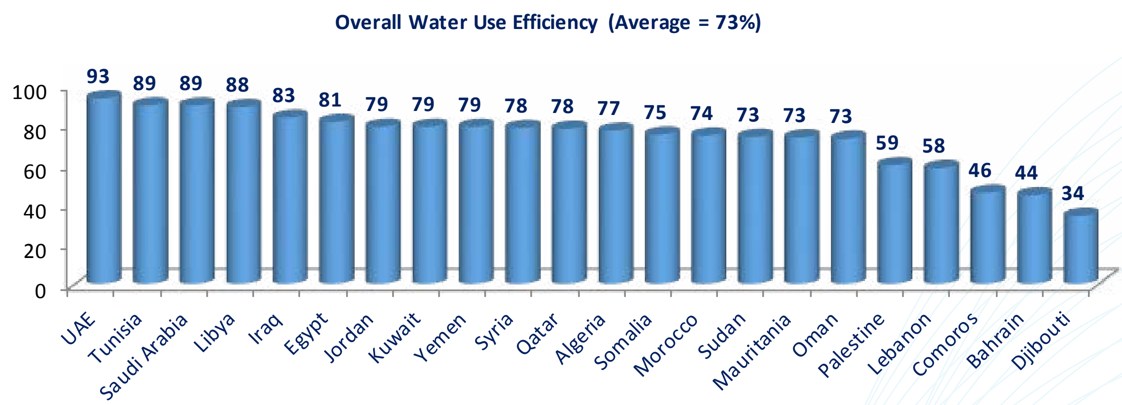


Figure 197. Overall Water Use Efficiency (%)

Figure 198 shows the wastewater and drainage outflows which are defined as the wastewater and agricultural drainage flowing out of the system to local and national sinks. This value amounts to a total of 36.6 BCM/y for the Arab countries.

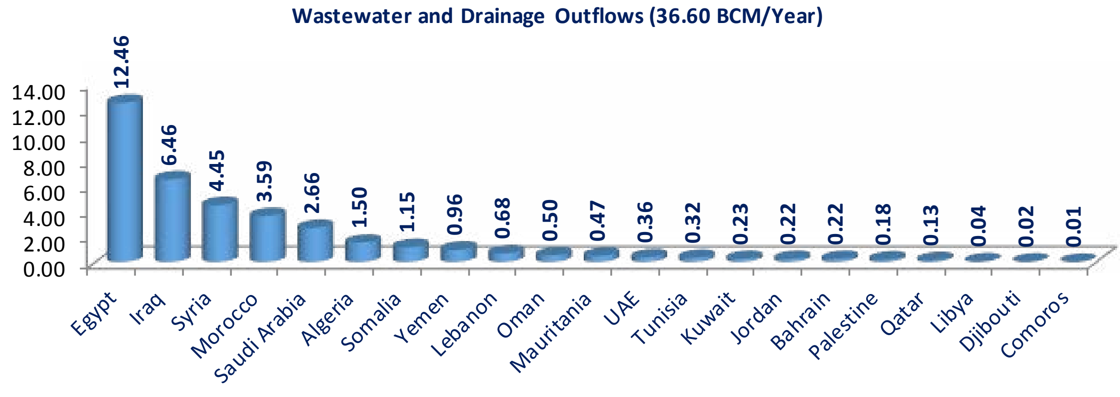


Figure 198. Wastewater and Agriculture Drainage Outflows

Figure 199 represents water sustainability / depletion Index, which is defined as the ratio of the total withdrawals from original sources including green water consumptions by rainfed agriculture to the total renewable water resources (including both blue and green water). 9 Arab countries have almost already exceeded the 100% value for this parameter, with an average value for 136% for the countries.

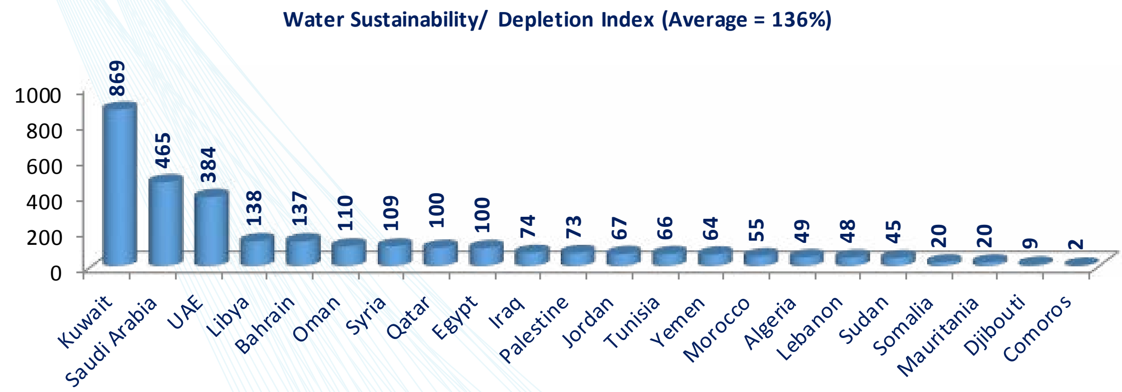


Figure 199. Water Sustainability / Depletion Index

Total number of annual water related citations is shown in Figure 200 as an indicator for law enforcement level. The figure records 25 thousand citations in Egypt and 24 thousand citations in Kuwait with a total of about 50,835 citations for the reporting countries in the region.

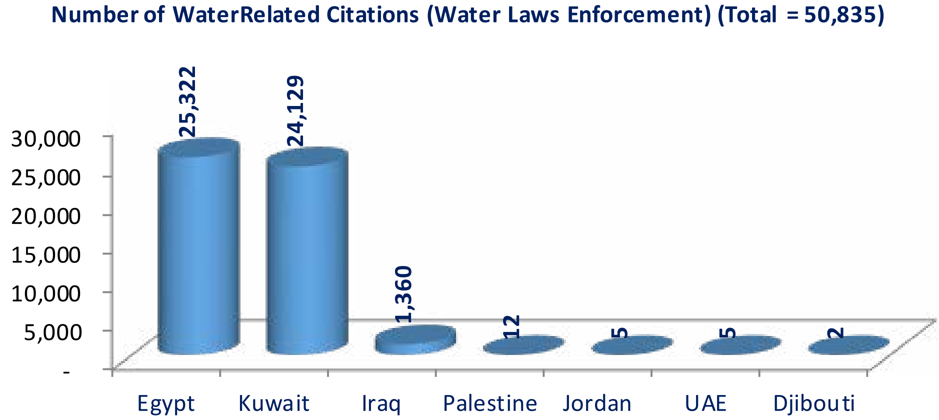


Figure 200. Number of Water-Related Citations

14.3- Stakeholder Participation

The total number of associations aiming to address the needs and complaints of agricultural and industrial water users as well as organize water withdrawals is being reported in Figure. More than 8,000 water associations are established and operating in Egypt 3,875 water user associations in Morocco, and more than 2,500 water user associations are established in Tunisia, while a single association is working in Bahrain. The agricultural lands under the jurisdiction of water user associations as percent of total agricultural lands is projected in Figure. In Jordan, 28 water user associations are covering about 80% of the total agricultural lands of the country. The region records a total of 14,845 water users associations. However, there is still irrigated agriculture lands that are not covered by water users associations. Table 27 in the Annex shows the details regarding the water user associations and the related indicators in the Arab region.

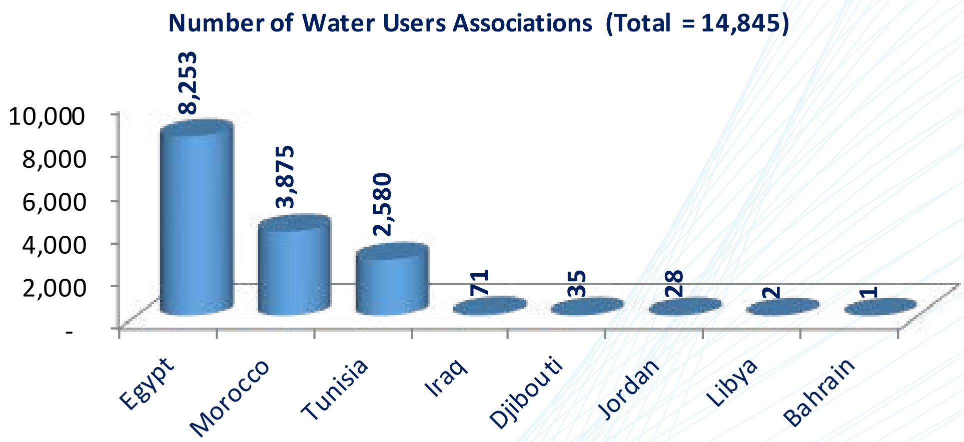


Figure 201. Number of Water User Associations

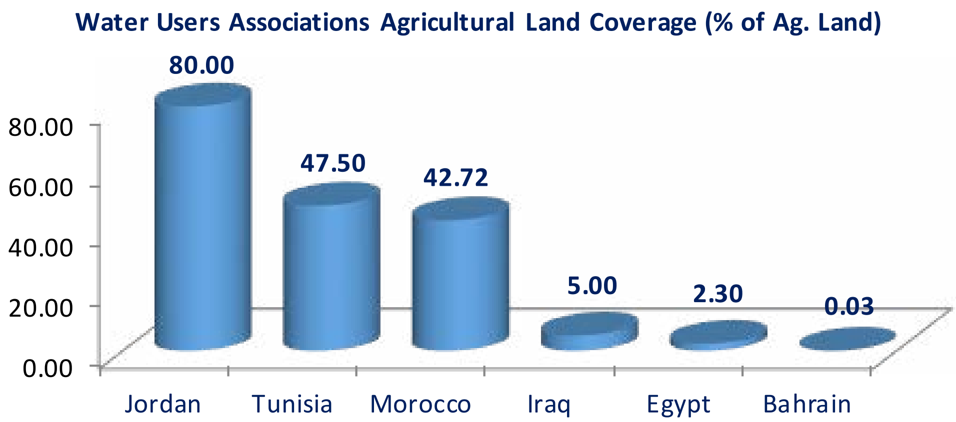


Figure 202. Agricultural Lands Under the Jurisdiction of Water User Associations as Percent of Total Agricultural Lands

15. Water & International Relations

Nearly 64% (163.2 BCM) of the renewable blue water resources of the Arab countries are generated outside the region. The Nile, the Euphrates, the Tigress, the Jordan, and the Senegal rivers are shared rivers providing external flows into the Arab Region. The riparian countries for each river vary from three to eleven countries. Major shared aquifers affecting the Arab Region include the Nubian sandstone aquifer (Chad, Egypt, Libya and Sudan), the North Western Sahara Aquifer System (Algeria, Libya and Tunisia,), the Disi aquifer (Jordan, Saudi Arabia), the Lake Chad basin (Algeria, Cameroon, Chad, Libya, Niger, Nigeria, CAR), the Neogene Aquifer System (Iraq, Kuwait, KSA), Dammam Aquifer System (KSA, UAE, Oman, Yemen), the Taurus-Zagros Aquifer (Iraq, Iran, Turkey). Severe problems exist regarding almost all shared rivers. Lack of effective coordination and monitoring is common to all shared aquifers. The indicators describing this section are projected in Figure 203 to Figure 208.

The transboundary water dependency ratio is the percent of annual volumes abstracted from transboundary water bodies to total annual available water resources, Figure 203.

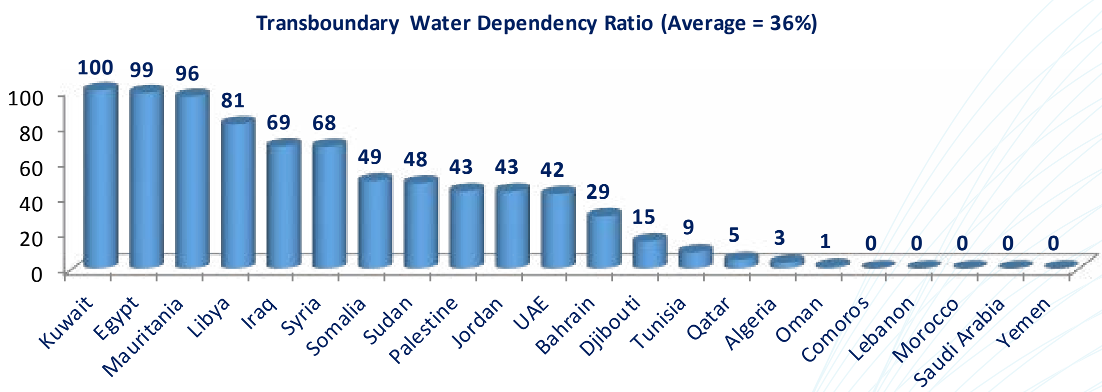


Figure 203. Agricultural Lands Under the Jurisdiction of Water User Associations as Percent of Total Agricultural Lands

Figure 204 shows the shared waters related agreements which represents the number of Bilateral or Multilateral agreements or other sort of cooperation a particular country is involved in. These agreements are solely intended for transboundary water resources with an average of 3 agreements per Arab country. Table 28, Table 29 & Table 30 show the transboundary water bodies with the riparian countries and related agreements for the Western Asia Arab countries.

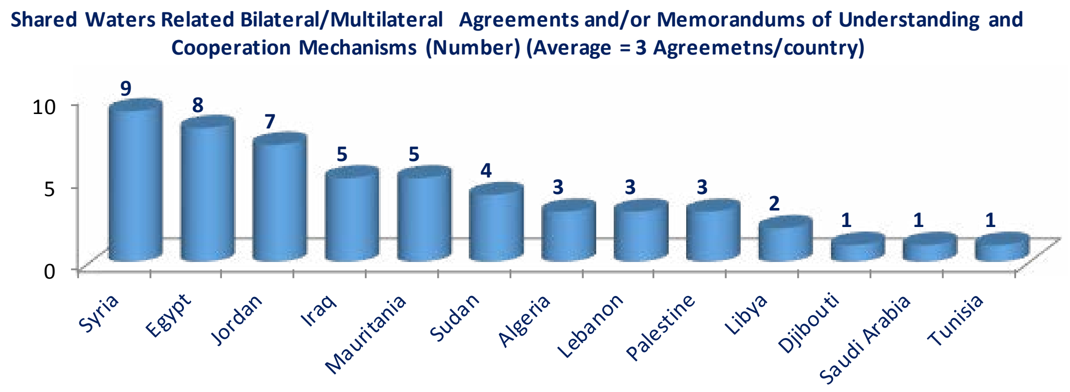


Figure 204. Number of Shared Waters Agreements in the Arab Region

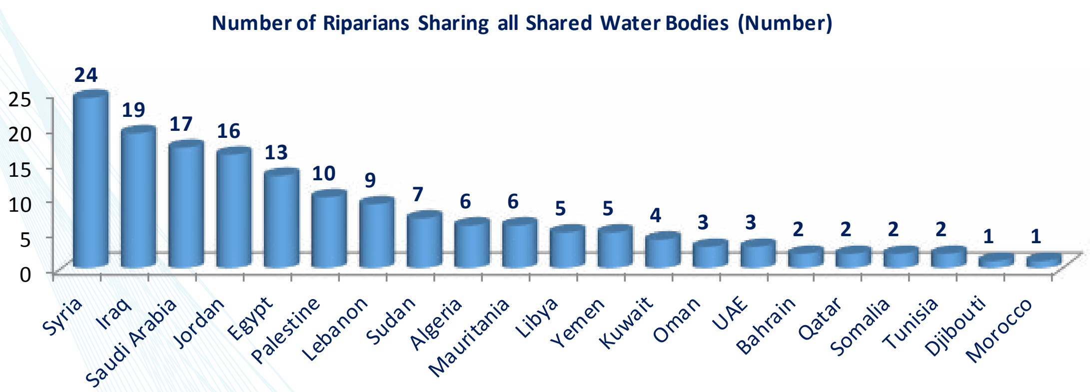


Figure 205. Number of Riparian Countries Sharing All Shared Water Bodies*

*includes double counting for various shared water bodies

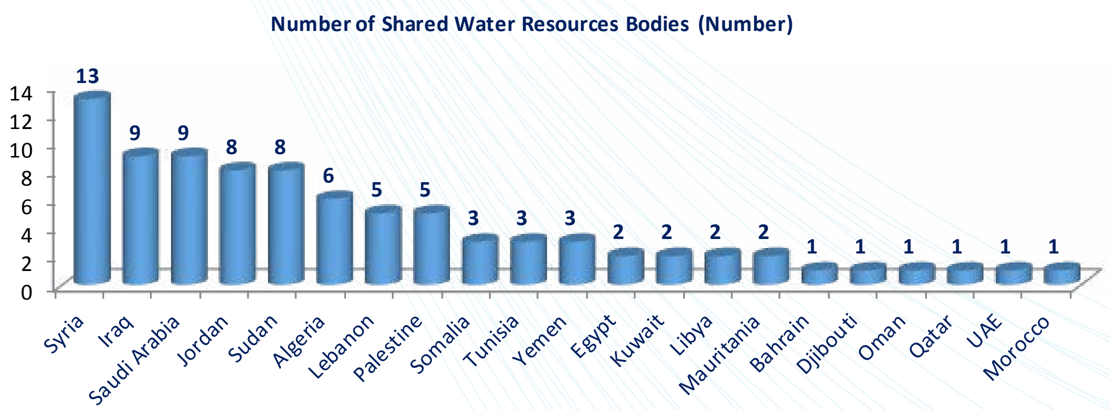


Figure 206. Number of Shared Water Resources Bodies

The shared waters cooperation indicator is an indicator representing the number of riparian countries, with water benefit sharing and/or water cooperation bilateral and/or multilateral agreements with the concerned country, as a percentage of the number of countries that are riparian to existing transboundary aquifers or river basins shared with that country. (Riparian countries may be recounted as many times as the number of different transboundary aquifer/river basins they may be sharing with the concerned country, but only counted once for one or more agreement with the same riparian country on the same basin).

Figure 207 shows the ratio of riparian countries with agreements to other riparian countries which is the ratio between the total of the shared water-related agreements to the number of shared water bodies with other riparian countries. Djibouti has only one shared water body and one agreement, thus the ratio is 100%. On the contrary, Saudi Arabia shares 17 water bodies with other riparian countries, all of them are groundwater aquifers, but has only 1 bilateral agreement, therefore it has the lowest ratio at 6%.

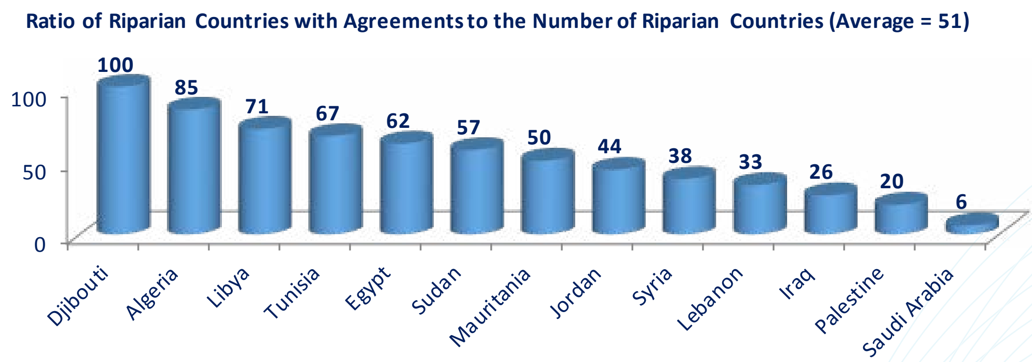


Figure 207. Rratio of Riparian Countries with Agreements to Riparian Countries

The estimated reduction in average transboundary flow due to upstream structure is the change in the external surface water inflow between the years 2012 and 2015 relative to the year 2012 is shown in the Figure 208 below. In Jordan, the flows of the Yarmouk River has been reduced by 70% due to the Syrian upstream structures.

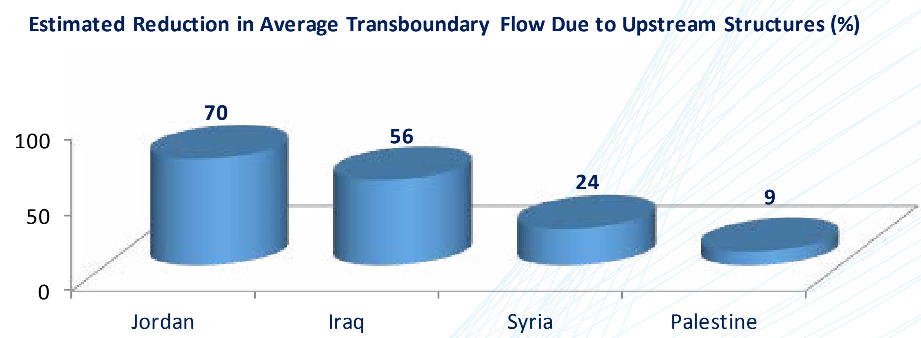


Figure 208. Estimated Reduction in Transboundary Flow due to Upstream Structures

16. Special Reporting on Sustainable Development Goal (SDG6)

Sustainable Development Goal 6 (SDG6) as part of the 2015-2030 Agenda for Sustainable Development is aiming at "ensuring clean water and sanitation for all". This may be attained through ensuring availability and sustainable management of water and sanitation for all. Eight targets have been agreed upon, along with their indicators, to govern the process towards achieving this goal. This State of the Water Report aims also at setting the 2015 Baseline for the assessment of SDG 6 indicators in the Arab Region. In this section, each of the latter targets will be presented with the assessment of their specific indicators for the Arab Countries. Part of the compilation for this special reporting may have been mentioned under the different categories of indicators especially in the country indicators datasheets, nevertheless, it is beneficial to re-aggregate all related indicators under the current section.

16.1- Target 6.1: 'By 2030, Achieve Universal and Equitable Access to Safe and Affordable Drinking Water for all'

The Proportion of Population Using Safely Managed Drinking Water Services (SDG 6.1.1) is an indicator that calculates the percentage of population using a basic drinking water source, which is located on premises and available when needed and free of fecal (and priority chemical) contamination. This source includes 'improved' sources of drinking water used for MDG monitoring (i.e. piped water into dwelling, yard or plot; public taps or standpipes; boreholes or tubewells; protected dug wells; protected springs and rainwater). Figure 209 shows that Bahrain, Qatar, United Arab Emirates, and Kuwait are already providing safely managed drinking water services to almost all of their populations. The three Maghreb countries along with Egypt and Saudi Arabia are achieving almost 98% coverage of safely managed services. Palestine, Sudan, Yemen, and Lebanon are providing services to nearly half of the population, while nearly 30% of the population in Somalia have the privilege of accessing safely managed drinking water services. The Arab region, on average, scores 82% for this indicator.

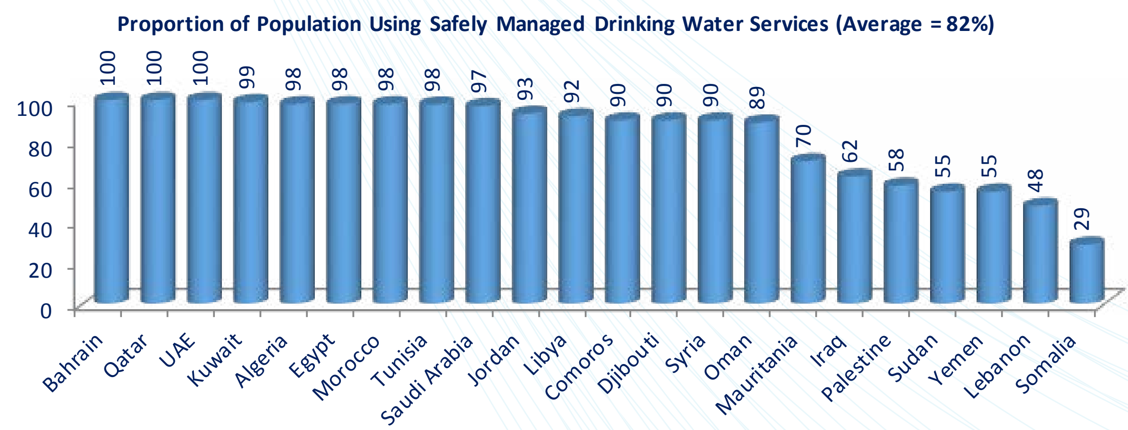


Figure 209. Proportion of Population Using Safely Managed Drinking Water Services in the Arab Region

16.2- Target 6.2: 'By 2030, Achieve Access to Adequate and Equitable Sanitation and Hygiene for all, and end Open Defecation, Paying Special Attention to the Needs of Women and Girls and those in Vulnerable Situations'

The Proportion of Population Using Safely Managed Sanitation Services (SDG 6.2.1a) is an indicator that calculates the percentage of population using a basic sanitation facility at the household level ('improved' sanitation facilities used for MDG monitoring i.e. flush or pour flush toilets to sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, pit latrines with a slab, and composting toilets) which is not shared with other households and where excreta is safely disposed in situ or treated off-site. Figure 210 indicates that all the Gulf countries, apart from Saudi Arabia, in addition to Libya are providing safely managed sanitation services to nearly all of their population. On the other hand, Sudan, Lebanon, and Somalia are providing these services to less than one quarter of their population. On average, the Arab Region scores 71.5% for this indicator. Further, it is interesting to see records for safely managed sanitation services coverage which is higher than the coverage for drinking water services, as in the case of Oman.

Figure 210. Proportion of Population Using Safely Managed Sanitation Services in the Arab Region

The Proportional of Population Using Hand washing Facility with Soap and Water (SDG 6.2.1b) is an indicator for general hygienic conditions and is displayed in Figure 211 for reporting countries. Except for Sudan and Somalia, the rest of the reporting countries indicate that this a prevailing practice all through the country. The average is shown to be 86.5%.

Figure 211. Proportion of Population Using Handwashing Facilities with Soap and Water

16.3- Target 6.3: 'By 2030, Improve Water Quality by Reducing Pollution, Eliminating Dumping and Minimizing Release of Hazardous Chemicals and Materials, Halving the Proportion of Untreated Wastewater and Substantially Increasing Recycling and Safe Reuse Globally'

The indicator named: Proportion of Wastewater Safely Treated (SDG 6.3.1), refers to the proportion of wastewater generated both by households (sewage and fecal sludge), and hazardous industries (for this reporting) which is safely treated as compared to total wastewater generated by both activities. Figure 212 shows that five countries (with low population) actually safely treating more than 90% of the generated wastewater. On the other hand, five countries safely treat 20% or less of their generated wastewater. The regional average scores 48%.

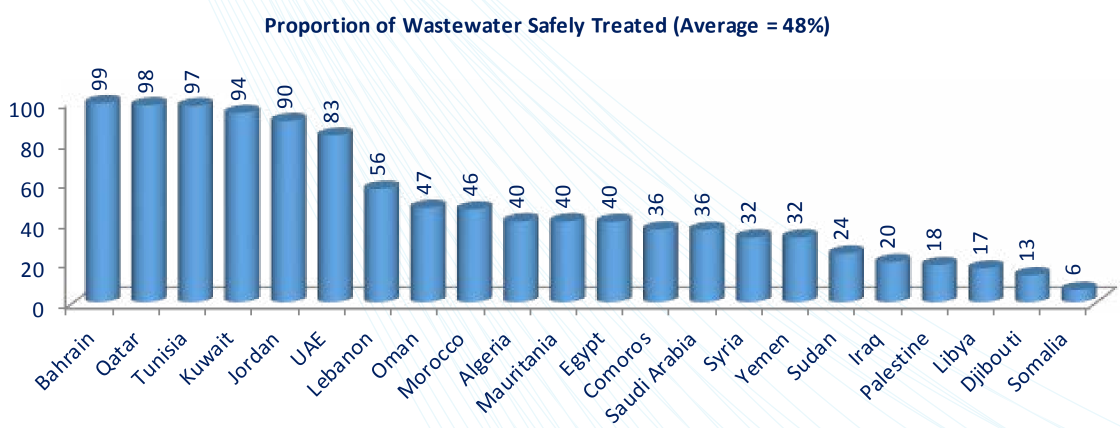


Figure 212. Proportion of Wastewater Safely Treated in the Arab Region

The Proportion of Bodies of Water with Good Ambient Water Quality (SDG 6.3.2) is an indicator for the overall status of aquatic ecosystems and ambient water quality. It measures the proportion of water bodies (area) in a country with good ambient water quality, which does not damage ecosystem function and human health, as compared to all water bodies in the country. Figure 213 shows an average regional score of 62% based on the reporting countries. Sudan reports the highest score where 95% of the water bodies of the country have good ambient water quality. Lebanon shows that only half of water bodies in the country do have good water quality while Tunisia showed none of the water bodies of good quality (UN Water, 2018).

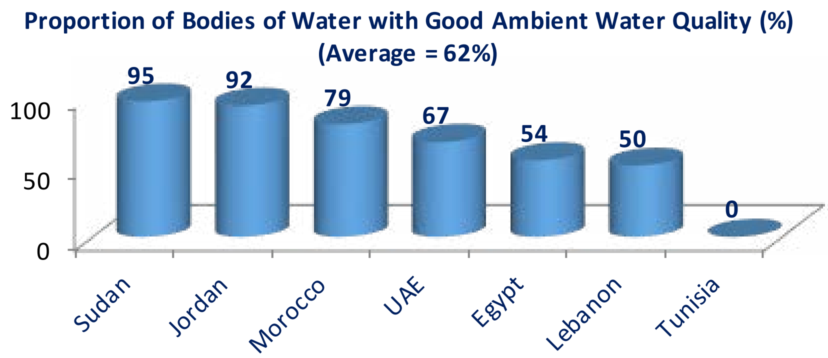


Figure 213. Proportion of Bodies of Water with Good Ambient Water Quality

16.4- Target 6.4: 'By 2030, Substantially Increase Water-Use Efficiency across all Sectors and Ensure Sustainable Withdrawals and Supply of Freshwater to Address Water Scarcity, and Substantially Reduce the Number of People Suffering from Water Scarcity'

The change in water use efficiency over time (SDG6.4.1) is displayed in Figure 214 for the period from 2012 to 2015. Seven countries reported incremental increase in efficiency while 14 countries reported declines, and one country with no change. Kuwait shows a maximum annual shift of nearly 60% in water use efficiency while Somalia infers a near 40% decline. In 2015, Industrial water productivity for Qatar, Kuwait, and UAE is around 8,900 $/CM, 2,800 $/CM, and 1,400 $/CM respectively (Figure 215), the average industrial water productivity for the Arab region has increased from 753 $/CM in 2012 to 1137 $/CM in 2015 which represents about a 50% increase for the 3 years period. Such high values are usually associated with the Oil & Gas sector. In Egypt and Sudan the industrial water productivity is in the range of 20$/CM. Moreover, the values reported for 2015 are in most countries lower than those reported for 2012 which may be due to drop in oil prices. The crop per drop indicator, or the agricultural productivity indicator is portrayed in Figure 216. The average agricultural water productivity for the Arab region has increased from 1.16 $/CM in 2012 to 1.98 $/CM in

2015 which represents an increase of 70% over the 3 years period. Values as high as 6.0 $/CM and 4.5 $/CM are reported for Comoros and Kuwait in 2015. The main agricultural producing countries like Egypt, Syria, Sudan and Morocco are reporting values in the order of 0.5 $/CM. The input data, especially related to the amount of water directed to agriculture, for calculating the indicator may need revision in order to reflect actual achievement of the intended target. It is to be noted that while the methodology for calculating the agriculture productivity calls for delineating the irrigated agriculture component only, the method used aggregated the agriculture productivity as a whole including the estimated green water contributing to rainfed agriculture, since it was difficult to delineate the GDP of irrigated agriculture separately from the rainfed agriculture GDP. Furthermore, the statistics pertaining to the physical domestic water losses are given in Figure 217. The figure shows a 20% reduction of losses for 2015 reporting as compared to 2012 reporting for Egypt and Morocco. A corresponding 60% reduction is recorded for Kuwait. The total physical domestic water losses for the Arab region have decreased from 6.67 BCM in 2012 to 5.88 BCM in 2015.

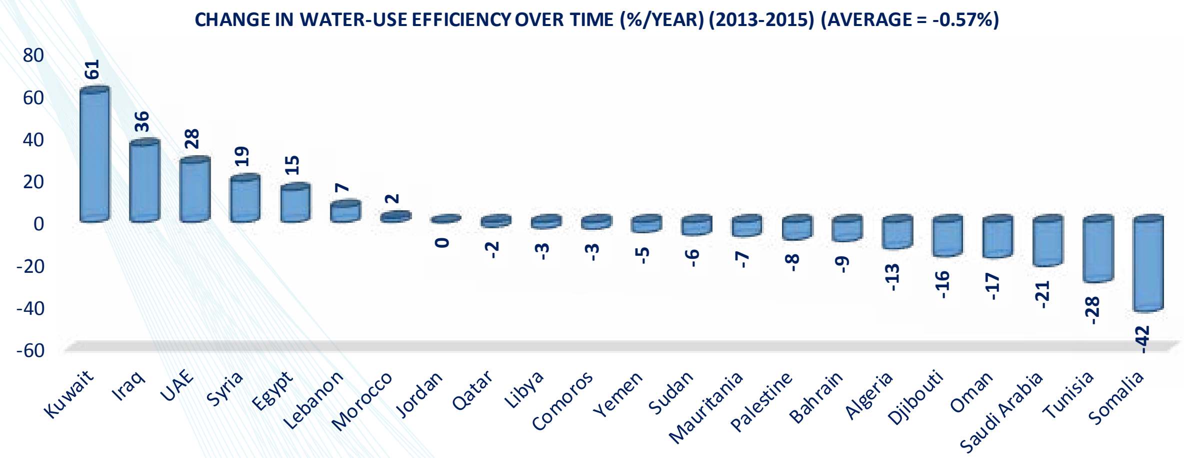


Figure 214. Change in Water-Use Efficiency over Time in the Arab Region

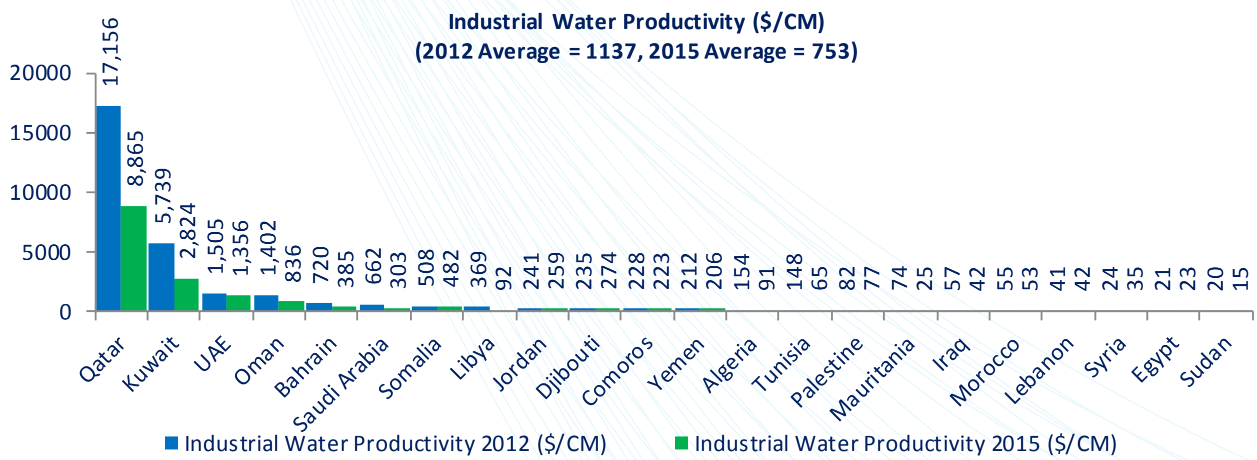


Figure 215. Industrial Water Productivity in the Arab Region

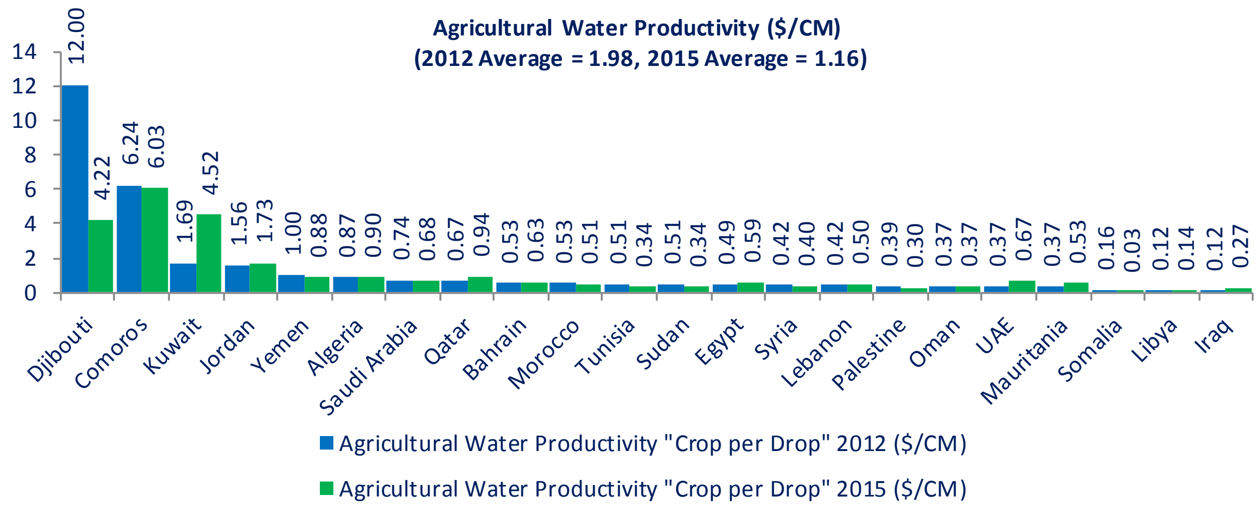


Figure 216. Agricultural Water Productivity in the Arab Region

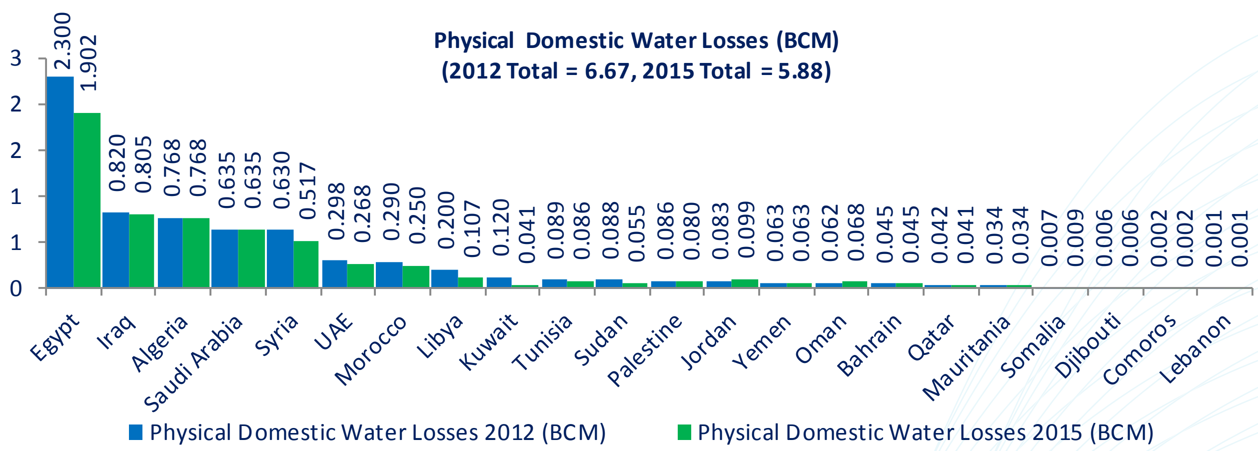


Figure 217. Physical Domestic Water Losses in the Arab Region

CEDARE Alternative Indicator

The Overall Water Use Efficiency is an alternative indicator proposed by CEDARE and refers to the ratio of the difference between the total withdrawals from original sources (surface water, renewable and non-renewable groundwater, and Desalinated Water) and the wastewater and drainage flows to the withdrawals from original sources expressed as a percentage. The reported values for this indicator are shown in Figure 218. UAE, Tunisia, and Saudi Arabia are the top three countries scoring around 90%. The regional overall water use efficiency was about 73%.

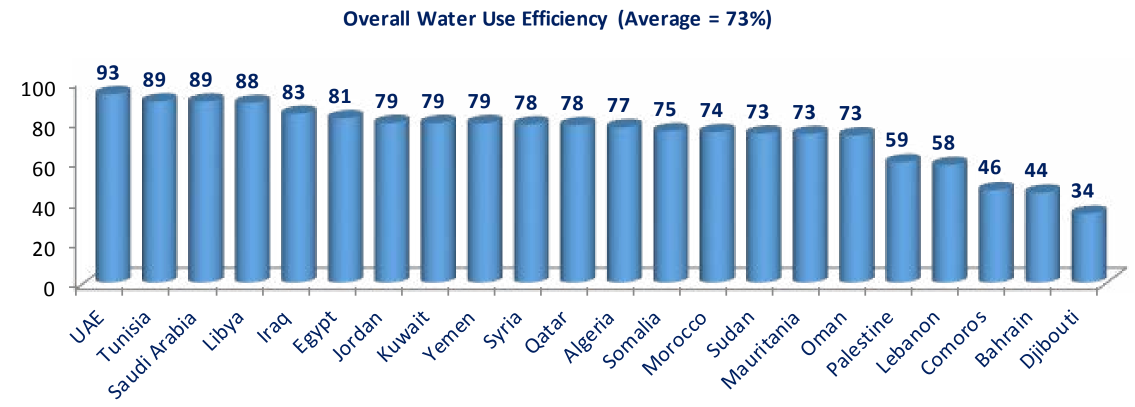


Figure 218. Overall Water Use Efficiency in the Arab Region

The Level of Water Stress is an indicator (SDG6.4.2) for Freshwater Withdrawal as a Proportion of Available Freshwater Resources. It is calculated as the ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after having taken into account environmental water requirements.

Figure 219 indicates that eleven countries representing half of the Arab countries are already exceeding the 100% level. UAE has a level of stress equivalent to nearly 2000, which means that withdrawals are twenty times the available renewable resources. Extreme aridity and impeding water scarcity are obvious from the fact that only 5 out of 22 countries are experiencing a level of water stress below 50%.

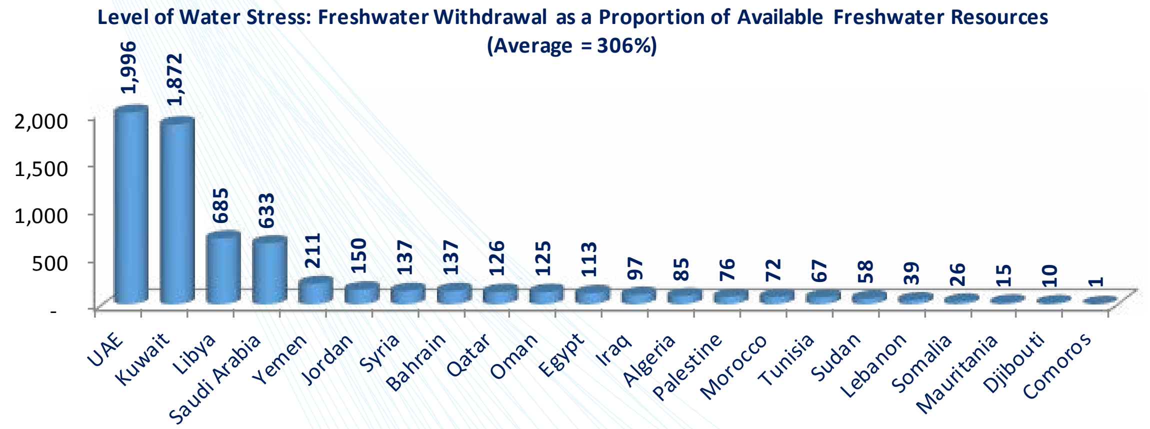


Figure 219. Level of Water Stress in the Arab Region

CEDARE Alternative Indicator

Another alternative indictor proposed by CEDARE is the Water Sustainability / Depletion Index. It is calculated as the ratio of the total withdrawals from original sources (including green water consumptions by rainfed agriculture) to the total renewable water resources (including both blue and green water). The indicator is calculated based on the equation:

Sustainability/Depletion= (Total Withdrawals from Blue Water+Green Water Consumption for Agr. Use)/(TRBWR+TRGWR) * 100

Where,

TRBWR = Total renewable blue water resources

TRGWR = Total renewable green water resources

Figure 220 displays the results for the water sustainability/depletion index for Arab countries. The four top countries which suffer more from water scarcity (or experiencing the highest water stress levels) are the same according to both indicators (although with different orders of ranking). Also, the four countries experiencing the least water stress are the same for both indicators. However, the regional average for the level of the Water Stress indicator is equal to 306% while the average for the Water Sustainability/Depletion index is equal to 136%.

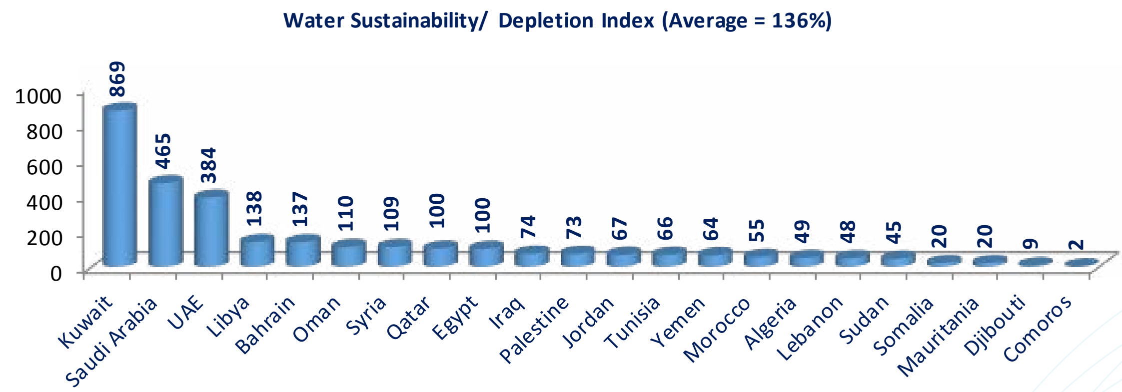


Figure 220. Sustainability/Depletion Index for the Arab Region

16.5- Target 6.5: 'By 2030, Implement Integrated Water Resources Management at all Levels, including through Transboundary Cooperation as Appropriate'

IWRM at National Level

The Degree of Integrated Water Resources Management (IWRM) Implementation (SDG 6.5.1) indicator is determined from the results of a questionnaire on integrated water resources management comprising four sections:

1. Enabling Environment: Creating the conditions that help to support the implementation of IWRM, which includes the most typical policy, legal and strategic planning tools for IWRM.
2. Institutions and participation: The range and roles of political, social, economic and administrative institutions and other stakeholder groups that help to support the implementation of IWRM.
3. Management Instruments: The tools and activities that enable decision-makers and users to make rational and informed choices between alternative actions.
4. Financing: Budgeting and financing made available and used for water resources development and management from various sources.

The indicator is plotted in Figure 221 for nine reporting countries. Kuwait asserts a 100% implementation for IWRM. Four countries claim a degree of implementation higher than 50% while the rest are at or below 40%. The reporting from different countries show an average of 53% but this may need further enhancement and unification to allow for meaningful comparison.

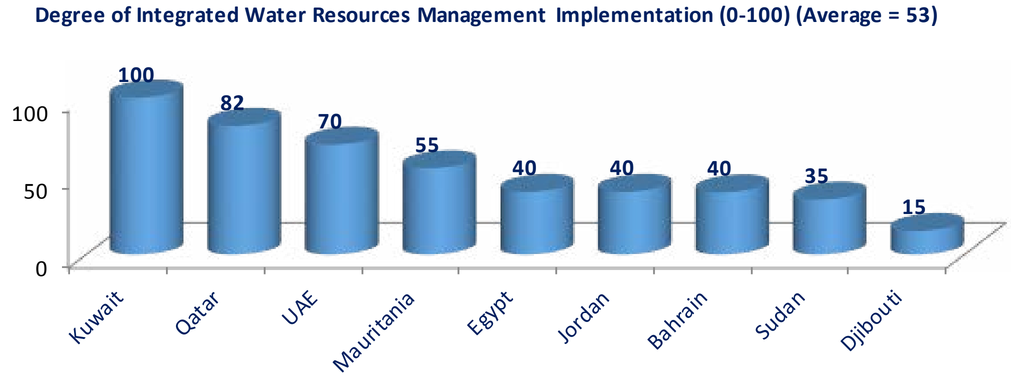


Figure 221. Degree of Integrated Water Resources Management Implementation in the Arab Region

IWRM at Transboundary Basin Level

The Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation (SDG 6.5.2) is referring to the Proportion of surface area of transboundary basins that have an operational arrangement for transboundary water cooperation. This is projected in Figure 222 showing that almost the full area of Libya is in transboundary basins (groundwater aquifers) with operational arrangements for cooperation. Only 3 countries have reported an average of 11%.

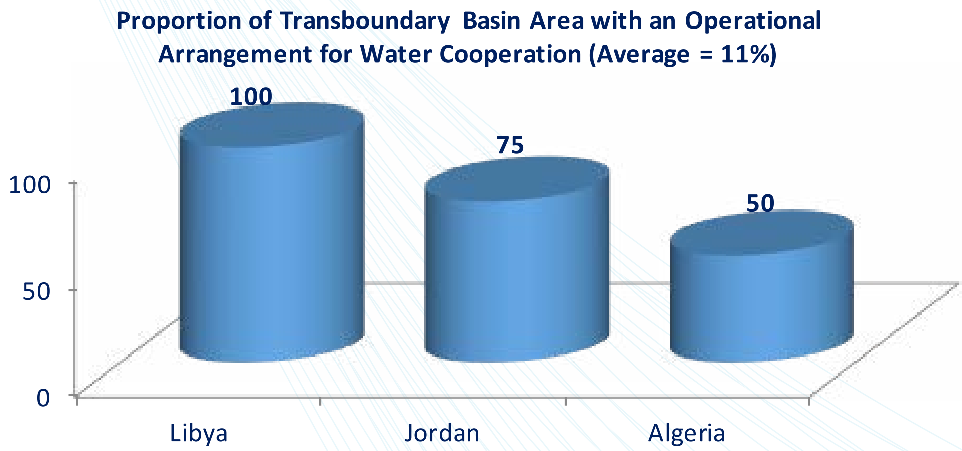


Figure 222. Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation in the Arab Region

CEDARE Alternative Indicator

The Ratio of Riparian Countries with Agreements to Riparian Countries is an indicator proposed by CEDARE on water and international relations. It is defined as the number of riparian countries, with water Benefit Sharing and/or Water Cooperation bilateral and/or multilateral agreements with the concerned country, as a percentage of the number of countries that are riparian to existing transboundary aquifers or river basins shared with the concerned country, this is projected in Figure 223 and it shows an average of 51% for the Arab countries.

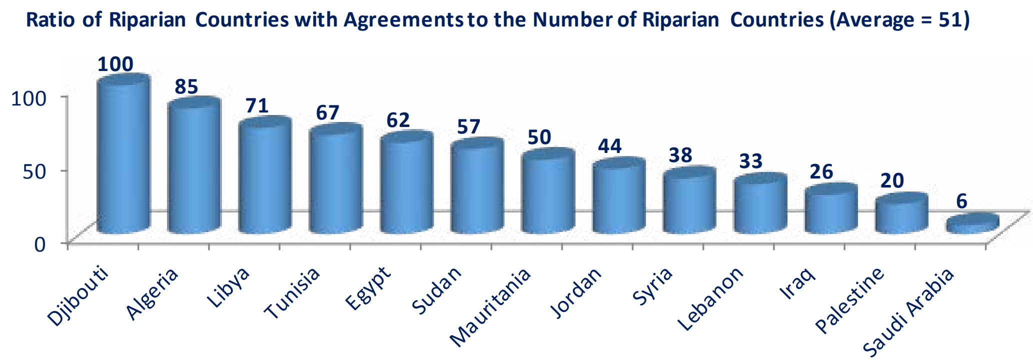


Figure 223. Transboundary Cooperation Indicator (Ratio of Riparian Countries with Agreements to Riparian Countries)

16.6- Target 6.6: ‘By 2020, Protect and Restore Water-Related Ecosystems, including Mountains, Forests, Wetlands, Rivers, Aquifers and Lakes’

6.6 HEALTHIER ECOSYSTEMS

The Change in the Extent of Water-Related Ecosystems over Time (SDG 6.6.1) indicator defines the percentage of change in water-related ecosystems over time (% change/year). The change was considered here to be between 2012 and 2015. Figure 224 displays this indicator which shows negative (degrading) values for Oman (-0.6%/y), Kuwait and Egypt while showing positive values for Sudan (+0.2%/y) and Iraq (+0.06 %/y). This information was extracted using Remote Sensing image analysis of the extent of change in areas of wetland ecosystems between years 2012 and 2015. Figure 225 shows the total wetland areas per country for the baseline year of 2015 where the indicator could be assessed in the future. A decrease of the total wetland areas from 934,545 ha in 2012 to 929,803 ha in 2015, this reflects a loss in wetlands in the Arab region equivalent to 4,742 ha.

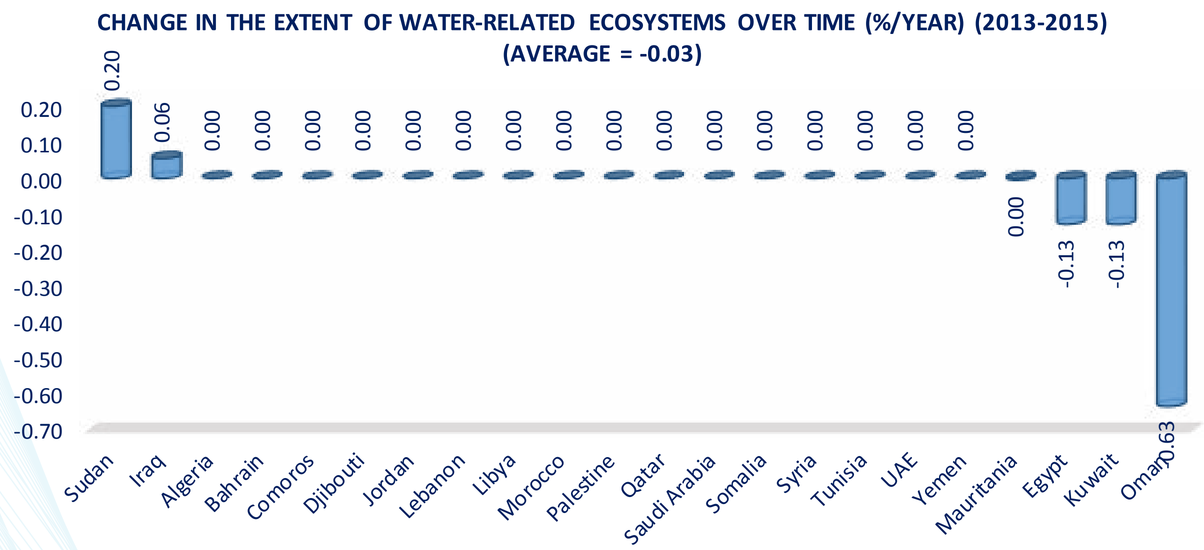


Figure 224. Change in the Extent of Water-Related Ecosystems over Time in the Arab Region

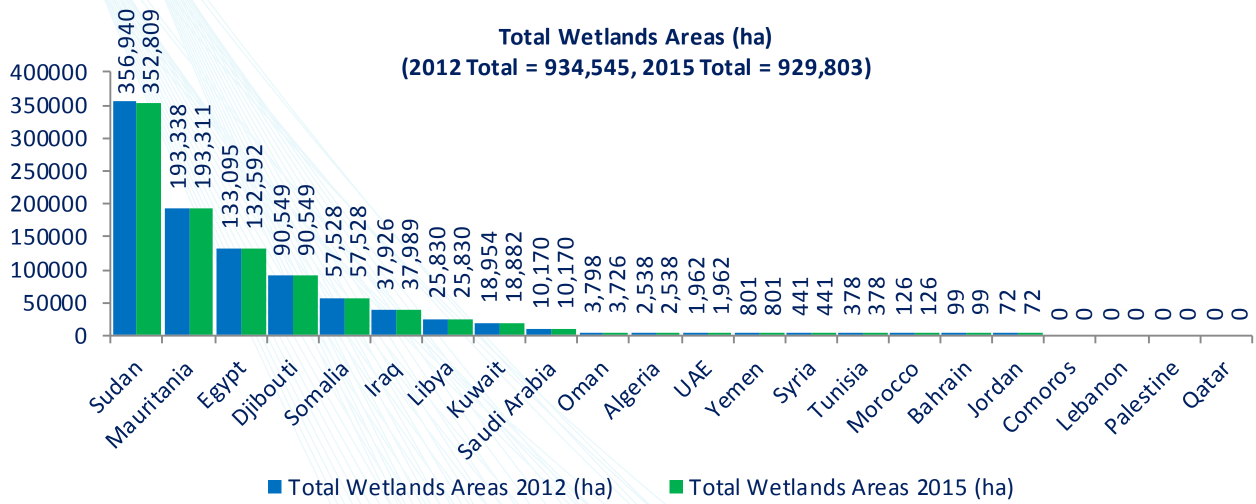


Figure 225. Total Wetland Areas in the Arab Region

16.7 Target 6.A: 'By 2030, Expand International Cooperation and Capacity-Building Support to Developing Countries in Water and Sanitation related Activities and Programs, including Water Harvesting, Desalination, Water Efficiency, Wastewater Treatment, Recycling and Reuse Technologies

The Foreign Aid Received for Water & Sanitation (SDG 6.a.1) is shown in Figure 226 while the Aid Paid for the Water & Sanitation Sector in Foreign Countries (SDG 6.a.2) is given in Figure 227. The figures show a foreign aid equivalent to 512 million USD being received by Sudan, 299 million USD received by Iraq and 170 million USD received by Egypt. On the other hand, the total foreign aid received by the Arab countries amounts to 1,567 million USD. The total aid paid by the Arab countries in foreign countries is 8.4 billion USD, a value of 7.7 billion USD is disbursed by UAE, representing almost 92% of the total aid paid, for the purpose of enforcing and enhancing the water & sanitation sector in other countries. It must be noted that data was not fully available for all countries.

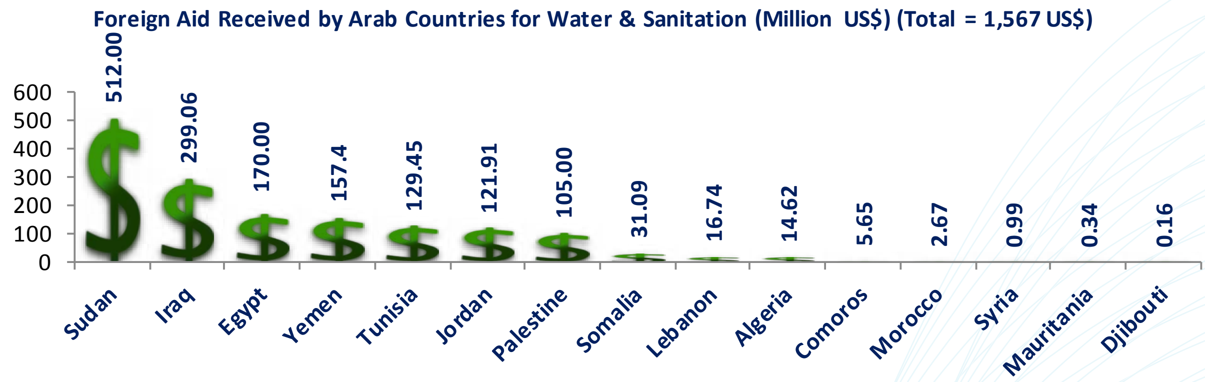


Figure 226. Foreign aid Received by Arab Countries for Water and Sanitation

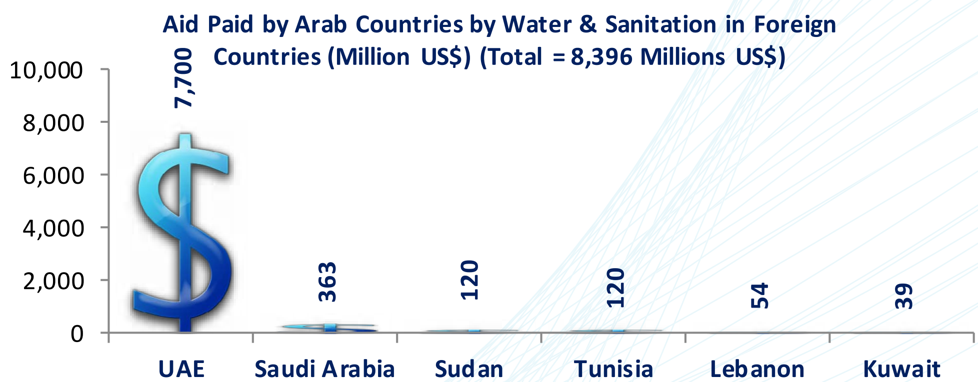


Figure 227. Aid Paid by Arab Countries for Water and Sanitation in Foreign Countries

16.8- Target 6.B: Support and Strengthen the Participation of Local Communities in Improving Water and Sanitation Management

The Proportion of Local administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management (SDG 6.b.1) indicator is depicted in Figure 228. Morocco and Qatar are reporting full involvement while Tunisia reports 50% enrolment. The average for the reporting countries is 65.7%.

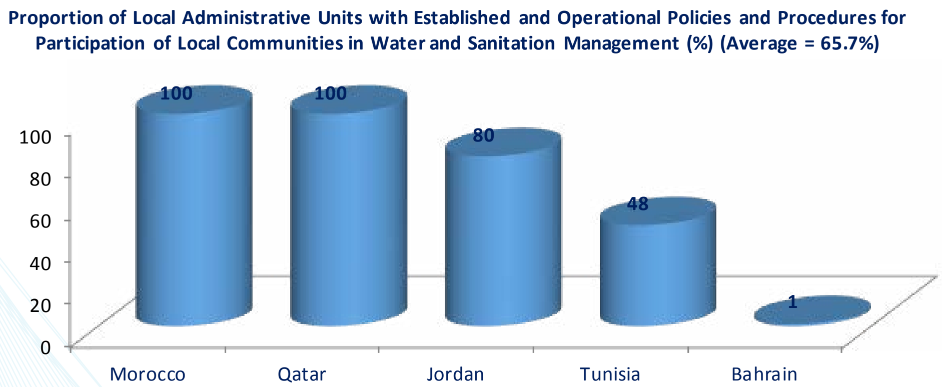


Figure 228. Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management in the Arab Region

State of the Water Definitions & Assessment Methods

1. Water & Availability

I-1-1- Annual Spatially Averaged Precipitation Depth: Average precipitation over space in depth

I-1-2- Annual Precipitation Volume: Average Precipitation over space in volume, it is the product of the Annual Average Precipitation Depth and the Effective Rainfall area.

P-1-1- Annual Hail Fall Volume

P-1-2- Annual Snow Fall Volume

I. Blue Water

The term "Blue Water" referrers to all Surface and groundwater resulting from natural hydrological processes, and are voluntarily abstracted by different water use sectors, the term also applies to stored masses of water directly consumed by ecological systems.

P-1-3- Internal Renewable Blue Surface Water (IRSW): The amount of precipitation that is neither beneficially abstracted by the green cover, nor infiltrated in the ground, but flows overland and routed through channels or joins bigger water bodies.

P-1-4- Internal Renewable Blue Groundwater (IRG): Groundwater Recharge is the total volume of water entering underground sources of water (typically aquifers) in a country's borders from endogenous (internal) precipitation and surface water flow. (FAO)

I-1-3- Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG): Annual flow of rivers and recharge of aquifers generated from endogenous precipitation. Double counting of surface water and groundwater resources is avoided by deducting the overlap from the sum of the surface water and groundwater resources. (FAO)

P-1-5- External Surface Water Inflow (ESWI): That part of the country's annual renewable surface water resources that are not generated in the country. It includes surface inflows from upstream countries, and part of the water of border lakes and/or rivers without human influence.

P-1-6- External Surface Water Outflow (ESWO): Annual quantity of fresh Surface water leaving the country's boundaries to another country.

P-1-7- External Groundwater Inflow (EGI): Quantity of groundwater annually entering the country naturally.

P-1-8- External Groundwater Outflow (EGO): Annual quantity of groundwater leaving the country. (FAO)

I-1-4- Total External Renewable Blue Water Resources (TERBWR)=(ESWI+EGI): The portion of the country's renewable water resources which is not generated in the country. (FAO)

I-1-5- Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO): Is the resultant of the internal produced surface water and the transboundary inflows and outflows of surface water.

I-1-6- Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO): Is the resultant of the internal produced groundwater and the transboundary inflows and outflows of groundwater.

P-1-9- Average Depth from Ground Surface to Groundwater Surface Level:

P-1-10- Overlap between Surface Water and Groundwater (OSWG): Part of the renewable freshwater resources that is common to both surface water and groundwater. It is equal to the difference between groundwater drainage into rivers (typically, base flow of rivers) and seepage from rivers into aquifers. (FAO)

I-1-7- Total Renewable Blue Water Resources (TRBWR)=(TRBSW) + (TRBG)-(OSW): Is the sum of total renewable blue surface and groundwater excluding the overlap between them.

I-1-8- Total Exploitable Non-Renewable Groundwater (TNRG): The annual extractable amount of non-renewable groundwater according to a pre specified safe yield that is dictated by a pre-specified sustainability period (x number of years) and a maximum allowable drawdown at the end of the sustainability period.

I-1-9- Total Blue Water Resources (TBWR): The sum of total Renewable and Non-Renewable Blue Water Resources

II. Green Water

The term "Green Water" refers to the portion of beneficial abstractions of renewable water resources from green cover which comes from atmospheric water directly and is consumed by rain-fed agriculture, natural pasture, and forests (AbuZeid, 2008). Sustainable, water-dependent, socio-economic development will simply not be possible without taking an integrated perspective on all water-dependent and water impacting activities in a river basin and their relative upstream\downstream relations (Falkenmark, 1999).

Total Green water consumptions are divided into: Rainfed agriculture lands areas consumptions, pasture lands consumptions, and forest lands consumptions. For the purpose of this report the following methodology will be used in estimating the total consumption for each of the three different kinds of areas that collectively represent the total Green Water Consumption:

- R is a Reference value calculated as the ratio between irrigation withdrawals and the irrigated agriculture area in the same country
- Alpha is a coefficient (from 0-1) function of the prevailing aridity and the plant cover (e.g. 0.2 for hyper arid regions, 0.5 for arid regions, 0.7 temperate regions, and 1.0 for tropical areas)
- The Rainy Period Coefficient for Rain-fed Agriculture is function of the rainy months (e.g. 3 months is "0.25" of a year, a value of "1.0" for 12 rainy months)
- Average Vegetat**ion consumptions for the Arab region = Area of Vegetation * R * Alpha * Rainy Period Coefficient**

P-1-11- Water for Rain-fed Agricultural Consumptions: The total amount of precipitation directly consumed by rain fed agriculture.

P-1-12- Water for Rain-fed Pasture Consumptions: The total amount of precipitation directly consumed by pasture areas.

P-1-13- Water for Rain-fed Forest Consumptions: The total amount of precipitation directly consumed by forests.

I-1-10- Total Renewable Green Water Resources (TRGWR): (Water for Rain-fed Agricultural Consumption) + (Water for Rain-fed Pasture Consumption) + (Water for Rain-fed Forest Consumption)

I-1-11- Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR): The Total Renewable Water Resources is hence calculated as the sum of the total Blue Water described in the previous sub-section and the total Green Water.

I-1-12- Total Conventional Water Resources (TCWR) = TRWR+TNRG = TBWR+TRGWR

III. Non-Conventional Water

P-1-14- Produced Municipal Wastewater (PMW): Annual quantity of wastewater generated in the country, in other words, the quantity of water that has been polluted by adding waste. The origin is domestic use (used water from bathing, sanitary, cooking, etc.) wastewater routed to the wastewater treatment plant. It does not include agricultural drainage water, which is the water withdrawn for agriculture but not consumed and returned to the system"

P-1-15- Collected Municipal Wastewater: Annual Quantity of Wastewater that reach the collection system.

P-1-16- Treated Municipal Wastewater

1-17- Produced Industrial Wastewater (PIW): Annual quantity of wastewater generated in the country, in other words, the quantity of water that has been polluted by adding waste. The origin is industrial wastewater routed to the wastewater treatment plant. It does not include agricultural drainage water, which is the water withdrawn for agriculture but not consumed and returned to the system"

P-1-18- Collected Industrial Wastewater

P-1-19- Treated Industrial Wastewater

I-1-13- Produced Municipal and Industrial Wastewater

P-1-20- Collected Municipal and Industrial Wastewater

I-1-14- Treated Municipal and Industrial Wastewater: Quantity of generated municipal and industrial wastewater that is treated in a given year and discharged from treatment plants (effluent).

I-1-15- Proportion of Wastewater Safely Treated (SDG 6.3.1): Proportion of wastewater generated both by households (sewage and faecal sludge), as well as economic activities (based on ISIC categories) safely treated compared to total wastewater generated both through households and economic activities. While the definition conceptually includes wastewater generated from all economic activities, monitoring will focus on wastewater generated from hazardous industries (as defined by relevant ISIC categories).

Method of computation: The wastewater safely treated is calculated by combining the percentage of household (sewage and faecal sludge) wastewater and the percentage of wastewater from hazardous industries treated. (=Treated Municipal and Industrial Wastewater / Produced Municipal and Industrial Wastewater *100)

P-1-21- Untreated Municipal and Industrial Wastewater: Quantity of Wastewater that is untreated by any centralized mean

I-1-16 - Produced Agricultural Drainage (PAD): Total volume of the water withdrawn for agriculture for the first time (First hand) but not consumed and flows out of the system.

I-1-17- Produced Desalinated Water (PDW): Water produced annually by desalination of brackish or salt water.

I-1-18- Total Exploitable Brackish Groundwater:

I-1-19- Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)

I-1-20- Total Potentially Available Water Resources (TAWR)= TCWR+TNCWR

2. Water & Uses

P-2-1- Withdrawals for Domestic Water Use: Total annual volume of water withdrawals used for domestic purposes.

P-2-2- Withdrawals for Industrial Water Use: Total annual volume of water withdrawals used for industrial purposes.

P-2-3- Withdrawals for Irrigated Agricultural Water Use: Total annual volume of water withdrawals used for irrigated agriculture purposes.

I-2-1- Annual Total Water Withdrawal: The gross amount of water extracted from all sources, either permanently or temporarily, for all uses. It can be either diverted towards distribution networks or directly used. It includes consumptive use, conveyance losses, and return flow

I-2-2- Green Water Consumption for Agriculture Water Use: The total volume of green water annually consumed by rain-fed agriculture equal Rainfed Agricultural Evapo-Transpiration.

I-2-3- Total Agricultural Water Use: The total annual volume consumed by both rain-fed and irrigated agriculture.

P-2-4- Withdrawals from Blue Surface Water: Annual gross amount of water extracted from rivers, lakes and reservoirs. It includes withdrawal of primary renewable surface water resources and secondary freshwater sources (water previously withdrawn and returned).

P-2-5- Withdrawals from Blue Renewable Groundwater: Total annual volumes abstracted from renewable resources.

P-2-6- Withdrawals from Blue Exploitable Non-renewable Groundwater: Total annual volumes abstracted from non-renewable resources, namely, fossil groundwater.

I-2-4- Total Withdrawals from Blue Water: (Withdrawals from Blue Surface Water) + (Withdrawals from Blue Renewable Groundwater) + (Withdrawals from Blue Non-Renewable Groundwater)

I-2-5- Agricultural Drainage Water Reuse: The total volume of agricultural drainage that is returned back to the system through reuse.

P-2-7- Reused Treated Municipal Wastewater: Quantity of treated municipal wastewater that is reused in a given year.

P-2-8- Reused Treated Industrial Wastewater: Quantity of treated industrial wastewater that is reused in a given year.

I-2-6- Reused Treated Municipal and Industrial Wastewater: Quantity of treated wastewater that is reused in a given year.

I-2-7- Withdrawals from Desalinated Water: The Total Volume of Water actually desalinated in a given year.

I-2-8- Total Withdrawals from Non-Conventional Water Resources = (Agricultural Drainage Water Reuse) + (Reused Treated Municipal and Industrial Wastewater) + (Withdrawals from Desalinated Water))

P-2-9- Rainfed Evapo-Transpiration (ET): It is the Evapo-Transpiration (ET) from Rainfed Agriculture, Rainfed Pasture & Rainfed Forests (Total Renewable Green Water Resources).

Evapotranspiration and evaporation values were estimated using the data provided the USGS through the Early Warning and Environmental Monitoring Program portal. The data is composed of the combination of transpiration from green covers and evaporation from soil in non-green areas Actual evapotranspiration is produced using the operational Simplified Surface Energy Balance model (SSEBop). The approach used to produce the data set is combining ET fractions from the MODIS thermal imagery captured every 8 days and a reference ET using the thermal index approach. The data was processed using the ArcGIS software.

An alternative approach to estimate the rainfed evapotranspiration is discussed below:

Data required:

1. Country shapefile
2. (Rainfall data) CHIRPS dataset
3. ET ensemble
4. MOD13A3 NDVI is accessible through: https://lpdaac.usgs.gov/dataset_discovery/modis/modis_products_table

An open ET dataset can be obtained by the MOD16 software which is available at http://www.ntsg.umt.edu/project/mod16

For the Evapotranspiration or ET, an ensemble product should be used. The idea behind an ensemble product is that it uses multiple ET products to create a new, combined and improved product. The ensemble product is further optimized using the MOD13A3 NDVI product to increase the resolution to 0.01 degree.

The ensemble ET product is then compared with the CHIRPS rainfall data. Rainfed ET is capped at 90% of the incoming rainfall on a monthly basis. If the ET is higher than the P, it is likely that the additional ET comes from irrigation, runoff or groundwater and is thus not directly rainfed. If the ET is lower that 90% of the precipitation, the ET is left unchanged.

Steps:

1. Download ensemble ET
2. Download CHIRPS data
3. Resample both to the MOD13A3 resolution

4. Set a threshold of ET max 90% of precipitation

5. Rasterize country shapefile and obtain values per country

P-2-10- Irrigated Evapo-Transpiration (ET):

An alternative approach to estimate the Irrigated evapotranspiration is discussed below:

Data required:

1. Country shapefile
2. (Rainfall data) CHIRPS dataset
3. ET ensemble
4. GlobCover Data
5. MOD13A3 NDVI
6. GMIA FAO irrigated areas dataset

There exist a publicly available land-use dataset. This dataset is called GlobCover and is accessible through: http://www.edenextdata.com/?q=content/esa-globcover-version-23-2009-300m-resolution-land-cover-map-0

The GlobCover has an irrigated areas land-use class however since this dataset is some years old, it needs an update. The areas for irrigation are investigated during the summer. In the winter then, the difference between P and ET is regarded as the irrigated ET. The steps for determining the summer irrigated areas are: Sum P and ensemble ET from April until (and including) September. The irrigated areas can be found using

- P-ET (summer) < -43 mm
- NDVI (summer) > 0.3
- Land-use class != 70
- Land-use class != 50
- GMIA > 0

The first condition ensures that there is a water source other than rain during the summer. This will include all irrigated areas but will also include nature with groundwater storage or runoff inflow. To eliminate these nature areas, the NDVI should be higher than 0.3 It is assumed that farmers will either irrigate with sufficient water or they don't irrigate at all. This can include deficit irrigation. The land-use class 70 and 50 in the GlobCover dataset have high NDVI values and sufficiently low P-ET values but are not irrigated areas. Therefore these land-use classes are excluded from the irrigated areas. Finally as a final check the output is compared with the GMIA or FAO database of irrigated areas. This database has a relatively coarse resolution but can definitely serve as a mask for the newly created high-resolution irrigation mask. The data is publicly available at: http://www.fao.org/nr/water/aquastat/irrigationmap/index10.stm

The output is multiplied by the ensemble ET product and the country raster file.

Steps:

1. Download Chirps (web) and ensemble ET
2. Transform to annual values and resample to MOD13A3 resolution and extent

3. Calculate P – ET for summer (April – Sept) and check P-Et < -43 mm
4. Download MOD13A3 NDVI data (web)
5. Check if NDVI > 0.3
6. Download and resample Globcover (web)
7. Resample land-use class (majority) and exclude 70 and 50
8. Download and resample GMIA
9. Resample (bilinear) GMIA irrigated areas and check if > 0
10. Rasterize country shapefile and obtain values per country

I-2-9- Annual Volume of Total Actual Evapotranspiration: It is the (total renewable green water resources) Evapo-Transpiration (ET) from Rainfed Agriculture, Rainfed Pasture & Rainfed Forests in addition to the ET from Irrigated Agriculture =(Rainfed Evapo-Transpiration (ET))+(Irrigated Evapo-Transpiration (ET)).

I-2-10- Green Water Consumption for Livestock Fodder Water Use: Is the total volume of green water consumed by livestock, It could be calculated by identifying the average number of heads for each kind of livestock and the average annual consumption per head, and by calculating the sum of the products of the number of heads and average annual consumption for each type.

P-2-11- Inland Fisheries and Aquaculture Demands: The Total Volume of Water used for Inland Fisheries and Aquaculture.

P-2-12- Evaporation Losses from Barren Lands:

An alternative approach to estimate the Barren Lands evaporation losses is discussed below:

Data required:

1. Country shapefile
2. ET ensemble
3. GlobCover

Although the areas might have changed from barren to other land-use classes or from other land-use classes to barren, the result on the mean precipitation or ET depth will be minimal. The reason for this is the large areas of barren lands in the Arab region. Each country has significant areas of barren lands. The definition of barren land in the GlobCover dataset is land devoid of vegetation. It can receive precipitation and hence also exhibit ET.

Steps:

1. Download GlobCover dataset
2. Resample to ET ensemble resolution and extent
3. Multiply barren areas (value == 200) with ET ensemble
4. Create values per country

P-2-13- Evaporation Losses from Open Water Bodies:

An alternative approach to estimate the open water bodies evaporation losses is discussed below:

Data required:

1. Country shapefile

2. ET ensemble
3. GlobCover
4. MOD13A3 NDVI

Although the GlobCover dataset has a specific class for water bodies, the dataset can be further updated. In order to be classified as open water the pixel must pass two conditions:

1. Land-use class == 210
2. NDVI < 0

Especially in Egypt there are some lakes that slowly dry up. Using this method, these dried up lakes will not be classified as open water.

Steps:

1. Download GlobCover dataset
2. Obtain ET ensemble dataset
3. Resample to ET ensemble resolution and extent
4. Download MOD13A3 NDVI dataset
5. Create annual values
6. Resample to same extent and resolution
7. Apply conditions in raster calculator
8. Multiply new water mask with ET ensemble
9. Create values per country

I-2-11- Evaporation Losses: The total Volume of Water lost by Evaporation =(Evaporation Losses from Barren Lands (& Urban Areas))+(Evaporation Losses from Open Water Bodies).

I-2-12- Bottled Water Production: The total volume of Water bottled for the purpose of commercial sale.

P-2-14- Navigation Water Flows: The Total Volume of Water Reserved for Inland Navigation.

P-2-15- Environmental Water Flows: The total volume of water used to sustain and preserve ecological systems.

P-2-16- Withdrawals for Oil and Gas Water Use: The total annual volume withdrawn for oil and gas water use.

3. Water & Land-Use Changes

P-3-1- Green Cover land-use change: From 2012 to 2015

P-3-2- Change in Irrigated Agricultural Land: From 2012 to 2015

P-3-3- Change in Rain-fed Agricultural Land : From 2012 to 2015

P-3-4- Total Irrigated Agricultural Land: Total agricultural area that is managed by irrigation systems.

P-3-5- Total Rain-fed Agricultural Land: The total rain-fed agricultural area

P-3-6- Total Pasture Area: The total pasture area

P-3-7- Total Forests Area: The total forests area

P-3-8- Urban Encroachment on Green Cover: Is the loss of Green Cover caused by urbanization, and is expressed by agricultural area lost/ year =(Urban Encroachment on Irrigated Agricultural Land) + (Urban Encroachment on Rain-fed Agricultural Land) + (Urban Encroachment on Rain-fed Pasture Land) + (Urban Encroachment on Rain-fed Forests Land).

P-3-9- Urban Encroachment on Irrigated Agricultural Land

P-3-10- Urban Encroachment on Rain-fed Agricultural Land

P-3-11- Urban Encroachment on Rain-fed Pasture Area

P-3-12- Urban Encroachment on Rain-fed Forests Area

Impact of Urban Encroachment on Water Resources

Impact of Urban Encroachment on Agricultural Land: Is the amount of water resources gained or lost due to urban encroachment on agricultural lands and is assessed through the following indicators:

I-3-1- The Decrease in Groundwater Recharge: defined as total volume of water that would have naturally entered underground sources of water (typically aquifers) in the Urbanized areas from endogenous (internal) precipitation and surface water flow, had urbanization not taken place (FAO).

It was assumed that all the effective rainfall (evapotranspiration depths subtracted from the rainfall depths) occurring on the areas where urban encroachment occurred will be considered as direct runoff. Therefore, the values of ground water recharge in those areas in 2012 are considered to be the amount of groundwater recharge decrease due to the urban encroachment. Using the rainfall and evapotranspiration data in 2012 the amount of runoff is calculated using the curve number method, then the groundwater recharge amounts are calculated using a simple mass balance equation. The SCS-Curve Number method is introduced in the TR-55 from the United States Department of Agriculture (USDA) and the steps followed are summarized below:

The SCS-Curve number equation is:

$$\boldsymbol{Q = \frac{(P - I_a)^2}{(P - I_a) + S}}$$

Where:

Q = runoff (in)

P = rainfall (in)

S = potential maximum retention after runoff begins (in) and

Ia= initial abstraction (in)

The equation was adjusted to be used with the international system units where all the values were converted into millimeters instead of inches.

The initial abstraction is calculated as a function of the potential maximum retention using the equation:

$$I_a = 0.2S$$

After substituting the terms the equation above becomes:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

S is related to the soil and cover conditions of the watershed through the curve number. CN has a range of 0 to 100, and S is related to CN by:

$$S = \frac{1000}{CN} - 10$$

The factors that determine the curve number are the hydrologic soil group (HSG), the land cover type, the land treatment, the hydrologic condition, and the antecedent runoff condition. The TR-55 from the USDA gives a table for the equivalent CN for each land cover type. CN were selected for each land cover type in our study scope. Then the equation above were followed in order to calculate the runoff depth. Those calculations were done using the raster calculator in ArcGIS.

A simple mass balance equation is used to calculated the groundwater recharge amounts:

$$P - ET = GW + Q$$

Where:

P = rainfall (mm)

ET = evapotranspiration (mm)

GW = groundwater recharge (mm) and

Q = runoff (mm)

P-3-12- Groundwater Recharge from Precipitation before Urban Encroachment

P-3-13- Groundwater Recharge from Precipitation after Urban Encroachment

P-3-14- Impact of NDVI Change on Groundwater Recharge

Data required:

1. Country shapefile
2. PCRGlobWB recharge
3. PCRGlobWB runoff
4. MOD13Q1 NDVI
5. CHIRPS Rainfall Data
6. ET ensemble

Since the data for recharge and runoff are unavailable (publicly), the fraction approach is used to estimate this indicator. First, the same short NDVI difference maps is created. Next the difference in P and ET for January and December in 2015 is investigated. Ideally you would use the ET ensemble data for December 2014 rather than

January 2015 due to seasonality. Unfortunately the data for the ET ensemble is available for January 2015 onward.

Next we calculate the Recharge for December and January and multiply this by the short term change raster [(Pdec-ETdec) * (R / (R+Q)) – (Pjan-ETjan) * (R / (R+Q))] * NDVIdif,short

The result is the change in ET in the pixels where the NDVI changed more than 0.3 [-]. A change to green will have a positive effect on the ET whereas a change to urban/barren will likely have a negative effect. If you like you can create two outputs: One for the positive changes, and one for the negative changes. The net effect is the sum of both changes.

Note that due to tides and water reflectance, NDVI values at the coast are of low quality. Therefore as a final check, one could create a negative buffer (eroded) of the countries shapefile. You can merge the attributes and than create a buffer.

Steps:

1. Create a short term change raster
2. Resample R and Q and create new fractions
3. Resample P
4. Resample ET ensemble
5. Calculate P – ET for Jan and Dec
6. Determine Recharge and Runoff for Dec and Jan
7. Multiply the results with the short term difference raster
8. Calculate values per country
9. optional (remove cells near the coast)

I-3-2- The Decrease in Water Consumption of Green Cover: defined as the product of the green cover area lost due to urban encroachment and the average consumption of the unit area.

The amount of evapotranspiration from the areas that changed into urban areas in 2015. The areas changed are masked for the evapotranspiration data in 2012 and the values are calculated for each country.

P-3-15- Impact of NDVI Change on ET

Data required:

1. Country shapefile
2. MOD13Q1 NDVI
3. ET ensemble product

The relation to NDVI change and ET change is 1.13 with ET being the more sensitive one. This relation is used to update ET values for 2011 and 2001.

In some areas, ET also causes P. An example is lake Victoria where ET from the same day will flow back in the lake in the form of P. A decrease in P can lead to less vegetation which turn reinvigorates the decrease in ET and eventually P itself.

ET needs to be resampled to the resolution of the MOD13Q1 250m resolution NDVI data. Because this concerns

ET and not P, it is better to use nearest neighbour as a resampling technique.

Steps:

1. Create a short term change raster
2. Create the short (annual) difference
3. Obtain the ET ensemble product (monthly)
4. Resample to same resolution and extent as NDVI
5. Use the short term change raster (>0.3 or <-0.3) and multiply with ET ensemble.

I-3-3- The Increase of Surface Runoff: under the assumption that most of the volume that used to infiltrate to the root zone will be changed into surface runoff due to the drastic difference in permeability between agricultural land and asphalt, the increase of surface runoff is estimated as 80-90% of the decrease in the amount of water infiltrated to the root zone in rain-fed agriculture.

As mentioned in the last point, it is assumed that the reminder of the subtraction of the evapotranspiration depths from the rainfall depths in 2015 on the areas where urban encroachment occurred are considered to be runoff. In order to calculate the increase in the runoff due to urban encroachment, we runoff amounts calculated in 2015 with the runoff amounts in 2012 calculated for the indicator above. The values were also calculated in ArcGIS using the raster calculator.

P-3-16- Surface Runoff from Rainfall before Urbanization

P-3-17- Surface Runoff from Rainfall after Urbanization

P-3-18- Impact of NDVI Change on Runoff

Data required:

1. Country shapefile
2. PCRGlobWB recharge
3. PCRGlobWB runoff
4. MOD13Q1 NDVI
5. CHIRPS P
6. ET ensemble product

Steps:

1. Create a short term change raster
2. Resample R and Q and create new fractions
3. Resample P
4. Resample ET ensemble
5. Calculate P – ET for Jan and Dec
6. Determine Recharge and Runoff for Dec and Jan
7. Multiply the results with the short term difference raster

8. Calculate values per country
9. Optional (remove cells near the coast)

I-3-5- The Increase in Domestic Water Withdrawals: defined as the total volume used by the population that re-located to the abused areas which is given by the product of the estimated population and the annual average domestic water consumption per capita (100-200 cubic meters).

4. Water & Services

i. Water Coverage & Accessibility

a) Percentage of Population with Improved Drinking Water: An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination". The improved options are ranked from best to worst as follows (WHO and UNICEF):

P-4-1- Piped water on premises (JMP): Piped household water connection located inside the user's dwelling, plot or yard.

P-4-1- Piped water on premises: Piped household water connection located inside the user's dwelling, plot or yard.

P-4-2- Public Taps

P-4-3- Other Improved Drinking Water Sources (JMP): Public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, rainwater collection.

Unimproved Drinking Water Sources: Unprotected dug well, unprotected spring, cart with small tank/drum, surface water, bottled water.

Unimproved: Surface drinking-water sources: river, dam, lake, pond, stream, canal, irrigation channels.

P-4-4- Improved Urban Drinking Water Coverage: The length, in kilometers, of drinking water supply networks.

P-4-5- Improved Rural Drinking Water Coverage: The length, in kilometers, of sewage networks.

P-4-6- Improved Urban Sanitation Coverage: The length, in kilometers, of irrigation networks.

P-4-7- Improved Rural Sanitation Coverage: The length, in kilometers, of drainage networks.

P-4-8- Everyday Accessibility to Drinking Water (MDG+): Have access to a drinking water (Pipes or Public taps) at least once every day

I-4-1- Proportion of Population Using Safely Managed Drinking Water Services (SDG 6.1.1): Population using a basic drinking water source ('improved' sources of drinking water used for MDG monitoring i.e. piped water into dwelling, yard or plot; public taps or standpipes; boreholes or tubewells; protected dug wells; protected springs and rainwater) which is located on premises and available when needed and free of faecal (and priority chemical) contamination.

I-4-2- Proportion of Population Using Safely Managed Sanitation Services (SDG 6.2.1a): Population using a basic sanitation facility at the household level ('improved' sanitation facilities used for MDG monitoring i.e. flush or pour flush toilets to sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, pit latrines with a slab, and composting toilets, the same categories as improved sources of drinking water used for MDG monitoring) which is not shared with other households and where excreta is safely disposed in situ or treated off-site. This is therefore a multipurpose indicator also serving the household element of the wastewater treatment indicator (SDG 6.3.1).

Method of computation: Household surveys and censuses provide data on use of types of basic sanitation facilities listed above. The percentage of the population using safely managed sanitation services is calculated by combining data on the proportion of the population using different types of basic sanitation facilities with estimates of the proportion of faecal waste which is safely disposed in situ or treated off-site.

Urban Drinking Water Coverage: Percentage of population provided with piped drinking water in urban areas

Rural Drinking Water Coverage: Percentage of population provided with piped drinking water in rural areas

Urban Sanitation Coverage: Percentage of population covered with sanitation in urban areas.

Rural Sanitation Coverage: Percentage of population covered with sanitation in rural areas.

Percentage of Population with Improved Sanitation: Defined looking at the following facilities as indicators: Flush or pour-flush (piped sewer system, septic tank, pit latrine), Ventilated Improved Pit (VIP) latrine, pit latrine with slab, composting toilet. The improved options are ranked from best to worst as follows(WHO and UNICEF):

Flush/pour Flush to: - piped sewer system- septic tank- pit latrine• Ventilated improved pit-(VIP) latrine- Pit latrine with slab

Sanitation facilities of an otherwise acceptable type shared between two or more households. Only facilities that are not shared or not public are considered improved

Unimproved Sanitation Facilities: do not ensure hygienic separation of human excreta from human contact. Unimproved facilities include pit latrines without a slab or platform, hanging latrines and bucket latrines.

Open defecation

ii. Water Infrastructure

I-4-3- Length of Drinking Water Networks

I-4-4- Length of Sewage Networks

I-4-5- Length of Irrigation Networks

I-4-6- Length of Drainage Networks

I-4-7- Dam Storage Capacity: The total capacity of all water regulating structures installed.

I-4-8- Drinking Water Capacity: Defined as the total drinking water Treatment capacity, in other words it is the summation of the potential capacities of all drinking water plants in any given country.

I-4-9- Desalination Capacity: The total capacity of all desalination plants

I-4-10- Municipal Wastewater Treatment Capacity: is the summation of the potential capacities of all municipal treated wastewater plants in any given country

I-4-11- Industrial Wastewater Treatment Capacity: is the summation of the potential capacities of all Industrial treated wastewater plants in any given country

I-4-12- Wastewater Collection Capacity: the Total volume of wastewater that can be collected through the existing collection systems.

I-4-13- Maximum Annual Dam Storage Reached: is the actual storage reached in a given year, which should always be lower than the Dam Storage Capacity.

5. Water & Energy

I-5-1- Electricity Generated Using Hydropower: Hydropower production as percent of total electricity production (World Bank). And, the hydropower generated per year.

I-5-2- Hydropower as % of Total Generated Electricity: Electricity generated using hydropower as a percent of all generated electricity

I-5-3 - Installed Hydropower Capacity: Sum of all generator nameplate power ratings (in GW) from the installed hydropower plants. (AMCOW, 2012)

I-5-4- Water Used to Generate Electricity: The total annual volume of inflow through all hydro generators.

6. Water & Population

P-6-1- Total Population: Number of population in the Arab region.

I-6-1- Internal Renewable Water Resources per Capita: The maximum theoretical amount of water produced internally and actually available including green water, on a per person basis.

I-6-2- Total Renewable Blue Water Resources per Capita: Is the resultant of the internal produced surface water and the transboundary inflows and outflows of surface water, on a per person basis.

I-6-3- Total Renewable Water Resources per Capita: Is the sum of total renewable blue and green water resources, on a per person basis.

I-6-4- Total Available Water Resources per Capita: The maximum theoretical amount of water actually available, on a per person basis.

I-6-5- Blue Water Withdrawal Per Capita: Total annual abstractions from surface and groundwater sources including non-renewable groundwater and secondary freshwater sources (water previously withdrawn and returned), on a per person basis.

I-6-6- Green Water Use Per Capita: The total amount of precipitation directly consumed by pasture areas, rain-fed areas, and forest areas, on a per person basis.

I-6-7- Total Water Consumption Per Capita: The gross amount of water abstracted from all sources, either primarily or recycled, including blue water withdrawals, non-conventional water withdrawals and green water consumption, on a per person basis.

P-6-2- Agricultural Water Withdrawal Per Capita: The sum of total agricultural abstractions from blue water, and direct beneficial abstractions from precipitation in rainfed areas, on a per person basis.

P-6-3- Industrial Water Withdrawal Per Capita: Total annual volume of water withdrawals used for industrial purposes on a per person basis.

P-6-4- Domestic Water Withdrawal Per Capita: Total annual volume of water withdrawals used for domestic purposes on a per person basis.

I-6-8- Population without Improved Drinking Water: The total population without improved drinking water.

I-6-9- Population without Improved Sanitation: The total population without improved sanitation.

7. Water & Health

I-7-1- Proportional of Population Using Handwashing Facility with Soap and Water (SDG 6.2.1b): Population with a handwashing facility (a device to contain, transport or regulate the flow of water to facilitate handwashing) with soap and water at home.

I-7-2- Dracunculiasis Reported Cases: Number of annual incidents of the disease.

I-7-3- Open Defecation Practice: Number of people who continue to practice open defecation.

I-7-4- Percentage of Open Defecation: The percentage of population practicing open defecation.

I-7-5- Cholera Reported Cases: Number of annual incidents of the disease.

I-7-6- Typhoid Reported Cases: Number of annual incidents of the disease.

I-7-7- Hepatitis A Reported Cases: Number of annual incidents of the disease.

I-7-8- Diarrhea Prevalence (% of children under five): Percentage of children under five cases suffering from Diarrhea.

8. Water & Quality

The following indicators should be measured or reported for in all surface and groundwater quality monitoring stations in each country to identify the average, minimum, and maximum values for each indicator, the values of all of these indicators are directly connected to anthropogenic activities:

P-8-1- Dissolved Oxygen (ppm): Is a measure of free (i.e., not chemically combined) oxygen dissolved in water. It is essential to the metabolism of all aerobic aquatic organisms. Reduced levels could harm and even kill plants and fish.

P-8-2- pH (dimensionless): is a measure of the acidity or alkalinity of a water body. It can affect aquatic organisms both directly, by impairing respiration, growth, and development of fish, and indirectly, by increasing the bioavailability of certain metals such as aluminum and nickel.

P-8-3- Electric Conductivity: measured in 1/OHM (S/M) is a measure of the ability of water to carry an electric current, which depends on the presence of ions. Increases in conductivity can lead to changes that reduce biodiversity and alter community composition.

P-8-4/P-8-5- Nitrogen Concentration (ppm)/Phosphorous Concentration (ppm): Nitrogen and phosphorus are naturally occurring elements essential for all living organisms. But they are often found in growth-limiting concentrations in aquatic environments. Increases in nitrogen or phosphorus in natural waters, largely as a result of human activities in the drainage basin (e.g., from agricultural runoff from manure and synthetic fertilizers, and from municipal and industrial waste-water discharge), can overstimulate plant growth and choke off oxygen supplies.

I-8-1- Water Quality Index: The Water Quality Index, developed by the Yale Center for Environmental Law & Policy, is one of the indicators that make up the Environmental Performance Index. It is a proximity-to-target composite of water quality, adjusted for the density of monitoring stations in each country, with a maximum score of 100. The Water Quality Index measures dissolved oxygen, pH, conductivity, total nitrogen, and total phosphorus. It is an indicator of eutrophication, nutrient pollution, acidification, and salinization.

For each of the above indicators there is a range of acceptable values, the percentage of samples in these acceptable values is recorded annually for each indicator. The Overall water quality index will be calculated as the arithmetic average of the 5 percentages for the 5 indicators.

I-8-2- Total Dissolved Solids (ppm): is a measure of the combined content of all organic and inorganic substances contained in a water sample.

I-8-3- Fecal Choliform (Colonies/100 ML): Increased levels of fecal coliforms means there is a failure in water treatment, a break in the integrity of the distribution system, or possible contamination with pathogens. Tests for this kind of bacteria are done through the cheap and rapid 1-day incubation methodology.

I-8-4- Biological Oxygen Demand (BOD) (mg/l): the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period

I-8-5- Chemical Oxygen Demand (COD) (mg/l): Chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water

I-8-6- Chloride Concentration: the concentration of chloride in a given water sample.

I-8-7- Total Hardness (CACO3): The concentration of Calcium Carbonate ($CaCO_3$) in a given water sample.

9. Water & Ecosystems

I-9-1- Number of Wetlands Sites: Including those acknowledged by RAMSAR, Sabkhas, Groundwater-based wetlands, and water bodies of special importance.

I-9-2- Total Wetlands Areas

I-9-3- Total Freshwater Species Count: The total number of species that dwell partially or permanently in the water bodies inbounded in the country.

I-9-4- Number of Endangered Species: The total number of endangered species that dwell partially or permanently in the water bodies inbounded in the country.

I-9-5- Number of Invasive Species: The total number of invasive species that dwells partially or permanently in the water bodies inbounded in the country.

I-9-6- Proportion of Bodies of Water with Good Ambient Water Quality (SDG 6.3.2): Proportion of water bodies (area) in a country with good ambient water quality compared to all water bodies in the country. "Good" indicates an ambient water quality that does not damage ecosystem function and human health according to core ambient water quality indicators.

Method of computation:

The GEMS/Water water quality index approach is used as a general model to calculate the index, in which measured determinand values are compared to guideline values (proximity to target approach):

1. Proximity-to-target (PTT) scores for each determinand at single monitoring sites are calculated as the difference between the temporal average (for the accounting period) of the determinand concentration and the target divided by the range between the (winsorized) minimum or maximum of the measured determinand concentration (for exceedance and non-exceedance targets, respectively) and the target. The PTT scores are scaled to the range between 0 and 100, where 100 indicates that the target is met and decreasing scores indicate an increasing distance from the target.
2. The water quality index (WQI) at site level is computed as the arithmetic mean of the site-level PTT scores for the selected determinands. The WQI scale can be divided into different water quality categories, ranging from very bad to excellent. The thresholds for these categories are country specific and should be reported in the monitoring system by the individual countries
3. For the spatial aggregation at the basin level and country level, the water bodies are divided into stretches of homogenous quality (between consecutive monitoring stations).
4. The final indicator is calculated from the proportion of the stretches with good quality compared to all water bodies assessed.

I-9-7- Change in the Extent of Water-Related Ecosystems over Time (SDG 6.6.1): Percentage of change in water-related ecosystems over time (% change/year). The indicator would track changes over time in the extent of wetlands, forests and drylands, and in the minimum flows of rivers, volumes of freshwater in lakes and dams, and the groundwater table. The Ramsar Convention broad definition of "wetland" is used, which includes rivers and lakes, enabling three of the biome types mentioned in the target to be assessed - wetlands, rivers, lakes - plus other wetland types.

Method of computation:

It is proposed to estimate percentage change in each major ecosystem present in a country, and the indicator will enable Member States to report on those water-related ecosystems that are important to them.

Wetland extent is computed through the existing Living Planet Index methodology for data collection and analysis (http://www.livingplanetindex.org/home/index). It consists of a number of stages including harvesting of time series data, codification and database entry, aggregation into sub-indices to reduce sampling bias, and further aggregation to create sub-global (ecologically and regionally specific) and global indices. The methodology is flexible to incorporating improving sources of information and data, for a more comprehensive assessment of trends.

The structure of the indicator can be designed to align with the SEEA Water accounts and estimate percentage change in Natural Water Capital available to society based on a) Mean Annual Water Availability; b) Mean Annual Water Withdrawals; c) Environmental Water requirements Aquastat (FAO); GEMS Water for national data (UNEP).

Calculation of the percentage change:

Percentage of change is calculated for each sub-indicator (i) as follows:

$$\% = (PD/R)100$$

$$CPD = |R - PD|$$

Where:

C% = Percentage change of the Present Day condition score from the Reference condition for sub-indicator i

CPD = Change of Present Day condition score from the Reference condition

R = Sub-indicator score set for the Reference Condition

PD = Sub-indicator score obtained for the Present Day Condition

10. Water & Climate

i. Extreme Weather Events

P-10-1- Number of Class 1 flood events: Class 1 floods are large flood events causing significant damage to structures or agriculture; fatalities; and/or 1-2 decades-long reported interval since the last similar event (Dartmouth, 2013)

P-10-2- Number of Class 1.5 Flood Events: Class 1.5 floods are very large events: with a greater than 2 decades but less than 100 year estimated recurrence interval, and/or a local recurrence interval of 1-2 decades and affecting a large geographic region (> 5000 sq. km) (Dartmouth, 2013)

P-10-3- Number of Class 2 Flood Events: Class 2 flood events are extreme events with an estimated recurrence interval greater than 100 years (Dartmouth, 2013)

I-10-1- Total Number of Floods in the Last Three Years

P-10-4- Average Temperature

I-10-2- Monthly Drought Events: a drought event is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions. The abnormally low rainfall will be taken as 25% of the record monthly average. In other words, a period where rainfall has been consistently lower than 25% of the record average will be considered a drought event.

I-10-3- Annual Drought Events: a drought event is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions. The abnormally low rainfall will be taken as 25% of the record annual average. In other words, a period where rainfall has been consistently lower than 25% of the record average will be considered a drought event.

I-10-4- Cost of Annual Damage Induced by Floods: estimate to be reported by the national authority

I-10-5- Cost of Annual Damage Induced by Droughts: estimate to be reported by the national authority

I-10-6- Annual Human Losses Related to Floods.

I-10-7- Annual Human Losses Related to Droughts.

I-10-8- Unusual Snow Events: The number of occurrences of snow events that are historically unusual to a given country.

I-10-9- Unusual Hail Events: The number of occurrences of hail events that are historically unusual to a given country.

I-10-10- National Climate Change Adaptation Plan. (Yes/No): A cross Sectoral plan that addresses Climate Change mitigation measures as well as water adaptation measures.

I-10-11- Existing Early Warning System

11. Water & Socio-Economics

i. Water Productivity

I-11-1- Industrial Water Productivity: Economic value added (in US$) per cubic meter of water withdrawn by the Industrial sector. In other words, it is the gross agricultural revenue (GDP) divided by the total industrial water consumption.

I-11-2- Agricultural Water Productivity "Crop per Drop": Economic value added (in US$) per cubic meter of water withdrawn by agriculture: In other words, it is the gross agricultural revenue (GDP) divided by the total agricultural water consumption (including irrigation withdrawals and rain fed agriculture green water consumption).

I-11-3- Employment in Agriculture "Job per Drop": The ratio of total labor employed in Agriculture to the total agricultural withdrawals (including irrigation withdrawals and rain fed agriculture green water consumption).

I-11-4- Employment in Industry "Industry Job per Drop": The ratio of total labor employed in Industry to the total industrial withdrawals.

I-11-5- Employment in Water Sector "Job per Drop": The ratio of total labor employed in the water sector.

P-11-1- Gross Domestic Product (GDP): The monetary value of all the finished goods and services produced in a country's borders in a specific time period

ii. Tariffs and Affordability

P-11-2- Water Average Tariff

P-11-3- Sanitation Average Tariff

I-11-6- Water and Sanitation charges as % of average household income: The monthly charge for 10 cubic metres of Water compared to the monthly household income. The household Income is estimated as five times the Gross National Income (GNI) per Capita*.

**GNI per capita (formerly GNP per capita) is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.*

12. Water & Finance

I-12-1- Percentage of National Budget Directed to the Water & Sanitation Sector: It is the percentage of national budget directed to all water related projects, labor, and services. It includes all water use sector, and is not limited to drinking water and Sanitation.

Target: Allocate immediately 5% of national budget for water & sanitation. (Pan-African Water And Sanitation Monitoring & Evaluation) – Suggested by the African Ministers Council on Water, according to global figures

I-12-2- Percentage of GDP Directed to Sanitation & Hygiene: It is the percentage of national budget directed to all water related projects, labor, and services compared to the country's GDP.

Target: Allocate immediately at least 0.5 % of GDP to sanitation & hygiene. (Pan-African Water And Sanitation Monitoring & Evaluation) – Suggested by the African Ministers Council on Water, according to global figures

I-12-3- Foreign Aid Received for Water & Sanitation (SDG 6.a.1): The sectoral distribution of bilateral Official Development Assistance commitments refers to the economic sector of destination (i.e. the specific area of the recipient's economic or social structure whose development is, or is intended to be fostered by the aid), rather than to the type of goods or services provided. These are aggregates of individual projects notified under the Creditor Reporting System, supplemented by reporting on the sectoral distribution of technical co-operation, and on actual disbursements of food and emergency aid.

I-12-4- Operation & Maintenance Cost Recovery for Irrigation: Is the sum of all tariffs collected from all farmers in one year divided by the total operation and Maintenance cost of irrigation for the same year. The total sum of incoming tariff payments could be obtained from the archives of the governmental entity in charge of Irrigation.

I-12-5- Operation & Maintenance Cost Recovery for Drinking Water and Sanitation: Is the sum of all tariffs collected from all subscribers to drinking water and Sanitation services in one year divided by the total operation and Maintenance cost of drinking water and Sanitation for the same year.

I-12-6- Operation & Maintenance Cost Recovery for Industry: Is the sum of all tariffs collected from all industrial establishments in one year divided by the total operational cost of irrigation for the same year. The total sum of incoming tariff payments could be obtained from the archives of the governmental entity in charge of Industrial Drinking Water.

I-12-7- Aid Paid for the Water & Sanitation Sector in Foreign Countries (SDG 6.a.2): The Total Financial Aid disbursed for the purpose of enforcing and enhancing the water & sanitation sector in other countries.

I-12-8- Total Investment in Water & Sanitation: It is defined as government spending in water resources infrastructure development, planning & management, as well as drinking Water and Sanitation treatment and reuse.

13. Water & Trade

Virtual-water flows related to trade in crop, animal per country:

I-13-1- Total Agricultural Virtual Water Export: Total outflow of virtual water which in turn is defined as: the volume of freshwater used to produce the product, measured at the place where the product was actually produced (Hoekstra and Chapagain, 2001).

I-13-2- Total Agricultural Virtual Water Import: Total inflow of virtual water which in turn is defined as the volume of freshwater used to produce the product, measured at the place where the product was actually produced (Hoekstra and Chapagain, 2001).

Hoekstra and Chapagain (2001) provided reference tables that provide the approximate volume of water needed to produce one ton of different crop, animal, and industrial products. Therefore, the volume of water used to produce a certain product can be estimated by multiplying these reference values (or any similar values provided in the national and global literature) by the total annual produced amount of the same product. In the same manner, it is possible to estimate the amount of water embedded in imported and exported products.

I-13-3- Bottled Water Export

I-13-4- Bottled Water Import

14. Water & Governance

I-14-1- IWRM Plan in place (yes/no): A national plan dedicated entirely to water resources, with more than 3 entities involved, and with all water use sectors addressed could qualify as a national IWRM, and Ensure the engagement of the civil society as a consulting partner during the development of integrated water resources management plans, under "Water and Governance" indicators.

I-14-2- Degree of Integrated Water Resources Management Implementation (0-100) (SDG 6.5.1): This indicator reflects the extent to which integrated water resources management (IWRM) is implemented. It takes into account the various users and uses of water with the aim of promoting positive social, economic and environmental impacts on all levels, including transboundary, where appropriate.

Method of computation: National surveys are structured in 4 components: policies, institutions, management tools, and financing. In each component there are questions with defined response options giving scores of 0-100. Questions scores are aggregated to the component level, and each component score is equally weighted to give an aggregated indicator score of 0-100.

The method builds on official UN IWRM status reporting, from 2008 and 2012, of the Johannesburg Plan of Implementation from the UN World Summit for Sustainable Development (1992).

I-14-3- National Water & Sanitation M&E & R System (AMCOW): A national Water Monitoring , Evaluation, and Reporting system is defined as a system of indicators that covers all areas related to water and is adequately and continuously assessed and reported according to clear pre-set definitions. The reporting could be in the form of reports or an online web-based system.

P-14-1- Surface Water Permits Issued to Date: Number of officially authorized water permits for beneficial usage by individuals or entities to date.

P-14-2- Total Volumetric Water Rights Associated with Surface Water Permits: The total annual authorized volumes associated with all authorized water Surface water permits.

I-14-4- Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals

P-14-3- Groundwater Well Permits Issued to Date: Number of officially authorized permits for registered shallow or deep wells for beneficial usage by individuals or entities, Issued to date.

P-14-4- Total Volumetric Water Rights Associated with Well Permits: The total annual authorized volumes associated with all authorized well permits.

I-14-5- Total Volumetric Water Rights Associated with Well Permits as a Percent of Annual Blue Groundwater Abstractions: Number of Unlicensed Wells, Could be obtained from annual well survey.

I-14-6- Number of Unlicensed Wells

I-14-7- Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users: Annual number of complaints that relate directly to irrigation and drainage issues.

I-14-8- Drinking Water and Sanitation Related Complaints as a Percent of Serviced Households: Annual number of complaints that relate directly to drinking water and sanitation services

I-14-9- Number of Drinking Water Meters Installed as a Percentage of the Total Covered Households: The ratio of the total number of installed drinking water meters to the total number of households covered with drinking water. The total number of households can be estimated by dividing the total covered population by 5.

I-14-10- Number of Groundwater Meters Installed as a Percent of Licensed Wells

I-14-11- Number of Surface Irrigation Meters Installed as a Percent of Surface Irrigation Water Permits

I-14-12- Physical Domestic Water Losses: The amount of domestic water lost due to leakage in the piped conveyance system. It is best determined by detailed flow measurements.

I-14-13- Commercial Water Losses: Is the Unaccounted for water due to theft or lack of metering and is calculated by subtracting the sum of the total accounted for water (metered volumes) and the physical losses from the total withdrawals by the domestic sector.

I-14-14- Physical Irrigation Water Losses: The amount of Irrigation water lost in the different elements of the irrigation conveyance system (canals and drains) through seepage and evaporation.

I-14-15- Overall Water Use Efficiency: The ratio of the difference between the total withdrawals from original sources (surface water, renewable and non-renewable groundwater, and Desalinated Water) and the wastewater and Drainage flows TO the Withdrawals from Original Sources expressed as a percentage.

(Overall water Use Efficiency= 100* ((Withdrawals from Original Sources- Wastewater and Drainage outflows) / Withdrawals from Original Sources))

I-14-16- Change in Water-Use Efficiency over Time (SDG 6.4.1): This indicator is defined as the output over time of a given major sector per volume of (net) water withdrawn (showing the trend in water use efficiency). Following ISIC 4 coding, sectors are defined as agriculture, forestry and fishing (ISIC 4-A); manufacturing, constructions, mining and quarrying (ISIC 4-B, 4-C and 4-F); electricity industry (ISIC 4-D); and the municipal sector (ISIC 4-E).

For the purpose of this note, the following terminology is used:

- Water use: general non-specific term that describes any action through which water provides a service
- Water withdrawal: water abstracted from a river, lake, reservoir or aquifer (V)
- Return flow: water returning to a river, lake, reservoir or aquifer6 (R)
- Net water withdrawal: water withdrawn (V) minus return flow (R)

Note: If no information is available on (R), then only (V) will be used.

Method of computation:

The indicator is disaggregated by sector, in order to allow for different metrics in different sectors.

Water efficiency in irrigated agriculture is calculated as the agricultural value added per agricultural (net) water withdrawn, expressed in USD/m3.

In formula:

$$A_{we} = \frac{GVA_a \times (1 - C_r)}{V_a - R_a}$$

Where:

- Awe = Irrigated agriculture water efficiency [USD/m3]
- GVAa = Gross value added by agriculture (excluding river and marine fisheries and forestry) [USD]
- Cr = Proportion of agricultural GVA produced by rainfed agriculture [-]

- Va = Volume of water withdrawn by the agricultural sector (including irrigation, livestock and aquaculture) [m3]
- Ra = Volume of water returned to the hydrologic system (return flow) [m3]

The volume of water withdrawn by the agricultural sectors (V) is collected at country level through national records and reported in questionnaires, in units of km3/year or million m3/year (see example in AQUASTAT http://www.fao.org/nr/water/aquastat/sets/aq-5yr- quest_eng.xls). Agricultural value added in national currency is obtained from national statistics, converted to USD and deflated to the baseline year 2015.

The Cr coefficient can be estimated as Cr= 37%, on the basis of the general FAO assumption on the ratio between rainfed and irrigated yield. More detailed estimations are however possible and encouraged at country level.

Water efficiency of industries is calculated as the industrial value added per unit of industrial (net) water withdrawn, and expressed in USD/m3.

In formula:

$$I_{we} = \frac{GVA_i}{V_i - R_i}$$

Where:

- Iwe = Industrial water efficiency [USD/m3]
- GVAi = Gross value added by industry (excluding energy) [USD]
- Vi = Volume of water withdrawn by the industries (excluding energy) [m3]
- Ri = Volume of water returned to the hydrologic system (return flow) [m3]

Industrial water withdrawal (V) is collected at country level through national records and reported in questionnaires, in units of km3/year or million m3/year (see example in AQUASTAT http://www.fao.org/nr/water/aquastat/sets/aq-5yr-quest_eng.xls). Industrial value added is obtained from national statistics, deflated to the baseline year 2015.

Energy (power) water efficiency is calculated as the value added of power production per unit of (net) water withdrawn for energy production, and expressed in MWh/m3.

In formula:

$$E_{we} = \frac{TEP}{V_e - R_e}$$

Where:

- Ewe = Energy water efficiency [MWh/m3]
- TEP = Total energy production [MWh]
- Ve = Volume of water withdrawn for energy production, i.e. for the cooling of power plants (including evaporation from reservoirs created behind dams for hydropower) [m3]
- Re = Volume of water returned to the hydrologic system (return flow) [m3]

Volume of water withdrawn for energy production (V) is collected at country level through national records and reported in questionnaires, in units of km3/year or million m3/year (see example in AQUASTAT http://www.fao.org/nr/water/aquastat/sets/aq-5yr-quest_eng.xls).

Value added of electricity production is obtained from national statistics, deflated to the baseline year 2015.

Municipal water supply efficiency is the ratio between water effectively distributed to the municipal users and the water withdrawn for municipal use by water supply utilities (i.e. distribution efficiency, size of network losses).

In formula:

$$M_{we} = \frac{Mu_d}{V_m}$$

Where:

- Mwe = Municipal water supply efficiency [-]
- Mud = Water distributed to municipal users [m3]
- Vm = Volume of water withdrawn by municipal utilities (i.e. the public distribution network) [m3]

Data on volumes of withdrawn and distributed are collected at country level from the municipal supply utilities records.

I-14-17- Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources (SDG 6.4.2): The ratio between total freshwater withdrawn by all major sectors and total renewable freshwater resources, after having taken into account environmental water requirements. Main sectors, as defined by ISIC standards, can include for example agriculture; forestry and fishing; manufacturing; electricity industry; and municipalities. This indicator is also known as water withdrawal intensity.

The indicator builds on MDG indicator 7.5 and also accounts for environmental water requirements.

Method of computation: The indicator is computed as the total freshwater withdrawn (TWW) divided by the difference between the total renewable freshwater resources (TRWR) and the environmental water requirements (Env.), multiplied by 100. All variables are expressed in km3/year (10^9 m3/year).

$$Stress\ (\%) = \frac{TWW}{TRWR - Env.} * 100$$

It is proposed to classify the level of water stress in three main categories (levels): low, high and very high. The thresholds for the indicator could be country specific, to reflect differences in climate and national water management objectives. Alternatively, uniform thresholds could be proposed using existing literature and taking into account environmental water requirements.

I-14-18- Water Sustainability / Depletion Index: The ratio of the Total Withdrawals from Original sources including green water consumptions by rainfed agriculture TO The Total Renewable Water Resources (including both Blue and Green Water).

I-14-19- Wastewater and Drainage Outflows: Wastewater and Agricultural Drainage flowing out of the system to local and national sinks.

I-14-20- Transboundary Wastewater and Drainage outflows: Wastewater and Agricultural Drainage flowing out of the country's borders.

I-14-21- Number of Water Related Citations (Water Laws Enforcement): Total annual number of water related citations.

P-14-5- Number of Water Users Associations: Number of associations aiming to address the needs and complaints of Agricultural and Industrial water users as well as organize water withdrawals.

I-14-22- Water Users Associations Agricultural land Coverage: The ratio of the agricultural areas covered by Water Users Associations to the total Agricultural area in the country.

I-14-23- Proportion of Local administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management (SDG 6.b.1): This indicator builds on data that are already regularly collected by UN-Water GLAAS on the presence, at the national level, of clearly defined procedures in laws or policies for participation by service users.

This indicator will also build on the data collected for the Status of Integrated Water Resources Management (IWRM) reporting in SDG target 6.5, in particular on the presence of formal stakeholder structures established at sub-catchment level.

Because of the above, it is envisaged that this indicator will evolve and will be further qualified during the SDG period, focusing on sanitation, drinking water and hygiene first and then expanding on water resources management.

I-14-24- Private Sector Corporate Social Responsibility in the Water Sector

15. Water & International Relations

I-15-1- Transboundary Water bodies' Dependency Ratio: The percent of annual volumes abstracted from transboundary water bodies to total annual available water resources.

I-15-2- Shared Waters Related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms: The number of Bilateral or Multilateral agreements or other sort of cooperation a particular country is involved in. These agreements should be solely intended for transboundary water resources.

I-15-3- Number of Riparians Sharing all Shared Water Bodies: Number of countries that are riparians to existing transboundary aquifers or river basins shared with the concerned country. (riparian countries may be recounted as many times as the number of different transboundary aquifer/river basins they may be sharing with the concerned country)

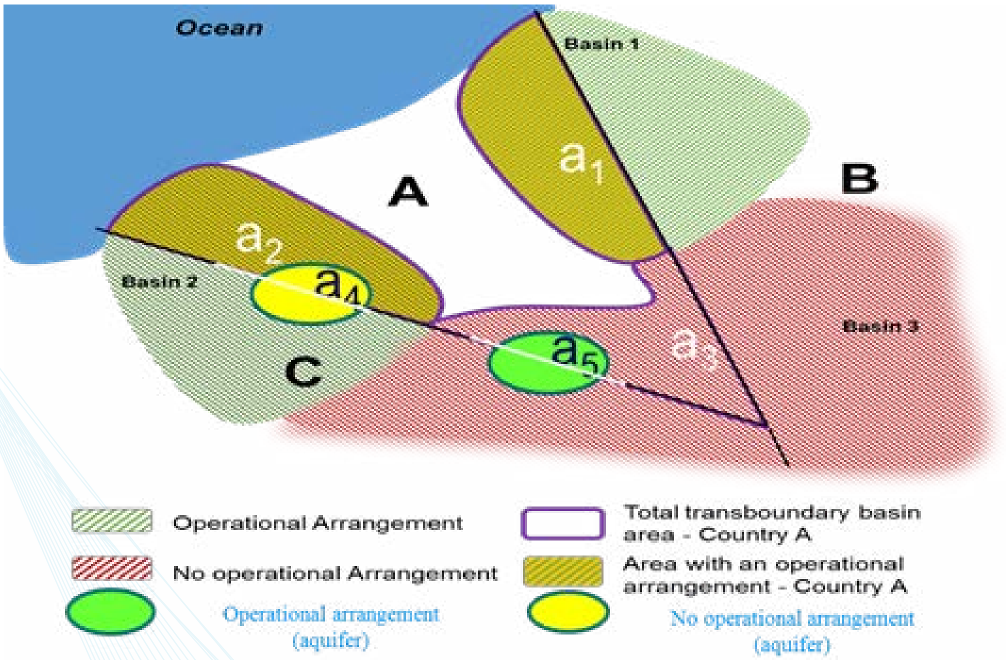
I-15-4- Number of Shared Water Resources Bodies: Number of shared water bodies with other riparian countries including both surface water bodies and groundwater aquifers.

I-15-5- Ratio of Riparian Countries with Agreements to Riparian Countries: The number of riparian countries, with water Benefit Sharing and/or Water Cooperation bilateral and/or multilateral agreements with the concerned country, as a percentage of the number of countries that are riparians to existing transboundary aquifers or river basins shared with the concerned country. (riparian countries may be recounted as many times as the number of different transboundary aquifer/river basins they may be sharing with the concerned country)

I-15-6- Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation

(SDG 6.5.2): Proportion of surface area of transboundary basins that have an operational arrangement for transboundary water cooperation. Regular meetings of the riparian countries to discuss IWRM and exchange of information are required for an arrangement to be defined as "operational".

Method of computation: Calculated – for any spatial unit (country, region) – as the percentage that the total surface area (in km2) of transboundary basins that have an operational arrangement for water cooperation makes up of the total surface area of transboundary basins (km2). GIS data on the extent and location of transboundary basins facilitates the spatial analysis, corresponding datasets available globally.



$$\frac{a_1 + a_2 + a_5}{a_1 + a_2 + a_3 + a_4 + a_5}$$

I-15-7- Estimated Reduction in Average Transboundary Flow Due to Upstream Structures

State of the Water (SOW) Indicators' Datasheets for Arab Countries

Algeria

Algeria SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	87	88.09, Chirps/CEDARE, World Bank: 89 mm
	I-1-2	Annual Precipitation Volume	BCM/Year	207	218.27, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	8	Less 1%
P-1-2		Annual Snow Fall Volume	BCM/Year	1	There is snow on mountains but not sustainable
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	11	9.8, FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	2.5	1.5, FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**12.00**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.12	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.3	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.02	Monts de Tlemcen- Zouia
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.02	Chott El Gharbi
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.14**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**10.82**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**2.5**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	(3 mm/y?!)
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	1.5	approximation: base flow
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**11.82**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	5	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**16.82**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	15.03	ESA/USGS/CEDARE, (3, FP)
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	9.47	ESA/USGS/CEDARE, (53, FP)
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	14.27	ESA/USGS/CEDARE (9, FP)
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**38.77**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**50.59**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**55.59**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	2.4	Waste water: 80%of potable water(3 BCM)
P-1-15		Collected Municipal Wastewater	BCM/Year	2.2	
P-1-16		Treated Municipal WasteWater	BCM/Year	0.9	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.2	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.18	

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
P-1-19		Treated Industrial WasteWater	BCM/Year	0.14	
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**2.6**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**2.38**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**1.04**	Calculated
	I-1-15	Proportion of Wastewater Safely Treated	%	40	SDG (6.3.1) (42%)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**1.56**	Calculated
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.65	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.062	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**3.31**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**58.90**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	3.2	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.65	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	6.9	CEDARE (7, Focal Point)
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**10.75**	Calculated (+Withdrawals for Oil & Gas)
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**15.03**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**21.93**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	6	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	2	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	2	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**10**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.1	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.1**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.65	
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.75**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**38.77**	Calculated
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	22.84	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**61.61**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	0	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	94.45	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.75	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**95.20**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	2.40	including sodas, juices,...
P-2-14		Navigation Water Flows	BCM/Year	0	

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0	
	3	Water & Land Use Changes			
P-3-1		Green Cover Land-Use Change	ha	3,726	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	11,466	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	1,260,000	
P-3-5		Total Rain-fed Agricultural Land	ha	5,648,499	ESA/CEDARE
P-3-6		Total Pasture Area	ha	7,406,334	ESA/CEDARE
P-3-7		Total Forests Area	ha	2,328,597	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**27,981**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	19,737	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	7,767	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	477	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0**	**Calculated (200, FP)**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE (2500, FP)
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE (2500, FP)
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	117	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	29.98	ESA/USGS/Chirps/CEDARE (11000, FP)
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	29.98	ESA/USGS/Chirps/CEDARE, (11000, FP)
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**263.30**	**Calculated**
	4	Water & Services			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	98	(77 JMP 2018)
P-4-2		Public Taps	%	0.1	
P-4-3		Other Improved Drinking Water	%	0	
P-4-4		Improved Urban Drinking Water Coverage	%	100	(85%, Total: 84%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	95	(79%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	95	(90%, Total: 88%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	85	(82%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	75	

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	98	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	90	SDG (6.2.1a) (19%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	127,250	
	I-4-4	Length of Sewage Networks	km	45,000	
	I-4-5	Length of Irrigation Networks	km	6,760	
	I-4-6	Length of Drainage Networks	km	3,213	
	I-4-7	Dam Storage Capacity	BCM	8.00	
	I-4-8	Drinking Water Capacity	BCM/Year	3.60	
	I-4-9	Desalination Capacity	BCM/Year	0.80	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.90	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.14	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	2.38	1 (Assumed equal to P-1-20)
	I-4-13	Maximum Annual Dam Storage Reached	BCM	6	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	145	Ref: Ministry of energy
	I-5-2	Hydropower as % of Total Generated Electricity	%	2	Total Electricity capacité: 17 000 MW
	I-5-3	Installed Hydropower Capacity	MW	270	Ref: Ministry of energy
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	40,400	Ref ONS- January 2016
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	1,257	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	293	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	1,252	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,458	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	248	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	960	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,226	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	171	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	16	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	79	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	586	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	3,192	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	100	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	95317, WHO

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	I-7-4	Percentage of Open Defecation	%	0	1, WHO
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	0	
	I-7-7	Hepatitis A Reported Cases	Number/Year	350	
	I-7-8	Diarrhea Prevalence	%	0	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	7	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	5	mg/l
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	1500	mg/l
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	50	
	I-9-2	Total Wetlands Areas	ha	2,981,421	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	39	Fish (vegetation: 784 species)
	I-9-4	Number of Endangered Species	Number	2	
	I-9-5	Number of Invasive Species	Number	82	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2), Calculated**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	5	floodlists.com
P-10-4		Average Temperature	C°	26	
	I-10-2	Monthly Drought Events	Number	6	
	I-10-3	Annual Drought Events	Number	20	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.11	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (178.37 Million USD)

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	12	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	4	
	I-10-9	Unusual Weather Hail Events	Number	9	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	2	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**91.23**	**Calculated from World Bank**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.90**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**41**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**5,018**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	165	
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.12	
P-11-3		Sanitation Average Tarrif	$/m3	0.02	0.03 (Danilenko, et al (2014))
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.27	CEDARE/AWC 2012
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	3.8	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	5.1	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	14.62	SDG (6.a.1), OECD.Stat (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	65	Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$		SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	3840	50000 for period:2000-2015
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.71	CEDARE, AOAD (0.96, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	44.08	CEDARE, AOAD (59.53, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0.0002	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.0002	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	45	IBNET 2010
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.768	Masmoudi et al (2016) & Aboelnga, H. (2018)
	I-14-13	Commercial Water Losses	BCM/Year	0.512	Masmoudi et al (2016) & Aboelnga, H. (2018)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**76.53**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-12.59**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**85**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**49**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	1.5	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	2.5	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**3**	**Calculated (Focal Point)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	3	Tunisia, Libya

P Code	I Code	Water Related Indicators	Units	Algeria	Notes/ Year/ References
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	13	(12) Benin (1), Burkina Faso (1), Cameroon (1), Chad (1), Guinea (1), Ivory Coast (1), Mali (1), Niger (1), Nigeria (1), Tunisia (2), Libya (1), 6 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	6	Madjerda, Niger river and aquifer, North Western Sahara Aquifer System
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**85**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	50	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Bahrain

Bahrain SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	68.21	Chirps/CEDARE (83, focal point)
	I-1-2	Annual Precipitation Volume	BCM/Year	0.04	Chirps/CEDARE (0.05 focal point)
P-1-1		Annual Hail Fall Volume	BCM/Year	0	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.004	
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.0003	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.00**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.11	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.11**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.00**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.11**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	0.00	Definition not accurately understood.
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.00	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.12**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.11	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**0.23**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.00	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.00	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.00	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.0002**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**0.12**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**0.23**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.15	Assuming that the collected amount equal the produced (generated) onces since, so far, there is no accurate quantification for the produced quatities
P-1-15		Collected Municipal Wastewater	BCM/Year	0.15	MDG+

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
P-1-16		Treated Municipal WasteWater	BCM/Year	0.15	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.01	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.01	MDG+
P-1-19		Treated Industrial WasteWater	BCM/Year	0.01	
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.16**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.16**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.15**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	99	SDG (6.3.1) (100%)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.002**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.01	Represents water drained to the sea after being used for agriculture?
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.24	Excluding desalinated brackish non-renewable groundwater resources (Ras Abu-Jarjur Plant); this is necessary to avoid double counting
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.10	Taken as 90%
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.41**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**0.64**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.25	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.03	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.147	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**0.43**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.00**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.15**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.00	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.11	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.05	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.159**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.03	Water Statistics in GCC Countries (2015)
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.03**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.24	Does not include withdrawal from the brackish non-renewable groundwater for desalination
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.272**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.0002**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.001	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**0.001**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	Included in the agriculture use
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.02	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.00	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.02**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	0.364	GOIC (2013)
P-2-14		Navigation Water Flows	BCM/Year	NAp	Not Applicable
P-2-15		Environmental Water Flows	BCM/Year	NA	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.00	Included in the industrial use
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	0	3730, focal point
P-3-2		Change in Irrigated Agricultural Land	ha	(14)	
P-3-3		Change in Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	3,730	* Data of year 2013
P-3-5		Total Rain-fed Agricultural Land	ha	0	117, ESA/CEDARE
P-3-6		Total Pasture Area	ha	0	3096, ESA/CEDARE
P-3-7		Total Forests Area	ha	0	297, ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**14**	Calculated
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	14	
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	0	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	Calculated
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0**	Calculated
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**0.13**	Calculated (0.2511, FP)
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	99	(MDG+)

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
P-4-2		Public Taps	%	NA	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	99	(100%, Total: 100%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	99	(100%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	88	(100%, Total: 99%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	87	(99%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	100	SDG (6.1.1) (99%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	100	SDG (6.2.1a) (93%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	419,400	
	I-4-4	Length of Sewage Networks	km	3,262.30	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	199.3	
	I-4-7	Dam Storage Capacity	BCM	N/A	
	I-4-8	Drinking Water Capacity	BCM/Year	0.25	assumed equal to P-2-1, 0.00254, focal point
	I-4-9	Desalination Capacity	BCM/Year	0.31	Design capacity
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.15	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.01	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.16	assumed equal to P-1-20, 0.1325, focal point
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	1,370	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	3	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	85	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	85	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	465	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	116	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	0	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	315	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	107	Calculated

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	24	**Calculated**
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	183	**Calculated**
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	10	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	166	**Calculated**
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	100	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	
	I-7-3	Open Defecation Practice	Number	NA	
	I-7-4	Percentage of Open Defecation	%	NA	
	I-7-5	Cholera Reported Cases	Number/Year	NA	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	N/A	Parameter not measured.
p-8-2		pH	Dimensionless	6.75	6.7 (1), 6.8 (2)
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	8,055	7578 (1), 8531 (2)
P-8-4		Nitrogen Concentration	PPM	NA	Parameter not measured for ambient water quality.
P-8-5		Phosphorous Concentration	PPM	NA	Parameter not measured for ambient water quality.
	I-8-1	**Water Quality Index**	**Score/100**	NA	**Not calculated for ambient water quality.**
	I-8-2	Total Dissolved Solids (TDS)	PPM	5,084	4759 (1), 5408 (2)
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	Parameter not measured for ambient water quality.
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	Parameter not measured for ambient water quality.
	I-8-6	Chloride Concentration	mg/l	1,866	1121 (1), 2611 (2)
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	1,589	1428 (1), 1750 (2)
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	0	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	2	
	I-9-2	Total Wetlands Areas	ha	6,810	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	12	
	I-9-4	Number of Endangered Species	Number	2	
	I-9-5	Number of Invasive Species	Number	14	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0	**SDG (6.6.1) Calculated**

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
	10	Water & Climate			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	1	Normal floods do not belong to Class 1, Class 1.5, and Class 2. Photos presented in the workshop are of this type.
P-10-4		Average Temperature	C°	28.1	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.00	Global Assessment Report (GAR 2015) - UNISDR, Annual Average
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	NA	
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	0	
	I-10-9	Unusual Weather Hail Events	Number	0	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	No	
	I-10-11	Existing Early Warning System	Number	0	
	11	Water & Socio-Economics			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**384.75**	**Calculated from WB, 446.23 Represents water use efficiency in industry - the figures are preliminary**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.63**	**AOAD, CEDARE (Calculated), (0.62 Focal Point)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**54**	**Calculated from ILO (0.000081458, FP)**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**8,313**	**Calculated from ILO (0.001393527, FP)**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		
P-11-1		GDP	Billion $	30.55	
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.704	(MDG+) D = domestic, and C = Commercial - Data given are not reliable as discussed in the workshop.
P-11-3		Sanitation Average Tarrif	$/m3	NA	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.30	
	12	Water & Finance			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	NA	SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	18	Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	1.43	CEDARE, AOAD (1.35, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	2.88	CEDARE, AOAD (3.10, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0.01	ITC statistics/CEDARE (104.50, Focal Point)
	I-13-4	Bottled Water Import	MCM/Year	0.04	ITC statistics/CEDARE (37.90, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	No	Starting from June 2017, National Water Strategy based on IWRM is being implemented.
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	39.7	SDG (6.5.1) represents data of 2017.
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	No	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	100	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**NA**	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**NA**	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.045	Danilenko, et al (2014) & Aboelnga, H. (2018)
	I-14-13	Commercial Water Losses	BCM/Year	0.030	Danilenko, et al (2014) & Aboelnga, H. (2018)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**44.25**	**Calculated (50, focal point)**

P Code	I Code	Water Related Indicators	Units	Bahrain	Notes/ Year/ References
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-8.96**	**SDG (6.4.1),Calculated - This should be in $/m3 according to the indicator 6.4.1: if so the change in water use effeciency in 2015 is 52.17 US$/m3**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**137**	**SDG (6.4.2),Calculated - Figures given are not final - to be verified**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**137**	**Calculated, (To be verified)**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.22	To be verified
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.22	**estimated equal to I-14-19**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	1	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**0.03**	**Calculated (0.0268, focal Point?)**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	1	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**29.2**	**Excluding brackish non-renewable groundwater resources and agriculture drainage water - Figures to be verified**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	2	(2) Qatar, Saudi Arabia, 1 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	1	Umm er Radhuma-Dammam Aquifer: Gulf (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	0	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

All data and estimates are for 2015 unless otherwise mentioned.

All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Comoros

Comoros SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	2,144	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	3	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.20	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	1.00	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**1.20**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	FAO Aquastat
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	FAO Aquastat
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	2012.00
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	2012.00
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.00**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.20**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**1.00**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.00	2012
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**1.20**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.00	2012
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**1.20**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.04	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.01	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	1.19	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**1.25**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**2.45**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**2.45**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.004	estimated as 80% of domestic use
P-1-15		Collected Municipal Wastewater	BCM/Year	0.001	assumed % Total Sanitation Coverage of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.001	assumed equal to P-1-15
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.0004	estimated as 80% of industrial use

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
P-1-18		Collected Industrial Wastewater	BCM/Year	0.0001	assumed % Total Sanitation Coverage of Produced
P-1-19		Treated Industrial WasteWater	BCM/Year	0.0001	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.004**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.002**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.002**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	36	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.003**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.00	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.00	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.01**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**2.46**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.005	etimated as pop. increase rate from 2012
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.001	etimated as 1/4 pop. Increaserate from 2012
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.005	etimated as 1/4 pop. Increase rate from 2012
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**0.01**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.04**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.05**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.005	estimated as 50% of I-2-1
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.005	estimated as 50% of I-2-1
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.01**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	estimated
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.00	estimated
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	estimated
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.00	estimated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**1.25**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.09	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**1.34**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.01	USGS/CEDARE

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.01**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NAp	Not Applicable
P-2-15		Environmental Water Flows	BCM/Year	NA	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	NA	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	261	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	(747)	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	567	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	132,984	ESA/CEDARE
P-3-6		Total Pasture Area	ha	14,256	ESA/CEDARE
P-3-7		Total Forests Area	ha	6,930	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**261**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	225	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	27	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	9	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	1.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.00**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.58	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.58	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**2.45601**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	63	JMP 2018
P-4-2		Public Taps	%	NA	
P-4-3		Other Improved Drinking Water	%	NA	
P-4-4		Improved Urban Drinking Water Coverage	%	93	(93%, Total: 90%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	88	(88%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	48	(48%, Total: 36%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	31	(31%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%		

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	90	SDG (6.1.1) assumed as MDG
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	36	SDG (6.2.1a) assumed as MDG
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	0	
	I-4-4	Length of Sewage Networks	km	0	
	I-4-5	Length of Irrigation Networks	km	0	
	I-4-6	Length of Drainage Networks	km	0	
	I-4-7	Dam Storage Capacity	BCM	0.00	
	I-4-8	Drinking Water Capacity	BCM/Year	0.005	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.00	assumed equal to I-1-17
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.001	assumed equal to P-1-16
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.0001	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.002	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	2	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	806	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	3,039	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	1,488	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	3,039	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	3,046	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	13	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	1,551	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,563	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	6	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	1	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	6	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	85	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	518	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	
	I-7-3	Open Defecation Practice	Number	64,000	WHO
	I-7-4	Percentage of Open Defecation	%	1	WHO
	I-7-5	Cholera Reported Cases	Number/Year	NA	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	3	RAMSAR
	I-9-2	Total Wetlands Areas	ha	16,030	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	19	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	1	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	NA	
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	4	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	I-11-1	**Industrial Water Productivity**	**$/CM**	**223**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**6.03**	**Calculated from WB**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**2,257**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**53,426**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	0.99	World Bank 2015
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	NA	
P-11-3		Sanitation Average Tarrif	$/m3	NA	
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	5.65	2012 SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	50000 for period:2000-2015
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	0	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.001	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	0	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	Not Available
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	**Calculated**
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**NA**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	

P Code	I Code	Water Related Indicators	Units	Comoros	Notes/ Year/ References
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.002	estimated 40% of domestic use
	I-14-13	Commercial Water Losses	BCM/Year	NA	
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**46**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-3**	**SDG (6.4.1)**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**0.86**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**2.23**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.006	estimated equal to I-14-20
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.006	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**0**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	NAp	Not Applicable
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	NAp	Not Applicable
	I-15-4	Number of Shared Water Resources Bodies	Number	NAp	Not Applicable
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**NAp**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	NAp	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**NAp**	**Not Applicable**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Djibouti

Djibouti SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	116.70	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	2.41	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.3	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.015	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.30**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.020	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.010	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.030	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.010	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.050**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.310**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.035**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	200	en mètre
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.015	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.330**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.015	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**0.345**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.01	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.11	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.001	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.11**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**0.44**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**0.46**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.02	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.003	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.003	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.001	estimated as 80% of industrial use
P-1-18		Collected Industrial Wastewater	BCM/Year	0.0003	assumed % Total Sanitation Coverage of Produced
P-1-19		Treated Industrial WasteWater	BCM/Year	0.0003	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.003**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.003**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	13	SDG (6.3.1) (18%)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.001	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.002	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.05**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**0.51**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.03	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.001	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.006	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**0.04**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.01**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.01**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.008	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.025	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.03**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.000	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.003	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.0003	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.003**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.002	assumed equal to I-1-17
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.005**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.11**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.45	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**0.56**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	4.71	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.36	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**5.07**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NAp	Not Applicable
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	414	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	1,395	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	3,114	ESA/CEDARE
P-3-6		Total Pasture Area	ha	88,479	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
P-3-7		Total Forests Area	ha	1,350	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**153**	Calculated
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	153	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0**	Calculated
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	1.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year		
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0**	Calculated
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**1.44**	Calculated
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	80	JMP 2018
P-4-2		Public Taps	%	1	(MDG+)
P-4-3		Other Improved Drinking Water	%	1	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	93	(97%, Total: 90%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	71	(65%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	71	(60%, Total: 47%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	34	(5%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	90	MDG+
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	90	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	47	SDG (6.2.1a)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	400	
	I-4-4	Length of Sewage Networks	km	38	
	I-4-5	Length of Irrigation Networks	km	0	
	I-4-6	Length of Drainage Networks	km	0	
	I-4-7	Dam Storage Capacity	BCM	0	
	I-4-8	Drinking Water Capacity	BCM/Year	0.030	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.003	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.008	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.000	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.003	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	939	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	441	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	351	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	473	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	539	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	34	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	121	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	161	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	6	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	1	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	32	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	113	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	354	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	Not Available
	I-7-3	Open Defecation Practice	Number	216,039	WHO
	I-7-4	Percentage of Open Defecation	%	23	WHO
	I-7-5	Cholera Reported Cases	Number/Year	127	WHO - 2011
	I-7-6	Typhoid Reported Cases	Number/Year	NA	Not Available
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	Not Available
	I-7-8	Diarrhea Prevalence	%	NA	Not Available
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	Not Available
p-8-2		pH	Dimensionless	NA	Not Available
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	Not Available
P-8-4		Nitrogen Concentration	PPM	NA	Not Available
P-8-5		Phosphorous Concentration	PPM	NA	Not Available
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	**Not Available**
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	Not Available
	I-8-3	Fecal Choliform	Colonies/100ML	NA	Not Available
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	Not Available
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	Not Available
	I-8-6	Chloride Concentration	mg/l	NA	Not Available
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	Not Available
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	Not Available
	9	**Water & Ecosystems**			

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	1	RAMSAR
	I-9-2	Total Wetlands Areas	ha	3000	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	13	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	NA	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.01	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (0.19 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	6	Global Assessment Report (GAR 2015) - UNISDR, Annual average (2005-2014) Mortality
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**274**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**4.22**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**15,586**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**27,700**	**Calculated from ILO (800 focal point)**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	200	
P-11-1		GDP	Billion $	1.46	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.07	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	0.49	Danilenko, et al (2014)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.5	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	

P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0.16	SDG (6.a.1) (OECD.Stat (2015), 121 FP)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	0	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.02	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	0.78	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.003	ITC statistics/CEDARE (1.82, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	NA	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	15	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	No	
P-14-1		Surface Water Permits Issued to Date	Number	NA	Not Available
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	Not Available
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	4	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	N	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	%	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	0	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**100**	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.006	WSS (2016) & Aboelnga, H. (2018), 46% FP
	I-14-13	Commercial Water Losses	BCM/Year	0.004	WSS (2016) & Aboelnga, H. (2018)
	I-14-14	Physical Irrigation Water Losses	BCM/Year		
	I-14-15	**Overall Water Use Efficiency**	**%**	**34**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-16**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**10**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**9**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.02	Calculated

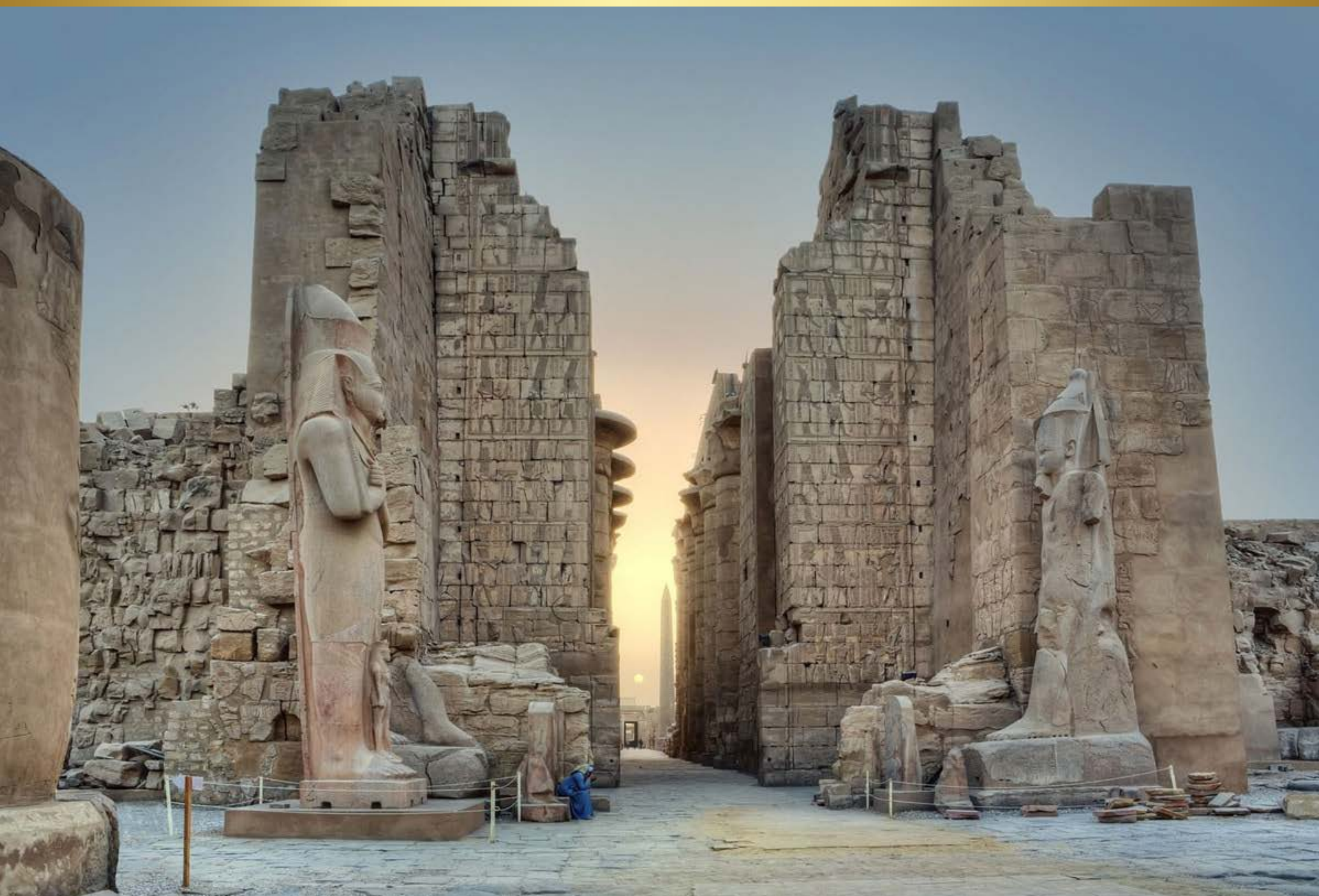
P Code	I Code	Water Related Indicators	Units	Djibouti	Notes/ Year/ References
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.02	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	2	
P-14-5		Number of Water Users Associations	Number	35	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**NA**	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**15**	Calculated (75%, FP)
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	1	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	1	
	I-15-4	Number of Shared Water Resources Bodies	Number	1	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**100**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	Calculated

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

All data and estimates are for 2015 unless otherwise mentioned.

All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Egypt



Egypt SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	1.8	22.4, Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	1.8	23.6, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	Not Available
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	Not Available
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.50	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.50	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**1.00**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	55.50	MWRI
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0	MWRI
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	1	FAO Aquastat
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	MWRI
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**56.50**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**56.00**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**1.50**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	200	CEDARE
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0	CEDARE/Aquastat
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**57.50**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	4.90	MWRI
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**62.40**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.41	(0.052+2.175=2.23), ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.07	0.000199, ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.26	0.000359, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.74**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**58.24**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**63.14**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	6.50	Egypt MWRI/CEDARE
P-1-15		Collected Municipal Wastewater	BCM/Year	4.60	estimated
P-1-16		Treated Municipal WasteWater	BCM/Year	4.10	estimated
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	4.20	Egypt MWRI/CEDARE
P-1-18		Collected Industrial Wastewater	BCM/Year	0.20	estimated

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
P-1-19		Treated Industrial WasteWater	BCM/Year	0.15	estimated
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**10.7**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**4.80**	**MWRI**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**4.25**	**MWRI**
	I-1-15	Proportion of Wastewater Safely Treated	%	40	SDG (6.3.1), (15%, MWRI)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**6.45**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	9.31	MWRI
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.35	MWRI
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	7.5	MWRI/Redefined
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**27.86**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**91.00**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	10.46	CEDARE (10.75, MWRI)
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	5.40	MWRI
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	61.10	MWRI
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**76.96**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.41**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**61.51**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	55.50	should include rain harvesting
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	7.50	MWRI (Recycled Groundwater)
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	2.1	MWRI
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**57.6**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	9.31	MWRI
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	2.20	MWRI
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.005	Egypt SOE 2015
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**2.2**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.35	MWRI
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**19.36**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.74**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	39.34	36.80, USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**40.08**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	Not Available
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	0.7	MWRI
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	6.80	USGS/CEDARE, (redefined) (6.08, FP)
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	2.30	0.83, USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**9.10**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	597	HCWW/CEDARE

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
P-2-14		Navigation Water Flows	BCM/Year	0	MWRI
P-2-15		Environmental Water Flows	BCM/Year	0	MWRI
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0	Not Available
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	-17,145	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-24,642	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	-2,232	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	3,738,000	3,809,358 ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	25,650	ESA/CEDARE, (164,789 FP)
P-3-6		Total Pasture Area	ha	882	ESA/CEDARE, (1425492 FP)
P-3-7		Total Forests Area	ha	1,953	ESA/CEDARE (102,123 fP)
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**32,004**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	26,388	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	2,592	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	2,997	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	27	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.02**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.02	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	Not Available
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	273	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	Not Available
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.02**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.29	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.31	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	Not Available
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**301.16**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	97	HCWW/MWRI, (98 JMP 2018)
P-4-2		Public Taps	%	1.15	HCWW/MWRI
P-4-3		Other Improved Drinking Water	%	0	HCWW/MWRI
P-4-4		Improved Urban Drinking Water Coverage (MDG)	%	99	HCWW/MWRI (100%, Total: 99%, JMP 2015)
P-4-5		Improved Rural Drinking Water Coverage (MDG)	%	98	HCWW/MWRI (99%, JMP 205)
P-4-6		Improved Urban Sanitation Coverage (MDG)	%	50	HCWW/MWRI, (97%, Total: 95%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage (MDG)	%	35	HCWW/MWRI, (93%, JMP 2015)

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
P-4-8		Everyday Accessibility to Drinking Water	%	98	HCWW/MWRI
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	98	SDG (6.1.1), HCWW/ MWRI
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	51	SDG (6.2.1a), HCWW (2018), (61% JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	161,850	HCWW/MWRI
	I-4-4	Length of Sewage Networks	km	46,173	HCWW/MWRI
	I-4-5	Length of Irrigation Networks	km	33,550	MWRI
	I-4-6	Length of Drainage Networks	km	23,867	MWRI
	I-4-7	Dam Storage Capacity	BCM	174.00	MWRI
	I-4-8	Drinking Water Capacity	BCM/Year	12.80	HCWW/MWRI
	I-4-9	Desalination Capacity	BCM/Year	0.35	NCWW/MWRI
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	3.73	HCWW (2018)/CEDARE
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.00	Egypt SOE 2015
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	4.80	Assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	120.00	MWRI
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	13,545	MERE (2017)
	I-5-2	Hydropower as % of Total Generated Electricity	%	7	MERE (2017), CEDARE
	I-5-3	Installed Hydropower Capacity	MW	2800	MERE (2017)
	I-5-4	Water Used to Generate Electricity	BCM/Year	186	MWRI
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	91,023	MWRI
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	19.11	**Calculated**
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	631.71	**Calculated**
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	639.82	**Calculated**
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	999.73	**Calculated**
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	632.80	**Calculated**
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	8.12	**Calculated**
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	853.62	**Calculated**
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	671.26	**Calculated**
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	59.33	**Calculated**
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	114.92	**Calculated**
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	1,429	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	53,294	**Calculated**
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	98	SDG (6.2.1b), MWRI
	I-7-2	Dracunculiasis Reported Cases	%	0	MWRI

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
	I-7-3	Open Defecation Practice	Number	0	MWRI
	I-7-4	Percentage of Open Defecation	%	0	MWRI
	I-7-5	Cholera Reported Cases	Number/Year	0	MWRI
	I-7-6	Typhoid Reported Cases	Number/Year	4,852	MWRI
	I-7-7	Hepatitis A Reported Cases	Number/Year	6,921	MWRI
	I-7-8	Diarrhea Prevalence (Children < 5 Years old)	%	18	MWRI
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	6.74	SOE 2015/CEDARE
p-8-2		pH	Dimensionless	7.81	MWRI/CEDARE
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	N/A	expressed in TDS below
P-8-4		Nitrogen / Ammonia Concentration	PPM	0.86	SOE 2015/CEDARE
P-8-5		Phosphorous Concentration	PPM	0.45	SOE 2015/MWRI/CEDARE
	I-8-1	**Water Quality Index**	**Score/100**	**85.4**	**SOE 2015/MWRI/CEDARE**
	I-8-2	Total Dissolved Solids (TDS)	PPM	433.48	SOE 2015/MWRI/CEDARE
	I-8-3	Fecal Choliform	Colonies/100ML	26,527	MWRI/CEDARE
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	9.09	SOE 2015/MWRI/CEDARE
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	14.41	SOE 2015/MWRI/CEDARE
	I-8-6	Chloride Concentration	mg/l	3.2	MWRI/CEDARE
	I-8-7	Total Hardness (CaCo3)	mg/l	NA	Not Available
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NAp	Not Applicable
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	4	MWRI
	I-9-2	Total Wetlands Areas	ha	430,000	MWRI, (RAMSAR Site 2015 (415,532 ha))
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	83	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**53.85**	**SDG (6.3.2),(47, MWRI, SoE 2015, MoH, CEDARE)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	-0.13	**2012-2015 Annual Change, SDG (6.6.1)**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	6	Attia, Karima (2017)
P-10-4		Average Temperature	C°	23.366	MWRI
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.05	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (161.27 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	31	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	1	
	I-10-9	Unusual Weather Hail Events	Number	1	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	NA	Not Available
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**22.57**	**Calculated from World Bank (38.34, MWRI)**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.59**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**111**	**Calculatd from ILO (161.19, MWRI)**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**1,224**	**Calculated from ILO (19.86, MWRI)**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	330.78	MWRI
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.07	HCWW/MWRI
P-11-3		Sanitation Average Tarrif	$/m3	0.02	HCWW/MWRI
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.27	Danilenko, et al (2014)
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	1.3	MWRI
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	0.2	MWRI
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	170	SDG (6.a.1), OECD (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	Not Available
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	76	MWRI
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	Not Available
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	0	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	1404.00	Ministry of Finance (2015)
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	7.84	AOAD / CEDARE (18.71, MWRI)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	49.29	AOAD / CEDARE (47.35, MWRI)
	I-13-3	Bottled Water Export	MCM/Year	0	UN COMTRADE and ITC statistics
	I-13-4	Bottled Water Import	MCM/Year	0.002	UN COMTRADE and ITC statistics

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
	14	Water & Governance			
	I-14-1	IWRM Plan	Yes/No	Yes	MWRI
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	40	SDG (6.5.1), MWRI
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	MWRI
P-14-1		Surface Water Permits Issued to Date	Number	1,346	MWRI
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	Not Available
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	48,068	MWRI
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	5.2	Egypt MWRI, CEDARE (2015)
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**54**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	45,000	MWRI
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	MWRI (2673 complaints in 2012)
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	4.05	HCWW (631450 Complaints, 15.6 Million Households)
	I-14-9	Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	79	IBNET (2015)
	I-14-10	**Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**71**	**34066 meters (Egypt MWRI, CEDARE (2015))**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**NA**	**6924 meters (Egypt MWRI, CEDARE (2015))**
	I-14-12	Physical Domestic Water Losses	BCM/Year	2	Nahla (2018), HCWW/ CEDARE
	I-14-13	Commercial Water Losses	BCM/Year	0.90	Nahla (2018), HCWW/ CEDARE
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	Not Available
	I-14-15	**Overall Water Use Efficiency**	**%**	**81**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**15**	**SDG (6.4.1), calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**113**	**SDG (6.4.2), calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**100**	
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	12.46	MWRI
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	12.46	**MWRI**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	25,322	Egypt MWRI, CEDARE (2015)
P-14-5		Number of Water Users Associations	Number	8,253	13,122 (CIHEAM Bari 2015)
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**2.3**	**(3388542 ha) CIHEAM Bari 2015, calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	Water & International Relations			

P Code	I Code	Water Related Indicators	Units	Egypt	Notes/ Year/ References
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**99**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	8	CEDARE
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	13	MWRI
	I-15-4	Number of Shared Water Resources Bodies	Number	2	MWRI, Nile River (S), Nubian Aquifer (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**62**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	NA	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Iraq

Iraq SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	175.00	185.92, Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	77.00	93.07, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	2	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	12.20	34, FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	3.20	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**13.40**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	27.15	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	1.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.08	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**27.23**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**38.35**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**3.28**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	2.00	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**39.63**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	1.00	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**40.63**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	2.20	24.15, ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	11.26	7.54, ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	1.95	0.14, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**15.41**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**55.04**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**56.04**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	1.09	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.62	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.23	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.14	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.01	
P-1-19		Treated Industrial WasteWater	BCM/Year	0.01	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**1.23**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.63**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.24**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	20	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.99**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	6.97	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.01	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**8.21**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**64.25**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	5.20	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	1.78	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	32.50	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**40.03**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**2.20**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**34.70**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	36.23	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	1.64	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.40	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**38.27**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	1.74	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.00	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.012	
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**1.76**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**15.41**	**Calculated (31.83, USGS/ CEDARE)**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	38.13	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**53.54**	**Calculated (69.96, USGS/ CEDARE)**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	23.82	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	8.39	USGS/CEDARE (2, FP)
	I-2-11	**Evaporation Losses**	**BCM/Year**	**32.21**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	0.00	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.55	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	8,757	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-275,000	-135
P-3-3		Change in Rain-fed Agricultural Land	ha	17,658	ESA/CEDARE, (0,FP)
P-3-4		Total Irrigated Agricultural Land	ha	3,250,000	

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
P-3-5		Total Rain-fed Agricultural Land	ha	1,250,000	4,587,965 ESA/CEDARE
P-3-6		Total Pasture Area	ha	3,432,546	ESA/CEDARE, 6,000,000 FP
P-3-7		Total Forests Area	ha	33,786	ESA/CEDARE, 2,217,000 FP
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**31,608**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	4,000	
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	24,080	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	3,528	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	216	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.00**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	7.71	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	7.71	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year		
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**297**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	85	(82 JMP 2018)
P-4-2		Public Taps	%	10	(MDG+)
P-4-3		Other Improved Drinking Water	%	12	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	94	(94%, Total: 87%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	70	(70%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	86	(86%, Total: 86%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	84	(84%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	90	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	62	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	86	SDG (6.2.1a) (32%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	0	
	I-4-4	Length of Sewage Networks	km	5,639	
	I-4-5	Length of Irrigation Networks	km	53,463	
	I-4-6	Length of Drainage Networks	km	95,000	
	I-4-7	Dam Storage Capacity	BCM	151.80	
	I-4-8	Drinking Water Capacity	BCM/Year	5.20	
	I-4-9	Desalination Capacity	BCM/Year	0.01	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.26	

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.01	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.63	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	72.00	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	1,752	
	I-5-2	Hydropower as % of Total Generated Electricity	%	1.8	
	I-5-3	Installed Hydropower Capacity	MW	2,439	
	I-5-4	Water Used to Generate Electricity	BCM/Year	3.54	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	36,934	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	780	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	1,073	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	1,490	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,740	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	1,036	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	417	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,501	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	880	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	48	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	141	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	4,964	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	5,400	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	286	
	I-7-6	Typhoid Reported Cases	Number/Year	900	
	I-7-7	Hepatitis A Reported Cases	Number/Year	350	
	I-7-8	Diarrhea Prevalence	%	0.01	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	7.5	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	0.98	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	635	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	4	
	I-9-2	Total Wetlands Areas	ha	537,900	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	264	
	I-9-4	Number of Endangered Species	Number	6	
	I-9-5	Number of Invasive Species	Number	57	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.06	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	0	
P-10-2		Number of Class 1.5 Flood Events	Number	0	
P-10-3		Number of Class 2 Flood Events	Number	0	
	I-10-1	Total Number of Floods in Last Three Years	Number	6	floodlists.com
P-10-4		Average Temperature	C°	24	
	I-10-2	Monthly Drought Events	Number	0	
	I-10-3	Annual Drought Events	Number	0	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.15	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (344.33 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	0	
	I-10-6	Annual Human Losses Related to Floods	Number	69	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	0	
	I-10-9	Unusual Weather Hail Events	Number	0	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**42**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.27**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**47**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**1,127**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		
P-11-1		GDP	Billion $	223.51	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.007	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	0.007	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.06	0.46, Danilenko, et al (2014)

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	299.06	SDG (6.a.1), OECD.Stat (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	0	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	9	30, Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	0	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.11	CEDARE, AOAD (0.12, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	4.40	CEDARE, AOAD (7.06, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0.0001	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.02	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	35	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	97%	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	83,000	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.74	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**36.23**	Calculated
	I-14-6	Number of Unlicensed Wells	Number	47,000	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	31	IBNET (2017)
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.81	25%, Danilenko, et al (2014)
	I-14-13	Commercial Water Losses	BCM/Year	0.54	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	3.49	
	I-14-15	**Overall Water Use Efficiency**	**%**	**83**	Calculated
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**36**	**SDG (6.4.1), Calculated**

P Code	I Code	Water Related Indicators	Units	Iraq	Notes/ Year/ References
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**97**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**73.53**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	6.46	5.46 FP
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	6.46	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	1360	
P-14-5		Number of Water Users Associations	Number	71	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**5**	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**69**	**Calculated, (56, FP)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	5	2 Agreements over the Euphartes - 3 Agreements over the Tigris
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	19	(6), Jordan (2), Syria (4), Saudi Arabia (5), Turkey (3), Iran (3), Kuwait (2), 3 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	9	Euphartes (S), Tigris (S), Shatt al Arab (S), Widyan-Salman (G), Dibdibba (G), Jezira (G), TaurusZagros ,(G), Sakaka-Rutba (G), Ga'ara (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**26**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**56**	**Calculated, 34 BCM/Y**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

*All data and estimates are for 2015 unless otherwise mentioned.

*All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Jordan

Jordan SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	100.68	"Long Term Average =91.73, 91.68 respectively, Jordan effective area 88240 km2 source Facts and Figures 2015, (129.2, Chirps/CEDARE) Source: MWI Water Budget 2014/2015"
	I-1-2	Annual Precipitation Volume	BCM/Year	8.88	Source: Water Budget 2014/2015, (12.684, Chirsps/CEDARE)
P-1-1		Annual Hail Fall Volume	BCM/Year	11.00	JMD estimation
P-1-2		Annual Snow Fall Volume	BCM/Year	0.97	JMD estimation
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.32	JVA Annual Report 2012, 2015
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.49	Source Facts and Figures 2015
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.81**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.06	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.06	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.12**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.38**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.54**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	347	the data included is the Average Depth from Ground Surface to Groundwater Surface Level in meter
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.00	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.92**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.157	Disi =152, 143--Abu zigan and others=14,14
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**1.08**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.09	1.34 ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.61	0.20, ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.06	0.01, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.760**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**1.68**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**1.84**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.17	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.15	MDG+ WAJ Annual report 2015
P-1-16		Treated Municipal WasteWater	BCM/Year	0.15	WAJ Annual report 2015
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.03	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.03	MDG+
P-1-19		Treated Industrial WasteWater	BCM/Year	0.03	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.20**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.18**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.18**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	90	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.20	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.01	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.02	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.41**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**2.25**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.457	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.038	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.711	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**1.21**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.09**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.80**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.27	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.60	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.16	**Calculated**
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**1.03**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.13	WAJ Annual report 2015
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.03	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.160**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.01	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.17**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.76**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.83	0.54, USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**1.59**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	0.95	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	0.004	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	6.10	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.74	USGS/CEDARE

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	I-2-11	**Evaporation Losses**	**BCM/Year**	**6.83**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	0.02	
P-2-14		Navigation Water Flows	BCM/Year	0.00	
P-2-15		Environmental Water Flows	BCM/Year	0.23	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.001	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	1,863	(5670, ESA/CDARE) (percentage change from 2012 is 0.17%), FAO, electronic files and web site.
P-3-2		Change in Irrigated Agricultural Land	ha	6,100	0, (ESA/CEDARE) (Percentage change from 2014 = 0.53, change from 2012 =0.63%)
P-3-3		Change in Rain-fed Agricultural Land	ha	-15,576	5103, (ESA/CEDARE), decreased by 10%
P-3-4		Total Irrigated Agricultural Land	ha	102,500	216, (ESA/CEDARE)
P-3-5		Total Rain-fed Agricultural Land	ha	156,900	508860, (ESA/CEDARE)
P-3-6		Total Pasture Area	ha	741,700	97578, (ESA/CEDARE)
P-3-7		Total Forests Area	ha	114,880	(3708, ESA/CEDARE) natural = 50 800ha; Planted forests estimated 45 000 ha. sum of in 2012 = 79304; sum in up to 2014 and 2015 (MOA)
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**5,715**	**Calculated (210,000 FP)**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE, (1000, FP)
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	5,166	ESA/CEDARE, (139000, FP)
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	540	ESA/CEDARE, (34000, FP)
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	9	ESA/CEDARE, (36000, FP)
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE (545.4, FP)
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE (540, FP)
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	2.7	Bakri 2015
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	23	ESA/USGS/Chirps/CEDARE, (13.5, Bakri 2015)
P-3-15		Impact of NDVI Change on ET	MCM/Year	10.8	Bakri 2015
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.72	ESA/USGS/Chirps/CEDARE (322, FP)
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.72	ESA/USGS/Chirps/CEDARE (325, FP)
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	10.8	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**53.78**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	97	(86 JMP 2018)

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
P-4-2		Public Taps	%	0	(MDG+)
P-4-3		Other Improved Drinking Water	%	3	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	99	(92%, Total: 97%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	97	(98%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	99	(99%, Total: 99%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	96	(99%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	97	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	93	SDG (6.1.1) (93%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	77	SDG (6.2.1a) (77%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	26,285	Miyahuna and WAJ Reports
	I-4-4	Length of Sewage Networks	km	6,140	Miyahuna and WAJ Reports
	I-4-5	Length of Irrigation Networks	km	1,025	
	I-4-6	Length of Drainage Networks	km	150	
	I-4-7	Dam Storage Capacity	BCM	0.33	
	I-4-8	Drinking Water Capacity	BCM/Year	0.46	
	I-4-9	Desalination Capacity	BCM/Year	0.02	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.15	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.03	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.18	
	I-4-13	Maximum Annual Dam Storage Reached	BCM	0.33	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	2.19	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	6	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0.06	King Talal (average water storage)
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	9,532	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	164	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	97	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	176	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	236	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	108	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	80	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	206	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	75	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	4	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	48	Calculated

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	135	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	145	**Calculated**
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	WB-JMP
	I-7-4	Percentage of Open Defecation	%	0	WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation (http://www.wssinfo.org/).
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	0	
	I-7-7	Hepatitis A Reported Cases	Number/Year	38	WHO -WeeklyEpidemiological Monitor
	I-7-8	Diarrhea Prevalence	%	11	Children Under 5 WB Data
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM		
p-8-2		pH	Dimensionless	7.6	DPIWE (2003)
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	920	DPIWE (2003)
P-8-4		Nitrogen Concentration	PPM	44	Rusaifa Field see sheet 2
P-8-5		Phosphorous Concentration	PPM	0.12	WAJ Lab Reports
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	650	
	I-8-3	Fecal Choliform	Colonies/100ML		
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	22	Surface water-Outlet of WWTP+ GW Average (inlet water at Samra Water 620 mg/l)
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	2	RAMSAR
	I-9-2	Total Wetlands Areas	ha	13,472	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	15	Clearing House Mechanism of Biodiversity in Jordan
	I-9-4	Number of Endangered Species	Number	2	Clearing House Mechanism of Biodiversity in Jordan
	I-9-5	Number of Invasive Species	Number	45	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**92**	**SDG (6.3.2), Calculated, (92, UN Environment/UN-Water (2018))**

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	SDG (6.6.1) Calculated
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	7	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.00	11.5 Global Assessment Report (GAR 2015) - UNISDR, Annual Average (4328.15 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	0	
	I-10-6	Annual Human Losses Related to Floods	Number	NA	
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	0	
	I-10-9	Unusual Weather Hail Events	Number	1	JMD
	I-10-10	National Climate Change Adaptation Plan	Yes/No	yes	
	I-10-11	Existing Early Warning System	Number	3	Wadi Al Yutum, KAC, Azraq
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**259**	**Calculated from WB (109.60 Water Valuation study ISSP USAID)**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**1.73**	**AOAD, CEDARE (Calculated), (0.66 Focal Point)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**90**	**Calculated from ILO (23.49 focal point)**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**13,193**	**Calculated from ILO (6588.39 focal point)**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	30.62	
P-11-1		GDP	Billion $	37.62	CBJ
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.02	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	0.48	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	2.25	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	9	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	11	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	121.91	SDG (6.a.1) Budget law-WAJ
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	87	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	83	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	0	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	975	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.74	CEDARE, AOAD (0.12, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	9.81	CEDARE, AOAD (7.06, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0.02	ITC statistics/CEDARE (0, Focal Point)
	I-13-4	Bottled Water Import	MCM/Year	0.004	ITC statistics/CEDARE (0.001, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	No/ Partially	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	40	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	No/ Partially	
P-14-1		Surface Water Permits Issued to Date	Number	187	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	0.05	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	16	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	3,138	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.49	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**64**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	850	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	33	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	100	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**100**	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**100**	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.10	Danilenko, et al (2014), 0.11 (FP)
	I-14-13	Commercial Water Losses	BCM/Year	0.07	Danilenko, et al (2014), 0.11 (FP)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	0.03	
	I-14-15	**Overall Water Use Efficiency**	**%**	**79**	**Calculated (67%, FP)**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**0**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**150**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**67**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.22	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.22	**estimate equal to 1-14-19, (0, FP)**

P Code	I Code	Water Related Indicators	Units	Jordan	Notes/ Year/ References
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	5	
P-14-5		Number of Water Users Associations	Number	28	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**80**	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	80	SDG (6.b.1) estimated equal to I-14-22
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	0	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**43**	Calculated
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	7	2, Syria in 2012; Syria and Saudi Arabia (SA) in 2015. Solely intended for transboundary water resources. (FP)
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	16	(7), Lebanon (1), Syria (6), Saudi Arabia (3), Turkey (1), Palestine (1), Iraq (2), Israel (1), 10 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	8	Jordan Valley surface water Basin/Israel, Yarmouk Surface water/ Syria and Israel, Yarmouk GW/Syria, Amman Zarqa Basin GW /Syria and surfac water Syria, Azraq GW/Syria and Iraq and SW/Syria, Disi/SA
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**44**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	75	SDG (6.5.2) (only Syrian agreement is not operational
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**70**	**the historical flow of yarmouk water river and GW basin has been reduced by 70% due to Syrian Upstream structures**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

All data and estimates are for 2015 unless otherwise mentioned.

All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Kuwait

Kuwait SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	98.00	69.91, (Chirps/CEDARE)
	I-1-2	Annual Precipitation Volume	BCM/Year	1.30	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.00**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.02	FAO Aquastat
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.02**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.02**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	130	60-200
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.02**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.08	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**0.10**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.01	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.02	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.00	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.02**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**0.04**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**0.13**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.31	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.31	
P-1-16		Treated Municipal WasteWater	BCM/Year	0.29	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.01	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.01	assumed % Total Sanitation Coverage of Produced
P-1-19		Treated Industrial WasteWater	BCM/Year	0.01	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.32**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.32**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.30**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	94	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	Calculated
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.00	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.68	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.0747	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**1.08**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**1.20**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	1.00	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.02	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.13	0.04845
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**1.15**	Calculated (+Withdrawals (for Oil & Gas
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.01**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.14**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.00	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.00	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.37	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.37**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.000	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.083	90 % from treated
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.009	estimated equal to treated (P-1-19)
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.092**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.683	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.775**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.02**	USGS/CEDARE
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.10	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**0.12**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	0.00	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.481	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.001	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.483**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	0.019	19 Million l/year
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.00	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	504	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	54	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
P-3-4		Total Irrigated Agricultural Land	ha	18	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	14,877	ESA/CEDARE
P-3-6		Total Pasture Area	ha	28,323	ESA/CEDARE
P-3-7		Total Forests Area	ha	0	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**504**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	54	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	450	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.00**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.02	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.02	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**4.74**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	92	(MDG+)
P-4-2		Public Taps	%	8	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	
P-4-4		Improved Urban Drinking Water Coverage	%	99	(99%, Total: 99%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	99	(99%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	100	(100%, Total: 100%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	100	(100%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	99	SDG (6.1.1) (100%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	100	SDG (6.2.1a) (100%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	9,611	
	I-4-4	Length of Sewage Networks	km	5,500	
	I-4-5	Length of Irrigation Networks	km	8,083	
	I-4-6	Length of Drainage Networks	km	0	
	I-4-7	Dam Storage Capacity	BCM	0	
	I-4-8	Drinking Water Capacity	BCM/Year	1.00	Capacity of water tanks (0.0194)
	I-4-9	Desalination Capacity	BCM/Year	0.88	

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.31	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.01	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.32	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	4,239	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	6	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	5	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	10	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	284	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	88	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	6	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	277	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	31	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	5	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	235	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	42	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	0	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	100	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	0	
	I-7-7	Hepatitis A Reported Cases	Number/Year	0	
	I-7-8	Diarrhea Prevalence	%	0	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	6.8	6.4-7.2
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	181	82-280
P-8-4		Nitrogen Concentration	PPM	0.003	0-0.006
P-8-5		Phosphorous Concentration	PPM	0.0005	0-0.001
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	87	39-135
	I-8-3	Fecal Choliform	Colonies/100ML	NA	

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	22.05	4.1-40
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	1	Abdullah Al-Mubarak in Boubyan Island
	I-9-2	Total Wetlands Areas	ha	50,948	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	19	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**Calculated**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	-0.13	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NAp	
P-10-2		Number of Class 1.5 Flood Events	Number	NAp	
P-10-3		Number of Class 2 Flood Events	Number	NAp	
	I-10-1	Total Number of Floods in Last Three Years	Number	2	floodlists.com
P-10-4		Average Temperature	C°	25.5	Average in summer 45 and in winter 6
	I-10-2	Monthly Drought Events	Number	NAp	
	I-10-3	Annual Drought Events	Number	NAp	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.00	Global Assessment Report (GAR 2015) - UNISDR, Annual Average
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	1	Global Assessment Report (GAR 2015) - UNISDR, Annual average (2005-2014) Mortality
	I-10-7	Annual Human Losses Related to Droughts	Number	NAp	
	I-10-8	Unusual Weather Snow Events	Number	NAp	
	I-10-9	Unusual Weather Hail Events	Number	NAp	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	NAp	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**2,824**	**Calculated from WB (9092.18 Focal Point)**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**4.52**	**AOAD, CEDARE (Calculated), (1.91 Focal Point)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**376**	**Calculated from ILO (0.0001 Focal Point)**

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**25,326**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	16.12	Freshwater production per employee: 8105282 Imperial gallons and number of employees in the ministry 18525
P-11-1		GDP	Billion $	112.92	KD 34.3 billion
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.63	(MDG+) (0.58, Danilenko, et al (2014))
P-11-3		Sanitation Average Tarrif	$/m3	0.7	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	18.42	18.1, ODI (2016)
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%		
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0.00	
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%		
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	11	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	39.4	OECD.Stat (2015)
	I-12-8	Total Investment in Water & Sanitation	Million US$	20,806	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.87	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	7.95	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.04	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.15	ITC statistics/CEDARE (0.019, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	100	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	**Calculated**
P-14-3		Groundwater Well Permits Issued to Date	Number	372	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.0201	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**5**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	

P Code	I Code	Water Related Indicators	Units	Kuwait	Notes/ Year/ References
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	100	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**NA**	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**NA**	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.04	0.12, Danilenko, et al (2014) & Al-Khalid, et al (2013)
	I-14-13	Commercial Water Losses	BCM/Year	0.08	0.08, Danilenko, et al (2014) & Al-Khalid, et al (2013)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**79**	Calculated
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**61**	Calculated
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**1872**	SDG (6.4.2), Calculated
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**869**	Calculated
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.23	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.23	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	24,129	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**NA**	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**100**	Calculated
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	4	(2), Iraq (2), Saudi Arabia (2), 1 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	2	Widyan-Salman (G), Dibdibba (G), 1 (FP)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	0	
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**NA**	Calculated

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

*All data and estimates are for 2015 unless otherwise mentioned.

*All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Lebanon

Lebanon SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	612.66	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	6.99	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	4.10	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	3.20	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**4.80**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0	FAO Aquastat
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.58	FAO Aquastat
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	FAO Aquastat
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.28	FAO Aquastat
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.00**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**3.53**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**2.92**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	Not Available
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	2.50	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**3.95**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.00	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**3.95**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	2.96	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	2.33	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.25	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**5.54**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**9.48**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**9.48**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.46	estimated 80% of domestic withdrawals
P-1-15		Collected Municipal Wastewater	BCM/Year	0.26	
P-1-16		Treated Municipal WasteWater	BCM/Year	0.26	MDG+
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	NA	
P-1-18		Collected Industrial Wastewater	BCM/Year	NA	
P-1-19		Treated Industrial WasteWater	BCM/Year	0.00	assumed equal to P-1-15
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.46**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.26**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.26**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	56	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.20**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.21	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.05	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.72**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**10.21**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.58	etimated as pop. increase rate from 2012
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.18	etimated as 1/4 pop. Increaserate from 2012
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.84	etimated as 2012
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**1.60**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**2.96**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**3.80**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.70	estimated
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.85	estimated
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.00	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**1.56**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	estimated
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.00	estimated
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	estimated
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.05	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.05**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**5.54**	**USGS/CEDARE**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.10	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**5.64**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	0.00	estimated
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.64	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.01	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.66**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	0.79	BLOMINVEST Bank (2016)
P-2-14		Navigation Water Flows	BCM/Year	0.00	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.00	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	4,032	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-99	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	1,116	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
P-3-4		Total Irrigated Agricultural Land	ha	2,088	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	516,618	ESA/CEDARE
P-3-6		Total Pasture Area	ha	380,619	ESA/CEDARE
P-3-7		Total Forests Area	ha	37,557	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**6,084**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	2,178	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	3,870	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	36	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	49	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.00**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.95	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.95	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**57.25**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	85	JMP 2018
P-4-2		Public Taps	%	NA	
P-4-3		Other Improved Drinking Water	%	NA	
P-4-4		Improved Urban Drinking Water Coverage	%	92	(100%, Total: 99%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	92	(100%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	99	(100%, Total: 81%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	99	(100%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	92	MDG+
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	48	SDG (6.1.1) (48%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	20	SDG (6.2.1a) (20%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	0.23	
	I-4-8	Drinking Water Capacity	BCM/Year	0.58	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.05	assumed equal to I-1-17
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.26	assumed equal to P-1-16

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.00	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.26	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	Water & Energy			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	750	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	221	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	Water & Population			
P-6-1		Total Population	1000 inhabitants	5,851	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	1,767	**Calculated**
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	674	**Calculated**
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	1,621	**Calculated**
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,745	**Calculated**
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	266	**Calculated**
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	947	**Calculated**
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,221	**Calculated**
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	144	**Calculated**
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	31	**Calculated**
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	99	**Calculated**
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	468	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	59	**Calculated**
	7	Water & Health			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	NA	
	I-7-4	Percentage of Open Defecation	%	NA	
	I-7-5	Cholera Reported Cases	Number/Year	1	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	Water & Quality			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	4	RAMSAR
	I-9-2	Total Wetlands Areas	ha	1,075	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	55	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**50**	**SDG (6.3.2), Calculated, (50, UN Environment/UN-Water (2018))**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	6	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.02	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (8.08 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	5.00	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**42**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.50**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**65**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**2,507**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	47.10	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.18	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	0.03	Danilenko, et al (2014)

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	1.8	ODI (2016)
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	16.74	SDG (6.a.1), OECD.Stat (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	54	SDG (6.a.2), OECD.Stat (2015)
	I-12-8	Total Investment in Water & Sanitation	Million US$	3,333	50000 for period:2000-2015
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.58	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	7.18	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.02	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.00	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	0	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	%	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**NA**	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**NA**	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.0012	Ministry of Energy and Water & USAID (2016)
	I-14-13	Commercial Water Losses	BCM/Year	0.0008	Ministry of Energy and Water & USAID (2016)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	

P Code	I Code	Water Related Indicators	Units	Lebanon	Notes/ Year/ References
	I-14-15	**Overall Water Use Efficiency**	**%**	**58**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**7**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**39**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**48**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.68	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.68	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**		**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**0**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	3	1 Agreements over the Jordan River - 1 Bilateral Agreements on the Orontes River Basin - 1 Treaty over Nahr el Kabir river with Syria in 1992
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	9	(5), Palestine (1), Syria (4), Jordan (1), Turkey (1), Israel (2), 3 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	5	Jordan (S), Orontes (S), Nahr el Kabir (S), Western Galilee (G), Anti-Lebanon (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**33**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**100**	**Calculated**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Libya

Libya SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	56.00	LT AV, 46.05, Chirps/ CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	98.00	LT AV, 78.97, Chirps/ CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	0	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.20	Total runoff is 0.2 BCM
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.60	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.70**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	0.7, FP
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.20**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.60**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M		
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.1	2012
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.70**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	3.00	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**3.70**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	2.34	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	1.37	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.77	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**4.49**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**5.19**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**8.19**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.48	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.30	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.05	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.08	CEDARE
P-1-18		Collected Industrial Wastewater	BCM/Year	0.12	CEDARE
P-1-19		Treated Industrial WasteWater	BCM/Year	0.04	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.56**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.42**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.09**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	17	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.47**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year		0.9 (2012)
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.07	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.63**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**8.82**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.6	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.25	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	3.8	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**4.84**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**2.34**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**6.14**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.03	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.60	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	4.16	2.97, FP
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**4.79**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.05	
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.05**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**4.49**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	4.62	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**9.11**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	0.06	2012
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	0.00	2012
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	9.31	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.11	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**9.42**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	0	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.19	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	4,302	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-36	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	1,719	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
P-3-4		Total Irrigated Agricultural Land	ha	325,120	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	953,667	ESA/CEDARE
P-3-6		Total Pasture Area	ha	1,367,151	ESA/CEDARE
P-3-7		Total Forests Area	ha	142,164	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**10,593**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	18	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	7,173	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	3,402	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.35**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.35	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	70	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.34**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.30	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.64	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**99.68**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	65	(41 JMP 2018)
P-4-2		Public Taps	%	0	(MDG+)
P-4-3		Other Improved Drinking Water	%	35	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	92	(70%, Total: 70%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	92	(70%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	99	(97%, Total: 97%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	99	(96%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	92	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	99	SDG (6.2.1a) (26%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	16,000	
	I-4-4	Length of Sewage Networks	km	7,000	
	I-4-5	Length of Irrigation Networks	km	4,000	2012
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	0.39	FAO Aquastat
	I-4-8	Drinking Water Capacity	BCM/Year	0.6	
	I-4-9	Desalination Capacity	BCM/Year	0.14	

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.22	0.073 at present
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.04	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.42	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	0.06	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	NA	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	6,400	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	811	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	109	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	811	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,378	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	749	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	701	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,458	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	594	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	39	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	94	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	512	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	64	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	100	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	86	WHO
	I-7-7	Hepatitis A Reported Cases	Number/Year	113	WHO
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	7.3	2012
p-8-2		pH	Dimensionless	7.25	6.7-7.79
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	1,250	300 - 2200
P-8-4		Nitrogen Concentration	PPM	50	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	850	200 - 1500
	I-8-3	Fecal Choliform	Colonies/100ML	0	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	212.5	25 - 400
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	300	100 -500
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	2	
	I-9-2	Total Wetlands Areas	ha	8300	
	I-9-3	Total Freshwater Species Count	Number	43	2012
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	13	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	4	floodlists.com
P-10-4		Average Temperature	C°	22.1	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.02	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (12.82 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	0	
	I-10-6	Annual Human Losses Related to Floods	Number	16.0	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**91.95**	**Calculated, CEDARE**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.14**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**27**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**2,095**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	65.68	AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.15	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	0.25	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	1.5	2012

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	12	Water & Finance			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	0.74	2012
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	NA	SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	Water & Trade			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.02	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	6.99	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.02	ITC statistics/CEDARE
	14	Water & Governance			
	I-14-1	IWRM Plan	Yes/No	NA	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	0	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	35,500	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**0**	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	30	2012
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.11	MDG+
	I-14-13	Commercial Water Losses	BCM/Year	0.11	MDG+
	I-14-14	Physical Irrigation Water Losses	BCM/Year	1.3	2012
	I-14-15	**Overall Water Use Efficiency**	**%**	**88**	Calculated
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-3**	SDG (6.4.1), Calculated
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**685**	SDG (6.4.2), Calculated

P Code	I Code	Water Related Indicators	Units	Libya	Notes/ Year/ References
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**138**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.040	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.56	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	0	
P-14-5		Number of Water Users Associations	Number	2	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**81**	**Calculated (71, FP)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	2	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	7	5 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	2	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**71**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	100	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Mauritania

Mauritania SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	95.45	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	92.00	100.16 (Chirps/CEDARE)
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.10	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.30	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.40**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	11.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0	2012
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0	2012
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	2012
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**11.00**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**11.10**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.30**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0	2012
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**11.40**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0	assumed equal to amount extracted
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**11.40**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.70	(6.08, ESA/USGS/CEDARE)
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	23.14	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.31	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**24.152**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**35.55**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**35.55**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.12	estimated 80% of domestic withdrawals
P-1-15		Collected Municipal Wastewater	BCM/Year	0.05	assumed % Total Sanitation Coverage of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.05	assumed equal to P-1-15
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.04	estimated 80% of industrial withdrawals
P-1-18		Collected Industrial Wastewater	BCM/Year	0.02	assumed % Total Sanitation Coverage of Produced

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
P-1-19		Treated Industrial WasteWater	BCM/Year	0.02	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.16**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.06**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.06**	Calculated
	I-1-15	Proportion of Wastewater Safely Treated	%	40	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.10**	Calculated
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.31	estimated 20% of Agricultural Withdrawals
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.03	2012.00
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.50**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**36.05**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.15	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.05	0.03, FP
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	1.56	1.32, FP
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**1.75**	Calculated (+Withdrawals (for Oil & Gas
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.70**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**2.26**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	1.60	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.13	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0	1.73, FP??
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**1.73**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.03	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.03**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**24.152**	Calculated
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	42.85	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**67.00**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	45.35	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.94	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**46.30**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	
	3	**Water & Land Use Changes**			

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
P-3-1		Green Cover Land-Use Change	ha	-1,620	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-27	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	1,737	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	158,868	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	1,585,008	ESA/CEDARE
P-3-6		Total Pasture Area	ha	12,219,516	ESA/CEDARE
P-3-7		Total Forests Area	ha	142,317	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**36**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	36	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.005**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.005	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.01**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.01	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**0.34**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	52	JMP 2018
P-4-2		Public Taps	%	NA	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	71	(58%, Total: 58%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	60	(57%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	60	(58%, Total: 40%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	40	(14%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	60	estimated
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	70	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	40	SDG (6.2.1a), (JMP 2015)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	50,000	
	I-4-4	Length of Sewage Networks	km	100	
	I-4-5	Length of Irrigation Networks	km	15,000	
	I-4-6	Length of Drainage Networks	km	0	2012
	I-4-7	Dam Storage Capacity	BCM	0.5	2012

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
	I-4-8	Drinking Water Capacity	BCM/Year	0.15	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.03	assumed equal to I-1-17
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.05	assumed equal to P-1-16
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.02	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.06	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	120	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	3,625	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	6,773	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	3,145	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	9,807	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	9,944	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	477	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	6,663	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	7,147	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	429	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	13	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	41	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	1,211	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	1,740	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	411,096	WHO
	I-7-4	Percentage of Open Defecation	%	30	WHO
	I-7-5	Cholera Reported Cases	Number/Year	NA	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	4	
	I-9-2	Total Wetlands Areas	ha	1,240,600	
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	25	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	2	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.42	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (18.88 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	8.00	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**25**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.53**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**252**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**2,365**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		
P-11-1		GDP	Billion $	4.47	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.67	Danilenko, et al (2014)

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
P-11-3		Sanitation Average Tarrif	$/m3	NA	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	2.78	Danilenko, et al (2014)
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0.34	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.1	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	1.70	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.0002	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	non	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	55	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**NA**	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	69	IBNET (2008)
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	%	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	%	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.0341	Danilenko, et al (2014)
	I-14-13	Commercial Water Losses	BCM/Year	0.0227	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year		
	I-14-15	**Overall Water Use Efficiency**	**%**	**73**	Calculated

P Code	I Code	Water Related Indicators	Units	Mauritania	Notes/ Year/ References
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-7**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**15**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**20**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.47	estimated equal to I-14-19
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.47	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**96**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	5	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	6	
	I-15-4	Number of Shared Water Resources Bodies	Number	2	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**50**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

All data and estimates are for 2015 unless otherwise mentioned.

All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Morocco

Morocco SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	355.00	(Chirps/CEDARE 175.41)
	I-1-2	Annual Precipitation Volume	BCM/Year	129.18	Chirps/CEDARE, FP 140 Average of the last 30 years
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	18.34	
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	3.83	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**19.17**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.000	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.03	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**18.34**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**3.80**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	3	The value of this indicator is kept as it was in the previous version of the report.
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**19.17**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**19.17**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	17.09	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	11.59	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	8.93	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**37.61**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**56.79**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**56.79**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.39	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.27	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.18	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.32	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.23	MDG+
P-1-19		Treated Industrial WasteWater	BCM/Year	0.15	

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.71**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.50**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.33**	Calculated
	I-1-15	Proportion of Wastewater Safely Treated	%	46	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.38**	**(MDG+)**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	2.95	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.03	Includes seawater and brackish water
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**3.69**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**60.48**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	1.44	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.50	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	12.03	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**13.97**	Calculated (+Withdrawals (for Oil & Gas
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**17.09**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**29.12**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	9.39	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	4.48	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.00	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**13.87**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.02	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.03	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.026	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.06**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.03	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.10**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**37.61**	Calculated
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	28.43	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**66.04**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year		
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	75.72	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.85	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**76.57**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	3	Water & Land Use Changes			
P-3-1		Green Cover Land-Use Change	ha	-11,997	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-558	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	10,575	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	1,360,000	72,414, ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	5,448,168	ESA/CEDARE
P-3-6		Total Pasture Area	ha	6,795,666	ESA/CEDARE
P-3-7		Total Forests Area	ha	2,284,038	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**14,211**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	288	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	10,935	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	2,583	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	405	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.50**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.50	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	70	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.51**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.40	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.91	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**134**	**Calculated**
	4	Water & Services			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	96	(76 JMP 2018)
P-4-2		Public Taps	%	5	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	100	(99%, Total: 85%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	95	(65%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	72	(84%, Total: 77%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	66	(66%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	95	(JMP/MDG+/Ministry Sector), 100 % FP
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	98	SDG (6.1.1) (69%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	74	SDG (6.2.1a) (38%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	17.96	FAO Aquastat, 17.60, FP
	I-4-8	Drinking Water Capacity	BCM/Year	1.44	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.03	assumed equal to I-1-17
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.82	Water Statistics in GCC Countries (2015)
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.15	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.70	Water Statistics in GCC Countries (2015)
	I-4-13	Maximum Annual Dam Storage Reached	BCM	17.60	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	2,500	
	I-5-2	Hydropower as % of Total Generated Electricity	%	8	
	I-5-3	Installed Hydropower Capacity	MW	1,730	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	33,850	2014
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	1,678	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	566	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	1,678	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,787	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	410	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	1,111	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,524	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	356	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	15	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	42	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	677	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	10,290	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	
	I-7-3	Open Defecation Practice	Number	2,565,830	WHO
	I-7-4	Percentage of Open Defecation	%	7.58	WHO
	I-7-5	Cholera Reported Cases	Number/Year	NA	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	26	RAMSAR
	I-9-2	Total Wetlands Areas	ha	274,286	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	102	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**79**	**SDG (6.3.2), Calculated, (79.15, UN Environment/ UN-Water (2018))**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	SDG (6.6.1) Calculated
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	4	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.14	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (132.04 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	60	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	Yes	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**53**	Calculated from WB
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.51**	AOAD, CEDARE (Calculated)

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**143**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**4,631**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	95.17	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.69	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	0.20	Danilenko, et al (2014)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	0.37	GLAAS (2014)
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	2.67	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	2,076	GLAAS (2014)
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	1.74	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	19.27	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.001	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.003	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1), Yes
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	**Calculated**
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	

P Code	I Code	Water Related Indicators	Units	Morocco	Notes/ Year/ References
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.25	
	I-14-13	Commercial Water Losses	BCM/Year	0.155	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	2	
	I-14-15	**Overall Water Use Efficiency**	**%**	**74**	Calculated (76, FP)
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**2**	SDG (6.4.1), Calculated
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**72**	SDG (6.4.2), Calculated (27, FP)
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**55**	Calculated (94, FP)
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	3.59	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	3.59	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	3,875	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	43	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	100	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**0**	Calculated
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	1	In fact, it is not rife, but there is one river that flows from Morocco and flows into Algeria
	I-15-4	Number of Shared Water Resources Bodies	Number	0	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	0	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**NA**	Calculated

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Oman

Oman SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	51.00	Water Balance, MRMWR, 2013 (74, Chirps/CEDARE)
	I-1-2	Annual Precipitation Volume	BCM/Year	15.84	Water Balance, MRMWR, 2013 (23, Chirps/CEDARE)
P-1-1		Annual Hail Fall Volume	BCM/Year	0	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.10	Water Balance, MRMWR, 2013 (1.05 FAO Aquastat)
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	1.22	Water Balance, MRMWR, 2013 (1.3, FAO Aquastat)
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**1.32**	Calculated
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	Water Balance, MRMWR, 2013
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	Water Balance, MRMWR, 2013
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.01	Water Balance, MRMWR, 2013
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.10	Water Balance, MRMWR, 2013
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.01**	Calculated
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.10**	Calculated
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**1.13**	Calculated
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	No permenant flow , not calculated
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.00	No permenant flow , not calculated
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**1.23**	Calculated
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.31	assumed equal to P-2-6
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**1.54**	Calculated
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.03	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.11	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.06	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.20**	Calculated
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**1.43**	Calculated
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**1.74**	Calculated
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.23	estimated as 80% of domestic use (including industrial)
P-1-15		Collected Municipal Wastewater	BCM/Year	0.11	

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
P-1-16		Treated Municipal WasteWater	BCM/Year	0.11	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.00	included in domestic
P-1-18		Collected Industrial Wastewater	BCM/Year	0.00	included in domestic
P-1-19		Treated Industrial WasteWater	BCM/Year	0.00	included in domestic
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.23**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.11**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.11**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	47	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.12**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.31	estimated
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.30	PAEW, ref. year 2015
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.84**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**2.58**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.29	0.326 includes Municipal, commercial, industrial and torism demand
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.04	estimated
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	1.546	Water Balance, MRMWR, 2013
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**1.87**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.03**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**1.58**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.10	Water Balance, MRMWR, 2013
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	1.13	Water Balance, MRMWR, 2013
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.31	estimated to balance abstractions
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**1.54**	**Calculated (1.859, Water Balance, MRMWR, 2013)**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.03	ref. year 2015 (0.07 Water Statistics GCC, 2015)
P-2-8		Reused Treated Industrial Wastewater	BCM/Year		included above
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.03**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.30	Calculated (PAEW, ref. year 2015)
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.33**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.20**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.36	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**0.56**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	5.23	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.05	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**5.28**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	0.40	GOIC (2013)
P-2-14		Navigation Water Flows	BCM/Year	0.00	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	3,177	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	135	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	225	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	37,989	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	7,047	ESA/CEDARE
P-3-6		Total Pasture Area	ha	332,757	ESA/CEDARE
P-3-7		Total Forests Area	ha	38,052	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**3,672**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	153	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	225	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	3,285	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	9	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.84**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.84	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	4.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.84**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.23	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	1.07	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**34.55**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	88	JMP 2018
P-4-2		Public Taps	%	NA	(MDG+)
P-4-3		Other Improved Drinking Water	%	19	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	95	(95%, Total: 93%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	86	(86%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	97	(97%, Total: 97%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	95	(95%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	86	estimated

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	89	SDG (6.1.1) (89%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	99	SDG (6.2.1a)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	0	PAEW
	I-4-4	Length of Sewage Networks	km	0	
	I-4-5	Length of Irrigation Networks	km	0	
	I-4-6	Length of Drainage Networks	km	0	
	I-4-7	Dam Storage Capacity	BCM	0.32	MRMWR, ref. year 2015
	I-4-8	Drinking Water Capacity	BCM/Year	0.35	PAEW, ref. year 2015
	I-4-9	Desalination Capacity	BCM/Year	0.35	PAEW, ref. year 2015
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.24	Water Statistics in GCC Countries (2015)
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.00	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.15	Water Statistics in GCC Countries (2015)
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	None
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	None
	I-5-3	Installed Hydropower Capacity	MW	0	None
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	None
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	4,159	ref. year 2015
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	365	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	296	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	344	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	619	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	370	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	48	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	498	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	372	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	10	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	69	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	290	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	143	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	Ministry of Health
	I-7-4	Percentage of Open Defecation	%	NA	Ministry of Health
	I-7-5	Cholera Reported Cases	Number/Year	1	Ministry of Health

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
	I-7-6	Typhoid Reported Cases	Number/Year	0	Ministry of Health
	I-7-7	Hepatitis A Reported Cases	Number/Year	576	Ministry of Health
	I-7-8	Diarrhea Prevalence	%	6.7	Ministry of Health
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	Ministry of Health
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	Ministry of Health
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	1	RAMSAR
	I-9-2	Total Wetlands Areas	ha	107	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	26	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	-0.63	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	6	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	NA	
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	NA	
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
	I-11-1	**Industrial Water Productivity**	**$/CM**	**836**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.37**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**67**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**20,118**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	69.69	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.55	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	0.64	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	1.18	Danilenko, et al (2014)
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0	SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	1.74	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	8.26	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.03	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.13	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	**Calculated**
P-14-3		Groundwater Well Permits Issued to Date	Number	83	2012
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	11	IBNET (2015)

P Code	I Code	Water Related Indicators	Units	Oman	Notes/ Year/ References
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.07	Danilenko, et al (2014) & Al-Bulushi, M., et al (2018)
	I-14-13	Commercial Water Losses	BCM/Year	0.05	Danilenko, et al (2014) & Al-Bulushi, M., et al (2018)
	I-14-14	Physical Irrigation Water Losses	BCM/Year		
	I-14-15	**Overall Water Use Efficiency**	**%**	**73**	Calculated
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-17**	SDG (6.4.1), Calculated
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**125**	SDG (6.4.2), Calculated
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**110**	Calculated
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.50	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.50	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**1**	Calculated
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	3	(3), Saudi Arabia (1), United Arab Emirates (1), Yemen (1), 3 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	4	Rub' al Khali (G), ESCWA
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	0	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	Calculated

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Palestine

Palestine SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	488.00	549 West Bank 488 Gaza (441 Chirps/CEDARE)
	I-1-2	Annual Precipitation Volume	BCM/Year	3.28	2.92, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	0	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.21	0.165 Long-term Average
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.77	0.680 Long-term Average
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.98**	**Calculated (.845 Annual Average)**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.250	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.08	Long-term Average 0.0738
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.58	Long-term Average
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.25**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.38**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.19**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	275	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.58**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.14	assumed equal to P-2-6
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**0.71**	**Calculated (1.5, FP)**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	1.19	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.25	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.23	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**1.67**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**2.25**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**2.39**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.17	76 +90
P-1-15		Collected Municipal Wastewater	BCM/Year	0.03	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.02	11 + 8
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.02	estimated as 50% of industrial use
P-1-18		Collected Industrial Wastewater	BCM/Year	0.01	assumed % Total Sanitation Coverage of Produced
P-1-19		Treated Industrial WasteWater	BCM/Year	0.01	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.18**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.04**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.03**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	18	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.15**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.00	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.005	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.28	12.5+100+172
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.47**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**2.86**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.21	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.03	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.21	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**0.44**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**1.19**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**1.40**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.01	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.29	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.14	estimated to balance withdrawals
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.44**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.001	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.000	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.001**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.005	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.006**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**1.67**	**USGS/CEDARE**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.23	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**1.91**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.26	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.29	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.55**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	0.00	0
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.00	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	6,300	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
P-3-2		Change in Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	5,085	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	171	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	270,315	ESA/CEDARE
P-3-6		Total Pasture Area	ha	56,646	ESA/CEDARE
P-3-7		Total Forests Area	ha	42,867	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**6,444**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	5,238	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	1,206	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.99**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.99	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	34.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.99**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.75	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	1.74	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**60.64**	**Calculated**
	4	Water & Services			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	57	(52 JMP 2018)
P-4-2		Public Taps	%	0	(MDG+)
P-4-3		Other Improved Drinking Water	%	62	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	58	(51%, Total: 58%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	87	(81%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	99	(93%, Total: 92%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	99	(90%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	44	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	58	SDG (6.1.1), (JMP 2015)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	92	SDG (6.2.1a) (60%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	0.00	

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
	I-4-8	Drinking Water Capacity	BCM/Year	0.22	
	I-4-9	Desalination Capacity	BCM/Year	0.00	assumed equal to 0.0039, FP
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.08	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.01	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.04	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	0.00	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	4,486	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	592	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	128	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	502	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	637	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	98	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	373	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	472	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	46	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	7	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	46	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	1,557	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	40	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	0	
	I-7-7	Hepatitis A Reported Cases	Number/Year	0	
	I-7-8	Diarrhea Prevalence	%	0	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	7.79	7.09 - 8.47
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	805.79	266 - 6130
P-8-4		Nitrogen Concentration	PPM	27.79	NO3 (0 - 213.84)
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	2.12	0 - 52
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	148.34	27.32 - 992.60
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	NA	
	I-9-2	Total Wetlands Areas	ha	0	
	I-9-3	Total Freshwater Species Count	Number	0	
	I-9-4	Number of Endangered Species	Number	0	
	I-9-5	Number of Invasive Species	Number	0	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated, Nap**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	4	EMDAT
P-10-4		Average Temperature	C°	23.2	5.2 - 41.2
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.00	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (0.29 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	10	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	0	
	I-10-9	Unusual Weather Hail Events	Number	0	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	0	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**77**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.30**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**58**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**8,793**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		
P-11-1		GDP	Billion $	12.68	CEDARE, AOAD

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.63	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	0.27	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	1.03	Danilenko, et al (2014)
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	0.0001	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	0.0001	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	105	SDG (6.a.1) The annual rate is about 100
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	104	Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$		SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	110	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.15	CEDARE, AOAD (0.37, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	1.81	CEDARE, AOAD (1.58, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	0	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	0	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	380	663 Total number of licensed wells
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.46	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**107**	Calculated
	I-14-6	Number of Unlicensed Wells	Number	30	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	100	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**100**	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**NA**	Calculated

P Code	I Code	Water Related Indicators	Units	Palestine	Notes/ Year/ References
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.0802	
	I-14-13	Commercial Water Losses	BCM/Year	0.0267	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**59**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-8.20**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**76**	**SDG (6.4.2), Calculated (50, FP)**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**73**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.18	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.18	**Calculated (0.015, FP)**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	12	Cases of digging wells without a permit were handled through the prosecution and the courts, and decisions were issued
P-14-5		Number of Water Users Associations	Number	0	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**0**	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**43**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	3	2 (ESCWA, 1 Bilateral Agreements with Israel over the Western Aquifer Basin - 1 Agreements over the Jordan River)
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	10	(5), Lebanon (1), Jordan (1), Syria (1), Egypt (2), Israel (5), 5 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	5	Jordan (S), Coastal (G), Eastern (G), North-Eastern (G), Western (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**20**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**9**	**Calculated**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Qatar

Qatar SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	74.00	109.60 Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	0.86	1.3 Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.04	2014 (0.056, FAO Aquastat)
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.04**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.002	2014
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.002**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.00**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.04**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	5500	2014
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.04**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**0.04**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.01	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.01	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.0002	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.02**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**0.06**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**0.06**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.20	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.20	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.19	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.002	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.002	MDG+
P-1-19		Treated Industrial WasteWater	BCM/Year	0.00	
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.20**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.20**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.19**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	98	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.005**	**Calculated (0.002, FP)**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.07	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.53	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0.00	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.80**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**0.86**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.35	2014
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.01	2014
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	0.27	2014
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**0.71**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.01**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**0.28**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	NA	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.04	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.01	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**0.05**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.136	0.10 (GCC 2015)
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.14**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.52	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.65**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.02**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.015	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**0.03**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.30	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.00	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.30**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	0.339	GOIC (2013)
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.08	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	117	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	10,777	7605 ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
P-3-5		Total Rain-fed Agricultural Land	ha	9	ESA/CEDARE
P-3-6		Total Pasture Area	ha	25,549	ESA/CEDARE
P-3-7		Total Forests Area	ha	826	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**135**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	135	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.09**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.09	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.09**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.04	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.13	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**1.27**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	NA	(MDG+)
P-4-2		Public Taps	%	NA	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	100	(100%, Total: 100%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	100	(100%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	100	(100%, Total: 98%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	100	(100%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	estimated
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	100	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	100	SDG (6.2.1a) (88%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	8,086	
	I-4-4	Length of Sewage Networks	km	2,793	
	I-4-5	Length of Irrigation Networks	km	869	
	I-4-6	Length of Drainage Networks	km	585	
	I-4-7	Dam Storage Capacity	BCM	NA	
	I-4-8	Drinking Water Capacity	BCM/Year	0.51	
	I-4-9	Desalination Capacity	BCM/Year	0.60	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.30	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.00	assumed equal to P-1-19

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.2	
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	NA	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	2,438	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	25	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	17	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	25	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	354	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	22	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	8	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	298	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	111	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	4	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	143	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	0	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	0	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	100	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	3	
	I-7-6	Typhoid Reported Cases	Number/Year	383	
	I-7-7	Hepatitis A Reported Cases	Number/Year	70	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	7.8	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	231.5	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	152.9	
	I-8-3	Fecal Choliform	Colonies/100ML	0.994	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	27.2	

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	49.9	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	NA	
	I-9-2	Total Wetlands Areas	ha	NA	
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	10	
	I-9-5	Number of Invasive Species	Number	8	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	1	floodlists.com
P-10-4		Average Temperature	C°	28	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	NA	
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	NA	
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**8,865**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.94**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**82**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**96,575**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		
P-11-1		GDP	Billion $	164.64	
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.33	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	NA	
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	1.72	Danilenko, et al (2014)
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$		SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	2,000	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.05	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	3.97	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.01	ITC statistics/CEDARE (0.0006, Focal Point)
	I-13-4	Bottled Water Import	MCM/Year	0.05	ITC statistics/CEDARE (0.007, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No		
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	82	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number		
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	%	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	94	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	11,948 (Number of Complaints)
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	%	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	%	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.04	WWAP (2015)
	I-14-13	Commercial Water Losses	BCM/Year	0.03	WWAP (2015)
	I-14-14	Physical Irrigation Water Losses	BCM/Year		
	I-14-15	**Overall Water Use Efficiency**	%	**78**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-2.22**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**126**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**100**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Qatar	Notes/ Year/ References
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.13	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.13	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	Calculated
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	100	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**5**	Calculated
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	2	Bahrain (1), Saudi Arabia (1)
	I-15-4	Number of Shared Water Resources Bodies	Number	1	Umm er Radhuma-Dammam Aquifer: Gulf
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	Calculated
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	Calculated

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Saudi Arabia

Saudi Arabia SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	60.00	185.92, Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	129.00	93.07, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.00	34, FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	5.60	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**3.60**	Calculated
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.00**	Calculated
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.00**	Calculated
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**5.60**	Calculated
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M		
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	2.00	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**3.60**	Calculated
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	15.50	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**19.10**	Calculated
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.37	24.15, ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.90	7.54, ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.11	0.14, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**1.38**	Calculated
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**4.98**	Calculated
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**20.48**	Calculated
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	1.60	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.23	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.23	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.78	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.62	
P-1-19		Treated Industrial WasteWater	BCM/Year	0.62	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**2.38**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.85**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.85**	Calculated

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	36	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**1.53**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.50	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	1.83	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**4.71**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**25.19**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	3.03	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.98	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	20.83	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**24.83**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.37**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**21.20**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.22	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	3.80	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	18.75	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**22.77**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	NA	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.23	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	NA	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.23**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	1.83	
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**2.06**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**1.38**	**Calculated (31.83, USGS/ CEDARE)**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	4.02	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**5.40**	**Calculated (69.96, USGS/ CEDARE)**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	40.11	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.10	USGS/CEDARE (2, FP)
	I-2-11	**Evaporation Losses**	**BCM/Year**	**40.20**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	9.79	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	-7,713	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	18	-135
P-3-3		Change in Rain-fed Agricultural Land	ha	-936	ESA/CEDARE, (0,FP)
P-3-4		Total Irrigated Agricultural Land	ha	25,677	

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
P-3-5		Total Rain-fed Agricultural Land	ha	250,119	4,587,965 ESA/CEDARE
P-3-6		Total Pasture Area	ha	2,989,791	ESA/CEDARE, 6,000,000 FP
P-3-7		Total Forests Area	ha	78,030	ESA/CEDARE, 2,217,000 FP
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**729**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	9	
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	513	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	45	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	162	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.84**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.84	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	4.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.84**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.31	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	1.15	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**6.86**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	100	(82 JMP 2018)
P-4-2		Public Taps	%	100	(MDG+)
P-4-3		Other Improved Drinking Water	%	100	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	87	(94%, Total: 87%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	87	(70%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	60	(86%, Total: 86%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	60	(84%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	97	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	84	SDG (6.2.1a) (32%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	37,941	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	2.37	
	I-4-8	Drinking Water Capacity	BCM/Year	3.03	
	I-4-9	Desalination Capacity	BCM/Year	2.25	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	1.97	

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.62	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	1.46	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	2.37	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	31,742	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	157	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	113	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	157	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	794	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	717	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	43	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	826	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	656	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	31	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	95	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	4,127	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	12,697	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	0	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	0	
	I-7-7	Hepatitis A Reported Cases	Number/Year	0	
	I-7-8	Diarrhea Prevalence	%	0	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	0	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	NA	
	I-9-2	Total Wetlands Areas	ha	10,170	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	52	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	9	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	NA	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (344.33 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	62	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	0	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**303**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.68**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**35**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**2,856**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	746.25	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.68	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	1.25	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.11	0.46, Danilenko, et al (2014)
	12	**Water & Finance**			

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	5.1	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	NA	SDG (6.a.1), OECD.Stat (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	30, Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	362.67	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$		
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	4.3	CEDARE, AOAD (0.12, Focal Point)
	I-13-2	Agricultural Virtual Water Import	BCM/Year	59.06	CEDARE, AOAD (7.06, Focal Point)
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.04	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	NA	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	146,369	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**0**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	IBNET (2017)
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.64	25%, Danilenko, et al (2014)
	I-14-13	Commercial Water Losses	BCM/Year	0.42	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year		
	I-14-15	**Overall Water Use Efficiency**	**%**	**89**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-21**	**SDG (6.4.1), Calculated**

P Code	I Code	Water Related Indicators	Units	KSA	Notes/ Year/ References
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**633**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**465**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	2.66	5.46 FP
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	2.66	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%		
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**0**	**Calculated, (56, FP)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	1	2 Agreements over the Euphartes - 3 Agreements over the Tigris
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	17	(6), Jordan (2), Syria (4), Saudi Arabia (5), Turkey (3), Iran (3), Kuwait (2)
	I-15-4	Number of Shared Water Resources Bodies	Number	9	Euphartes (S), Tigris (S), Shatt al Arab (S), Widyan-Salman (G), Dibdibba (G), Jezira (G), Taurus-Zagros (G), Sakaka-Rutba (G), Ga'ara (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	5.88	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	NA	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	**Calculated, 34 BCM/Y**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Somalia

Somalia SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	400.00	FAO-SWALIM, 318.38 Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	162.00	191.40 Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	0	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	6.00	5.7, FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	6.05	3.3 FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**9.05**	Calculated
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	8.70	2012
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	2012
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**8.70**	Calculated
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**14.70**	Calculated
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**6.05**	Calculated
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	3.00	2012.00
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**17.75**	Calculated
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**17.75**	Calculated
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	26.62	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	96.54	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	11.73	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**134.89**	Calculated
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**153**	Calculated
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**153**	Calculated
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.02	estimated as 80% of domestic use
P-1-15		Collected Municipal Wastewater	BCM/Year	0.006	assumed 30% of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.001	assumed 20% of collected
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.002	estimated as 80% of industrial use
P-1-18		Collected Industrial Wastewater	BCM/Year	0.001	assumed 30% of collected
P-1-19		Treated Industrial WasteWater	BCM/Year	0.0001	assumed 20% of collected
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	Calculated

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.01**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.001**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	6	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.02**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	1.13	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	0	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**1.15**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**153.79**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.03	etimated as pop. increase rate from 2012
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.003	etimated as 1/4 pop. Increaserate from 2012
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	4.51	etimated as 1/4 pop. Increase rate from 2012
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**4.54**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**26.62**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**31.14**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	4.43	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.11	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**4.54**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.00	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.00**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**134.89**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	114.91	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**249.80**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	53.59	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.36	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**53.95**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	
	3	**Water & Land Use Changes**			

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
P-3-1		Green Cover Land-Use Change	ha	-30,951	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	2,223	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	135	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	811,179	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	4,539,555	ESA/CEDARE
P-3-6		Total Pasture Area	ha	40,678,938	ESA/CEDARE
P-3-7		Total Forests Area	ha	3,437,361	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**1,926**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	81	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	666	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	1,170	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	9	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.29**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.29	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	14.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.29**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.26	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.55	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**18.12**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	30	(JMP 2018)
P-4-2		Public Taps	%	NA	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	29	JMP, Total: 29%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	29	JMP 2015
P-4-6		Improved Urban Sanitation Coverage	%	23	JMP, Total: 23%, JMP 2015
P-4-7		Improved Rural Sanitation Coverage	%	23	JMP 2015
P-4-8		Everyday Accessibility to Drinking Water	%	29	estimated
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	29	SDG (6.1.1), (JMP 2015)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	14	SDG (6.2.1a) (JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	NA	
	I-4-8	Drinking Water Capacity	BCM/Year	0.03	assumed equal to P-2-1

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
	I-4-9	Desalination Capacity	BCM/Year	0.0000	assumed equal to I-1-17
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.001	assumed equal to P-1-16
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.0001	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.007	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	NA	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	28	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	13,910	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	10,348	**Calculated**
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	1,276	**Calculated**
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	10,973	**Calculated**
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	11,056	**Calculated**
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	327	**Calculated**
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	9,697	**Calculated**
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	10,024	**Calculated**
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	325	**Calculated**
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	0	**Calculated**
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	2	**Calculated**
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	9,876	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	10,711	**Calculated**
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	39	SDG (6.2.1b), estimated
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	5,438,810	WHO (2015)
	I-7-4	Percentage of Open Defecation	%	39	WHO (2015)
	I-7-5	Cholera Reported Cases	Number/Year	7,536	WHO (2015)
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	24	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM		
	I-8-3	Fecal Choliform	Colonies/100ML	NA	

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	Water & Ecosystems			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	NA	
	I-9-2	Total Wetlands Areas	ha	57,528	
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	31	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	Water & Climate			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	10	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.43	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (28.37 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	169	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	No	
	I-10-11	Existing Early Warning System	Number	NA	
	11	Water & Socio-Economics			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**482**	**Estimated**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.03**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**68**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**67,914**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	6.63	CEDARE, World Bank
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	NA	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	NA	(MDG+)

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	
	12	Water & Finance			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	31.09	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$		
	13	Water & Trade			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.78	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	1.46	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.0005	ITC statistics/CEDARE
	14	Water & Governance			
	I-14-1	IWRM Plan	Yes/No		
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No		
P-14-1		Surface Water Permits Issued to Date	Number		
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number		
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number		
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.0091	
	I-14-13	Commercial Water Losses	BCM/Year	NA	
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**75**	Calculated

P Code	I Code	Water Related Indicators	Units	Somalia	Notes/ Year/ References
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-42**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**26**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**20**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	1.15	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	1.15	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%		
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**49**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	2	
	I-15-4	Number of Shared Water Resources Bodies	Number	3	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	NA	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	**Calculated**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Sudan

Sudan SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	300.00	rainfall- northern part 0-100, 214.10 Chirps/ CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	400.00	394.76 Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NAp	
P-1-2		Annual Snow Fall Volume	BCM/Year	NAp	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	6.00	
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	4.00	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**9.30**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	84.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	63.50	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.20	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	1.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**84.2**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**26.50**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**3.20**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	50.00	in alluvium basin =15
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.70	accurate estimations is not available
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**29.00**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	12.00	it needs more assessment and forecasting tobe specified
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**41.00**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	60.00	113.11, ESA/USGS/ CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	47.00	159.34, ESA/USGS/ CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	35.00	40.36, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**142.00**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**171.00**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**183.00**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	1.36	estimated as 80% of domestic use
P-1-15		Collected Municipal Wastewater	BCM/Year	0.33	assumed 24% of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.33	assumed equal to P-1-15
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.10	estimated as 80% of industrial use

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
P-1-18		Collected Industrial Wastewater	BCM/Year	0.02	assumed 24% of Produced
P-1-19		Treated Industrial WasteWater	BCM/Year	0.02	assumed equal to P-1-18
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**1.46**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.35**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.35**	Calculated
	I-1-15	Proportion of Wastewater Safely Treated	%	24	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**1.11**	Calculated
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	2.97	assumed 20% of Industrial Withdrawals
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.0001	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	2.7	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**7.13**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**190.13**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	1.70	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.13	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	14.84	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**16.68**	Calculated (+Withdrawals (for Oil & Gas
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**60.00**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**74.84**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	13.86	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	2.17	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.65	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**16.68**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.0001	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.0001**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**142**	Calculated
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	28.12	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**170.12**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	57	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	41.83	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	5.30	6.39 USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**47.13**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	9.50	
P-2-14		Navigation Water Flows	BCM/Year	18.5	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.01	

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
	3	Water & Land Use Changes			
P-3-1		Green Cover Land-Use Change	ha	26,119,000	-107,163 ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-20,900	-11,169 ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	9,447,479	-18,837 ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	1,666,670	4,178,439 ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	17,750,000	24,306,894 ESA/CEDARE
P-3-6		Total Pasture Area	ha	54,000,000	42,943,194 ESA/CEDARE
P-3-7		Total Forests Area	ha	22,321,000	6,640,803 ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**18,855**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	4,374	ESA/CEDARE (920, FP)
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	2,997	ESA/CEDARE (150, 000 FP)
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	11,322	ESA/CEDARE (540, 000 FP)
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	162	ESA/CEDARE (220, 000 FP)
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.54**	**Calculated, 3.64, ESA/ USGS/Chirps/CEDARE**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.54	3.64, ESA/USGS/Chirps/ CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	not avilable	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	83.00	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	not avilable	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**3.64**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	4.55	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	8.19	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	not avilable	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**177.43**	**Calculated**
	4	Water & Services			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	48	(44 JMP 2018)
P-4-2		Public Taps	%	18	(MDG+)
P-4-3		Other Improved Drinking Water	%	2	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	87	(67%, Total: 55%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	64	(52%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	57	(44%, Total: 24%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	22	(14%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	58	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	55	SDG (6.1.1) assumed as MDG
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	24	SDG (6.2.1a) assumed as MDG
		Water Infrastructure			

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
	I-4-3	Length of Drinking Water Networks	km	43,980	
	I-4-4	Length of Sewage Networks	km	97	
	I-4-5	Length of Irrigation Networks	km	70,000	
	I-4-6	Length of Drainage Networks	km	90,000	
	I-4-7	Dam Storage Capacity	BCM	22	
	I-4-8	Drinking Water Capacity	BCM/Year	1.75	
	I-4-9	Desalination Capacity	BCM/Year	0.0001	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.33	
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.02	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	1.46	
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	8,200	
	I-5-2	Hydropower as % of Total Generated Electricity	%	51	
	I-5-3	Installed Hydropower Capacity	MW	1,905	
	I-5-4	Water Used to Generate Electricity	BCM/Year	3.77	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	38,435	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	3,937	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	755	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	4,449	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	4,947	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	434	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	3,695	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	4,129	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	386	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	3	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	44	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	10,919	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	25,406	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	54.9	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	NA	
	I-7-3	Open Defecation Practice	Number	9,570,315	
	I-7-4	Percentage of Open Defecation	%	24.9	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	26	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	5.5	
p-8-2		pH	Dimensionless	7.6	surface water

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	215	average surface water
P-8-4		Nitrogen Concentration	PPM	0.04	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	**NA**	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	135	average surface water
	I-8-3	Fecal Choliform	Colonies/100ML	0	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	9	average surface water
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	84	average surface water
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	0	No case
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	3	
	I-9-2	Total Wetlands Areas	ha	2,489,600	
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	49	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**95**	**SDG (6.3.2), (86.05, UN Environment/UN-Water (2018))**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.20	**SDG (6.6.1) Calculated, (-0.39)**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	1	
P-10-2		Number of Class 1.5 Flood Events	Number	0	
P-10-3		Number of Class 2 Flood Events	Number	0	
	I-10-1	Total Number of Floods in Last Three Years	Number	10	floodlists.com
P-10-4		Average Temperature	C°	32	
	I-10-2	Monthly Drought Events	Number	3	
	I-10-3	Annual Drought Events	Number	2	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.08	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (71.67 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	0.04	
	I-10-6	Annual Human Losses Related to Floods	Number	135	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	0	
	I-10-9	Unusual Weather Hail Events	Number	0	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	Yes	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**15**	**Calculated from WB**

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.34**	**AOAD, CEDARE (Calculated), (0.60 Focal Point)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**54**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**10,683**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	not avilable	
P-11-1		GDP	Billion $	94.01	
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.22	(MDG+)
P-11-3		Sanitation Average Tarrif	$/m3	0.40	(MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.45	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	6.7	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	0.06	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	512	SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	23	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	30	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	not avilable	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	120	SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	1,575	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	1.83	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	6.13	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.00008	ITC statistics/CEDARE (0, Focal Point)
	I-13-4	Bottled Water Import	MCM/Year	0.00007	ITC statistics/CEDARE (0, Focal Point)
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	35	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	yes	
P-14-1		Surface Water Permits Issued to Date	Number		
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	14	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	101	**Calculated (113, FP)**
P-14-3		Groundwater Well Permits Issued to Date	Number	14,518	By Rural water Corporations and State Water Corporations, for do
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	1.4	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**49.6**	**Calculated (64.5, FP)**
	I-14-6	Number of Unlicensed Wells	Number	not avilable	

P Code	I Code	Water Related Indicators	Units	Sudan	Notes/ Year/ References
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	32	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	4	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	61	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**53**	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	**80**	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.06	
	I-14-13	Commercial Water Losses	BCM/Year	0.006	
	I-14-14	Physical Irrigation Water Losses	BCM/Year	1.57	
	I-14-15	**Overall Water Use Efficiency**	**%**	**NA**	**73, Calculated (81, FP)**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-6**	**SDG (6.4.1), Calculated (0.36, FP)**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**58**	**SDG (6.4.2), Calculated (55, FP)**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**45**	**Calculated (39, FP)**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	NA	4.43, Calculated
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	NA	**4.43, Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number		
P-14-5		Number of Water Users Associations	Number		
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	45	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**48**	**Calculated (88, FP)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	4	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	7	14, NACSE
	I-15-4	Number of Shared Water Resources Bodies	Number	8	3, NACSE
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**57**	**Calculated (50), FP)**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**NA**	**Calculated**

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

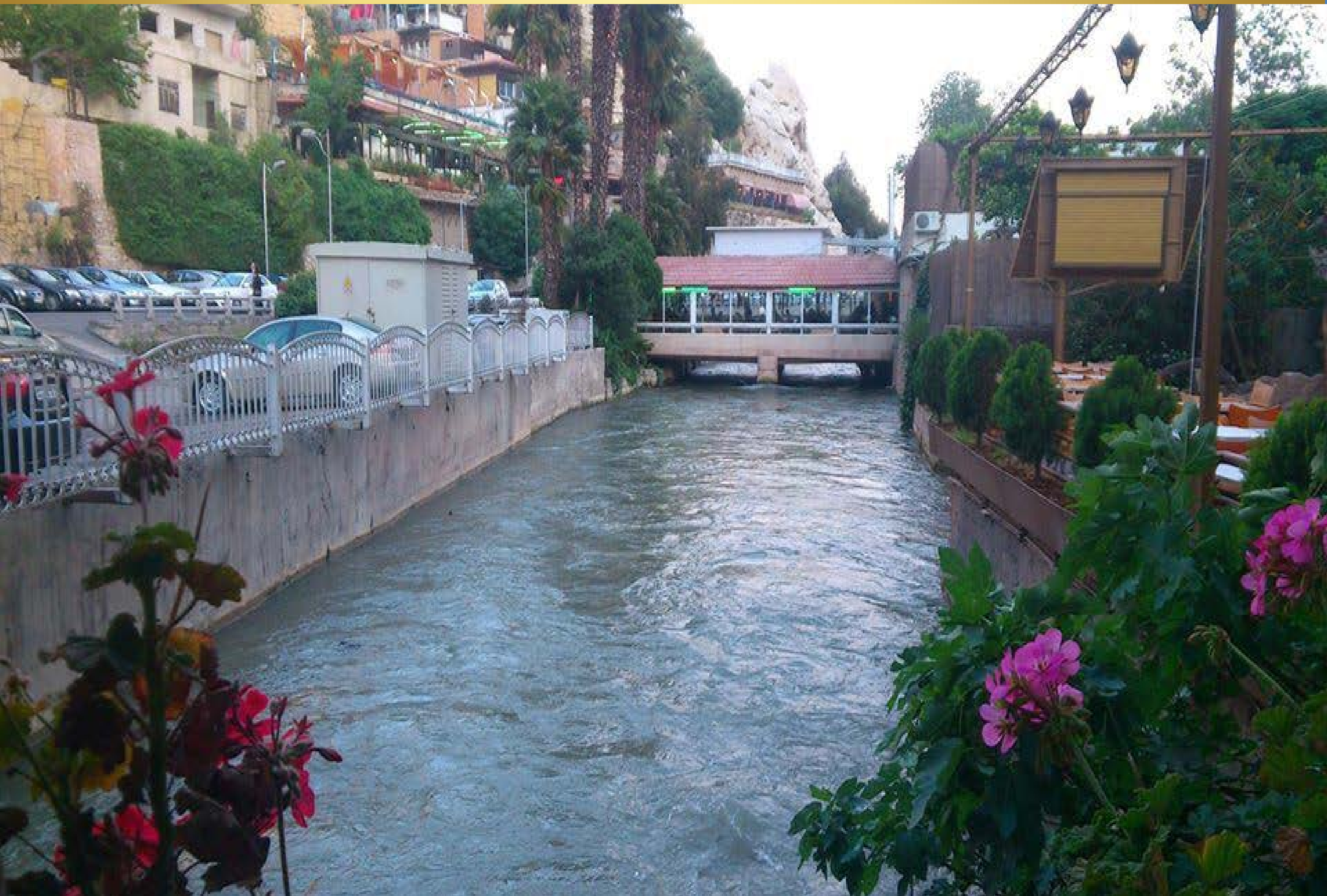
SDGs Indicators

Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Syria



Syria SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	1	**Water & Availability**			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	209.97	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	45.06	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	4.29	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	4.84	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**7.13**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	28.52	FAO Aquastat
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	31.73	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	11.13	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.34	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**39.65**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**1.08**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**15.63**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	2.00	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**14.71**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.00	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**14.71**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	12.94	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	1.53	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	1.18	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**15.65**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**30.36**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**30.36**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	1.18	estimated as 80% of domestic use
P-1-15		Collected Municipal Wastewater	BCM/Year	0.95	assumed 80% of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.38	assumed 40% of collected
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.57	estimated as 80% of industrial use
P-1-18		Collected Industrial Wastewater	BCM/Year	0.46	assumed 80% of collected
P-1-19		Treated Industrial WasteWater	BCM/Year	0.18	assumed 40% of collected
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**1.76**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**1.41**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.56**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	32	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**1.19**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	2.69	assumed 15% of Agr Withdrawals
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.01	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**4.45**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**34.82**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	1.48	etimated as pop. change rate from 2012
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.72	etimated as 1/4 pop. changerate from 2012
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	17.95	etimated as 1/4 pop. change rate from 2012
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**20.15**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**12.94**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**30.89**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	10.07	estimated
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	10.07	estimated
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.00	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**20.14**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	estimated
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.00	estimated
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	estimated
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.005	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.01**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**15.65**	**Calculated**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	12.63	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**28.28**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	6.19	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	2.04	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**8.23**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	NA	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.00	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	29,628	ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
P-3-2		Change in Irrigated Agricultural Land	ha	981	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	21,114	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	221,346	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	3,858,525	ESA/CEDARE
P-3-6		Total Pasture Area	ha	2,405,043	ESA/CEDARE
P-3-7		Total Forests Area	ha	248,949	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**20,016**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	144	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	14,931	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	4,797	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	144	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**2.63**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	2.63	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	89	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**1.63**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	3.33	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	4.96	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**188.35**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	86	JMP 2018
P-4-2		Public Taps	%	NA	
P-4-3		Other Improved Drinking Water	%	NA	
P-4-4		Improved Urban Drinking Water Coverage	%	92	(92%, Total: 90%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	87	(87%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	96	(96%, Total: 96%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	95	(95%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	87	estimated
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	90	Total: 90%, JMP 2015
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	96	Total: 96%, JMP 2015)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	
	I-4-7	Dam Storage Capacity	BCM	19.65	
	I-4-8	Drinking Water Capacity	BCM/Year	1.48	assumed equal to P-2-1
	I-4-9	Desalination Capacity	BCM/Year	0.01	assumed equal to I-1-17

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.38	assumed equal to P-1-16
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.18	assumed equal to P-1-19
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	1.41	assumed equal to P-1-20
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	8,000	
	I-5-2	Hydropower as % of Total Generated Electricity	%	13	estimated
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	18,502	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	405	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	1,051	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	3,824	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,882	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	947	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	1,351	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,935	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	833	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	33	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	80	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	1,869	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	818	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	NA	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	9	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	0	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	1	RAMSAR
	I-9-2	Total Wetlands Areas	ha	10,000	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	62	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	2	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.19	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (114.65 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	13	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	0	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**35.22**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.40**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**20.87**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**1,809**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	60.19	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	NA	
P-11-3		Sanitation Average Tarrif	$/m3	NA	
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	NA	

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0.99	OECD.Stat (2015)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	NA	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	NA	
	I-12-8	Total Investment in Water & Sanitation	Million US$	NA	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	1.72	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	9.08	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.01	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	NA	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number	NA	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Associated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	NA	
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	NA	Calculated
	I-14-6	Number of Unlicensed Wells	Number	NA	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	NA	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	Calculated
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	Calculated
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.52	assumed 35% losses
	I-14-13	Commercial Water Losses	BCM/Year	NA	
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**78**	**Calculated**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**19**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**137**	**SDG (6.4.2), Calculated**

P Code	I Code	Water Related Indicators	Units	Syria	Notes/ Year/ References
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**109**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	4.45	estimated equal to I-14-20
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	4.45	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**68**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	9	2 Agreements over the Euphartes between the years - 2 Agreements over the Tigris - 1 Agreements over the Jordan River - 2 Bilateral Agreements on the Orontes River Basin - 1 Treaty over Nahr el Kabir river with Lebanon in 1992 - 1 Agreement with Turkey in 1921 (under the French mandate) over the Qweik river basin
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	24	(8), Jordan (6), Turkey (5), Iraq (4), Lebanon (4), Sauid Arabia (2), Iran (1), Israel (1), Palestine (1)
	I-15-4	Number of Shared Water Resources Bodies	Number	13	Euphrates (S), Tigirs (S), Jordan (S), Orontes (S), Nahr el Kabir (S), Qweik (S), Jezira (G), Central Hammad (G), Azraq-Dhuleil (G), Yarmouk (G), Jezira Tertiary Limestone (G), Anit-Lebanon (G), Ga'ara (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**38**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**24**	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

Tunisia

Tunisia SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	244.70	211.55, Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	23.70	37.18 Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	52	
P-1-2		Annual Snow Fall Volume	BCM/Year	0	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	3.10	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	1.50	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**4.20**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.30	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.19	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.10	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.40**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**3.21**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**1.60**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	1,000	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.4	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**4.41**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	0.65	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**5.06**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	6.57	ESA/USGS/CEDARE, 6.12 FP
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.75	ESA/USGS/CEDARE, 6, FP
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	2.68	ESA/USGS/CEDARE, 1.5 FP
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**10.00**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**14.40**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**15.05**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.24	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.24	
P-1-16		Treated Municipal WasteWater	BCM/Year	0.24	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.02	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.01	
P-1-19		Treated Industrial WasteWater	BCM/Year	0.01	
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.26**	**Calculated**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.26**	**Calculated**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.25**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	I-1-15	Proportion of Wastewater Safely Treated	%	97	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.007**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.14	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.03	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.43**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**15.48**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.59	
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.17	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	2.30	
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**3.05**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**6.57**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**8.87**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.821	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	1.51	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	0.61	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**2.94**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.02	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.06	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.06**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.03	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.11**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**10.00**	**USGS/CEDARE**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	12.45	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**22.45**	**Calculated**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	6.00	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year		
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	3.01	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.51	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**3.52**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	1.00	
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	-23,940	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	-9	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	-15,516	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	489,710	2657454 (GIS)

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
P-3-5		Total Rain-fed Agricultural Land	ha	3,871,300	3059556 (GIS)
P-3-6		Total Pasture Area	ha	4,895,000	143833 (GIS)
P-3-7		Total Forests Area	ha	4,500,775	474903 (GIS)
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**4,779**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	4,509	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	270	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.85**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.85	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	0	ESA/USGS/Chirps/CEDARE
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	20	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.84**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	1.13	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	1.97	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**44.97**	**Calculated**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	93	(87 JMP 2018)
P-4-2		Public Taps	%	0	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	100	(100%, Total: 98%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	93	(93%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	97	(97%, Total: 92%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	80	(80%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	98	SDG (6.1.1) (93%, JMP 2018)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	94	SDG (6.2.1a) (73%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	51,902	
	I-4-4	Length of Sewage Networks	km	15,364	
	I-4-5	Length of Irrigation Networks	km	20,000	
	I-4-6	Length of Drainage Networks	km	10,500	
	I-4-7	Dam Storage Capacity	BCM	2.15	
	I-4-8	Drinking Water Capacity	BCM/Year	0.65	
	I-4-9	Desalination Capacity	BCM/Year	0.03	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.24	

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.02	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.26	
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	111	
	I-5-2	Hydropower as % of Total Generated Electricity	%	1	
	I-5-3	Installed Hydropower Capacity	MW	66	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0.83	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	11,234	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	1,263	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	392	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	1,282	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	1,378	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	262	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	890	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	1,162	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	205	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	15	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	52	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	260	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	967	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	300,500	58510 (JMP Arab)
	I-7-4	Percentage of Open Defecation	%	3	1 (JMP Arab)
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	29	
	I-7-7	Hepatitis A Reported Cases	Number/Year	670	
	I-7-8	Diarrhea Prevalence	%	45	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated
	I-8-2	Total Dissolved Solids (TDS)	PPM	NA	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	0	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	41	RAMSAR
	I-9-2	Total Wetlands Areas	ha	840,363	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	450	
	I-9-4	Number of Endangered Species	Number	10	
	I-9-5	Number of Invasive Species	Number	70	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**0**	**SDG (6.3.2), Calculated, (UN Environment/UN-Water (2018))**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	0	
P-10-2		Number of Class 1.5 Flood Events	Number	1	
P-10-3		Number of Class 2 Flood Events	Number	0	
	I-10-1	Total Number of Floods in Last Three Years	Number	2	floodlists.com
P-10-4		Average Temperature	C°	24.5	16-33
	I-10-2	Monthly Drought Events	Number	0	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0.13	Global Assessment Report (GAR 2015) - UNISDR, Annual Average (40.6 Million USD)
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	4.00	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	5	
	I-10-9	Unusual Weather Hail Events	Number	0	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	1	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**65**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.34**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**58**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**6,919**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	31.35	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	0.18	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	NA	(MDG+)

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	0.7	2012
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	1.9	2012
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	0.13	2012
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	129.45	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	64	2012
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	80.7	2012
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	64	2012
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	120	SDG (6.a.2), (OECD.Stat (2015))
	I-12-8	Total Investment in Water & Sanitation	Million US$	276	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	3.74	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	10.41	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.002	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.000001	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	No	
P-14-1		Surface Water Permits Issued to Date	Number	163	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	0.005	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0.61	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	1,232	2012
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.05	2012
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**2.44**	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number	2,847	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	83	2012
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	NA	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.09	Danilenko, et al (2014)
	I-14-13	Commercial Water Losses	BCM/Year	0.06	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	0.82	2012
	I-14-15	**Overall Water Use Efficiency**	**%**	**89**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Tunisia	Notes/ Year/ References
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-28**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**67**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**66**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.32	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.32	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	2,580	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**48**	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	47.50	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**9**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	1	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	2	
	I-15-4	Number of Shared Water Resources Bodies	Number	3	
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**50**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	**0**	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

United Arab Emirates

United Arab Emirates SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	102.00	58.49, Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	5.54	4.69, Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	0.14	
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	0.12	
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**0.14**	Calculated
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.10	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.10**	Calculated
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**0.14**	Calculated
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**0.22**	Calculated
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	53	5-100m
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	0.12	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**0.24**	Calculated
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	2.59	Total groundwater abstraction from non-renewable aquifers
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**2.83**	Calculated
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	0.12	0.001, ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	0.25	0.007, ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	0.15	0.01, ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**0.52**	Calculated
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**0.76**	Calculated
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**3.35**	Calculated
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.75	
P-1-15		Collected Municipal Wastewater	BCM/Year	0.60	MDG+
P-1-16		Treated Municipal WasteWater	BCM/Year	0.60	
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.11	
P-1-18		Collected Industrial Wastewater	BCM/Year	0.11	MDG+
P-1-19		Treated Industrial WasteWater	BCM/Year	0.11	
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.86**	Calculated
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.71**	Calculated

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.71**	**Calculated**
	I-1-15	Proportion of Wastewater Safely Treated	%	83	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.15**	**Calculated**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.13	
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	2.23	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	2.48	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**5.70**	**Calculated**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**9.05**	**Calculated**
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	1.49	1.7786, MDG+
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.12	
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	3.90	This incudes (Farms + forests + recreational areas landscaping and amenity)
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**5.66**	**Calculated (+Withdrawals (for Oil & Gas**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**0.12**	**Calculated**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**4.02**	**Calculated**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	0.09	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	0.11	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	2.59	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**2.80**	**Calculated**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.13	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.42	0.5417, GCC (2015)
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.08	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.5**	**Calculated**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	2.23	**Calculated**
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**2.86**	**Calculated**
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**0.52**	**USGS/CEDARE**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	0.62	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**1.14**	**Calculated, (0.95 FP)**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	0.13	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	0.49	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.01	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**0.50**	**Calculated**
	I-2-12	Bottled Water Production	MCM/Year	0.18	3.28, GOIC (2013)
P-2-14		Navigation Water Flows	BCM/Year	0.00	
P-2-15		Environmental Water Flows	BCM/Year	0.10	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.15	
	3	**Water & Land Use Changes**			
P-3-1		Green Cover Land-Use Change	ha	2,300	-369, ESA/CEDARE

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
P-3-2		Change in Irrigated Agricultural Land	ha	250	0, ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	66,700	567, ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	75,000	1206, ESA/CEDARE
P-3-6		Total Pasture Area	ha	305,000	259,191 ESA/CEDARE
P-3-7		Total Forests Area	ha	238,000	33003 ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**126**	**Calculated (1200, FP)**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	0	ESA/CEDARE (1750, FP)
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	0	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	126	ESA/CEDARE (2500, FP)
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	0	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**0.00**	**Calculated (10 FP)**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE (250, FP)
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE (450, FP)
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	0.00	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE (100, FP)
P-3-15		Impact of NDVI Change on ET	MCM/Year	0.00	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**0.003**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	0.03	ESA/USGS/Chirps/CEDARE (0.09, FP)
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	0.03	ESA/USGS/Chirps/CEDARE (0.09, FP)
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	0.00	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**1.19**	**Calculated (0.01, FP)**
	4	**Water & Services**			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	99	(MDG+)
P-4-2		Public Taps	%	98	(MDG+)
P-4-3		Other Improved Drinking Water	%	NA	(JMP)
P-4-4		Improved Urban Drinking Water Coverage	%	100	(100%, Total: 100%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	98	(100%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	100	(98%, Total: 98%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	97	(95%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	98	(JMP/MDG+/Ministry Sector)
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	100	SDG (6.1.1)
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	98	SDG (6.2.1a) (93%, JMP 2018)
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	12,500	Including main transmission pipelines and distribution pipelines

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
	I-4-4	Length of Sewage Networks	km	8,560	
	I-4-5	Length of Irrigation Networks	km	3,670	
	I-4-6	Length of Drainage Networks	km	375	
	I-4-7	Dam Storage Capacity	BCM	0.14	
	I-4-8	Drinking Water Capacity	BCM/Year	1.75	
	I-4-9	Desalination Capacity	BCM/Year	2.45	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	1.85	0.856 GCC (2015)
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.24	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	2.10	0.72, GCC (2015)
	I-4-13	Maximum Annual Dam Storage Reached	BCM	0.09	
	5	Water & Energy			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	0	
	I-5-3	Installed Hydropower Capacity	MW	0	
	I-5-4	Water Used to Generate Electricity	BCM/Year	0	Desalination plants used water for cooling (mainly seawater)
	6	Water & Population			
P-6-1		Total Population	1000 inhabitants	9,121	0.949 million UAE national + 7.31 Expats)
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	72	**Calculated**
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	26	**Calculated**
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	83	**Calculated**
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	993	**Calculated**
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	306	**Calculated**
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	57	**Calculated**
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	677	**Calculated**
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	427	**Calculated**
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	13	**Calculated**
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	164	**Calculated**
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	26	**Calculated**
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	38	**Calculated**
	7	Water & Health			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	0	
	I-7-4	Percentage of Open Defecation	%	NA	
	I-7-5	Cholera Reported Cases	Number/Year	0	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	Water & Quality			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
p-8-2		pH	Dimensionless	7.90	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	0.15	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	**Calculated**
	I-8-2	Total Dissolved Solids (TDS)	PPM	175	150-200
	I-8-3	Fecal Choliform	Colonies/100ML	0	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	82.5	75-90
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	7	RAMSAR
	I-9-2	Total Wetlands Areas	ha	34,978	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	25	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**66.67**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	0	
P-10-2		Number of Class 1.5 Flood Events	Number	0	
P-10-3		Number of Class 2 Flood Events	Number	0	
	I-10-1	Total Number of Floods in Last Three Years	Number	4	floodlists.com
P-10-4		Average Temperature	C°	27.5	25-30
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	0	
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	0	
	I-10-6	Annual Human Losses Related to Floods	Number	NA	
	I-10-7	Annual Human Losses Related to Droughts	Number	0	
	I-10-8	Unusual Weather Snow Events	Number	2	
	I-10-9	Unusual Weather Hail Events	Number	4	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	Yes	
	I-10-11	Existing Early Warning System	Number	1	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**1,356**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.67**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**63**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**13,260**	**Calculated from ILO**

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	1	
P-11-1		GDP	Billion $	399.45	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	8.41	0.95, (MDG+) , 1.59 Danilenko et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	NA	0, (MDG+)
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	2.7	
	12	**Water & Finance**			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	3.7	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	1.6	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	0	SDG (6.a.1)
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	0	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	75	
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	84	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	7,700	SDG (6.a.2) (80.8, OECD, 2015)
	I-12-8	Total Investment in Water & Sanitation	Million US$	55,000	
	13	**Water & Trade**			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	4.56	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	16.46	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.17	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.14	ITC statistics/CEDARE
	14	**Water & Governance**			
	I-14-1	IWRM Plan	Yes/No	Yes	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	70	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	Yes	
P-14-1		Surface Water Permits Issued to Date	Number	0	
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	0	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	0	Calculated
P-14-3		Groundwater Well Permits Issued to Date	Number	8,540	Groundwater well permits started in 2007 after issuing the law 6/2006
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	0.1	Starting 2007
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**	**4**	**Calculated (0.08, FP)**
	I-14-6	Number of Unlicensed Wells	Number	109,500	
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	2.1	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	0.001	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	95	
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**	**1**	**Calculated (85 meters)**

P Code	I Code	Water Related Indicators	Units	UAE	Notes/ Year/ References
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.27	12% of the desalinated water
	I-14-13	Commercial Water Losses	BCM/Year	0.18	8% of the desalinated water
	I-14-14	Physical Irrigation Water Losses	BCM/Year	0.58	15% of irrigation water
	I-14-15	**Overall Water Use Efficiency**	**%**	**93**	**Calculated, (82, FP)**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**28**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**1996**	**SDG (6.4.2), Calculated (69, FP)**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**384**	**Calculated (230, FP)**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.36	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.36	**Calculated**
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	5	
P-14-5		Number of Water Users Associations	Number	0	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	NA	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%	NA	
	15	**Water & International Relations**			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**42**	**Calculated (2.8, FP)**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	3	(3), Saudi Arabia (1), Oman (1), Yemen (1), 2 (FP)
	I-15-4	Number of Shared Water Resources Bodies	Number	1	Rub' al Khali (G)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%	0	SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

*All data and estimates are for 2015 unless otherwise mentioned.

*All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Yemen

Yemen SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	1	Water & Availability			
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year	109.68	Chirps/CEDARE
	I-1-2	Annual Precipitation Volume	BCM/Year	48.69	Chirps/CEDARE
P-1-1		Annual Hail Fall Volume	BCM/Year	NA	
P-1-2		Annual Snow Fall Volume	BCM/Year	NA	
		Blue Water			
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	2.00	FAO Aquastat
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	1.50	FAO Aquastat
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**2.10**	**Calculated**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	0.00	
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	0.00	
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	0.00	
P-1-8		External Groundwater outflow (EGO)	BCM/Year	0.00	
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**0.00**	**Calculated**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**2.00**	**Calculated**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**1.50**	**Calculated**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M	NA	
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	1.40	
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**2.10**	**Calculated**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	1.23	
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**3.33**	**Calculated**
		Green Water			
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	1.79	ESA/USGS/CEDARE
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	4.74	ESA/USGS/CEDARE
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	1.15	ESA/USGS/CEDARE
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**7.68**	**Calculated**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**9.78**	**Calculated**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**11.01**	**Calculated**
		Non-Conventional Water			
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	0.29	estimated as 80% of domestic use
P-1-15		Collected Municipal Wastewater	BCM/Year	0.23	assumed 80% of Produced
P-1-16		Treated Municipal WasteWater	BCM/Year	0.09	assumed 40% of collected
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	0.06	estimated as 80% of industrial use
P-1-18		Collected Industrial Wastewater	BCM/Year	0.05	assumed 80% of collected
P-1-19		Treated Industrial WasteWater	BCM/Year	0.02	assumed 40% of collected
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**0.36**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**0.28**	Calculated
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.11**	Calculated
	I-1-15	Proportion of Wastewater Safely Treated	%	32	SDG (6.3.1)
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**0.24**	Calculated
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	0.60	assumed 15% of Agr Withdrawals
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	0.03	
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	NA	
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**0.98**	Calculated
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**12.00**	Calculated
	2	**Water & Uses**			
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	0.36	etimated as pop. change rate from 2012
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	0.08	etimated as 1/4 pop. changerate from 2012
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	4.01	etimated as 1/4 pop. change rate from 2012
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**4.46**	Calculated (+Withdrawals (for Oil & Gas
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**1.79**	Calculated
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**5.80**	Calculated
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	1.80	
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	1.40	
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	1.23	
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**4.43**	Calculated
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	0.00	
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	0.00	
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.00	
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**0.00**	Calculated
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	0.025	Calculated
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**0.03**	Calculated
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**7.68**	USGS/CEDARE
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	3.30	USGS/CEDARE
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**10.98**	Calculated
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	NA	
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	NA	
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	10.80	USGS/CEDARE
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	0.08	USGS/CEDARE
	I-2-11	**Evaporation Losses**	**BCM/Year**	**10.88**	Calculated
	I-2-12	Bottled Water Production	MCM/Year	2.06	GOIC (2013)
P-2-14		Navigation Water Flows	BCM/Year	NA	
P-2-15		Environmental Water Flows	BCM/Year	0.00	
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.000	

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	3	Water & Land Use Changes			
P-3-1		Green Cover Land-Use Change	ha	-4,500	ESA/CEDARE
P-3-2		Change in Irrigated Agricultural Land	ha	63	ESA/CEDARE
P-3-3		Change in Rain-fed Agricultural Land	ha	-531	ESA/CEDARE
P-3-4		Total Irrigated Agricultural Land	ha	391,095	ESA/CEDARE
P-3-5		Total Rain-fed Agricultural Land	ha	359,199	ESA/CEDARE
P-3-6		Total Pasture Area	ha	2,934,810	ESA/CEDARE
P-3-7		Total Forests Area	ha	448,515	ESA/CEDARE
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**2,421**	**Calculated**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	171	ESA/CEDARE
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	855	ESA/CEDARE
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	1,377	ESA/CEDARE
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	18	ESA/CEDARE
		Impact of Urban Encroachment on Water Resources			
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**1.37**	**Calculated**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	1.37	ESA/USGS/Chirps/CEDARE
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	ESA/USGS/Chirps/CEDARE
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	NA	
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	2	ESA/USGS/Chirps/CEDARE
P-3-15		Impact of NDVI Change on ET	MCM/Year	NA	
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**1.37**	**Calculated**
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	1.09	ESA/USGS/Chirps/CEDARE
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	2.46	ESA/USGS/Chirps/CEDARE
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	NA	
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**22.78161**	**Calculated**
	4	Water & Services			
		Water Coverage and Accessibility			
P-4-1		Piped Water on Premises	%	42	JMP 2018
P-4-2		Public Taps	%	NA	
P-4-3		Other Improved Drinking Water	%	NA	
P-4-4		Improved Urban Drinking Water Coverage	%	72	(72%, Total: 55%, JMP 2015
P-4-5		Improved Rural Drinking Water Coverage	%	47	(47%, JMP 2015)
P-4-6		Improved Urban Sanitation Coverage	%	93	(93%, Total: 54%, JMP 2015)
P-4-7		Improved Rural Sanitation Coverage	%	34	(34%, JMP 2015)
P-4-8		Everyday Accessibility to Drinking Water	%	100	estimated
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%	55	SDG (6.1.1), JMP 2015
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%	54	SDG (6.2.1a), JMP 2015
		Water Infrastructure			
	I-4-3	Length of Drinking Water Networks	km	NA	
	I-4-4	Length of Sewage Networks	km	NA	
	I-4-5	Length of Irrigation Networks	km	NA	
	I-4-6	Length of Drainage Networks	km	NA	

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	I-4-7	Dam Storage Capacity	BCM	0.46	
	I-4-8	Drinking Water Capacity	BCM/Year	0.36	
	I-4-9	Desalination Capacity	BCM/Year	0.03	
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	0.03	GCC (2015)
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	0.02	
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	0.05	GCC (2015)
	I-4-13	Maximum Annual Dam Storage Reached	BCM	NA	
	5	**Water & Energy**			
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	0	
	I-5-2	Hydropower as % of Total Generated Electricity	%	NA	
	I-5-3	Installed Hydropower Capacity	MW	NA	
	I-5-4	Water Used to Generate Electricity	BCM/Year	NA	
	6	**Water & Population**			
P-6-1		Total Population	1000 inhabitants	26,832	
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**	365	Calculated
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**	78	Calculated
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**	365	Calculated
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**	447	Calculated
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**	165	Calculated
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**	286	Calculated
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**	452	Calculated
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**	150	Calculated
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**	3	Calculated
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**	14	Calculated
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	11,873	Calculated
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	12,168	Calculated
	7	**Water & Health**			
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%	NA	SDG (6.2.1b)
	I-7-2	Dracunculiasis Reported Cases	%	0	
	I-7-3	Open Defecation Practice	Number	5,903,040	
	I-7-4	Percentage of Open Defecation	%	22	
	I-7-5	Cholera Reported Cases	Number/Year	NA	
	I-7-6	Typhoid Reported Cases	Number/Year	NA	
	I-7-7	Hepatitis A Reported Cases	Number/Year	NA	
	I-7-8	Diarrhea Prevalence	%	NA	
	8	**Water & Quality**			
P-8-1		Dissolved Oxygen (DO)	PPM	NA	
p-8-2		pH	Dimensionless	NA	
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)	NA	
P-8-4		Nitrogen Concentration	PPM	NA	
P-8-5		Phosphorous Concentration	PPM	NA	
	I-8-1	**Water Quality Index**	**Score/100**	NA	Calculated

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	I-8-2	Total Dissolved Solids (TDS)	PPM	0	
	I-8-3	Fecal Choliform	Colonies/100ML	NA	
	I-8-4	Biological Oxygen Demand (BOD)	mg/l	NA	
	I-8-5	Chemical Oxygen Demand (COD)	mg/l	NA	
	I-8-6	Chloride Concentration	mg/l	NA	
	I-8-7	Total Hardness ($CaCo_3$)	mg/l	NA	
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%	NA	
	9	**Water & Ecosystems**			
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	1	RAMSAR
	I-9-2	Total Wetlands Areas	ha	580	RAMSAR
	I-9-3	Total Freshwater Species Count	Number	NA	
	I-9-4	Number of Endangered Species	Number	NA	
	I-9-5	Number of Invasive Species	Number	28	Global Invasive Species Database (issg.org)
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**	**NA**	**SDG (6.3.2)**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	0.00	**SDG (6.6.1) Calculated**
	10	**Water & Climate**			
		Extreme Weather Events			
P-10-1		Number of Class 1 Flood Events	Number	NA	
P-10-2		Number of Class 1.5 Flood Events	Number	NA	
P-10-3		Number of Class 2 Flood Events	Number	NA	
	I-10-1	Total Number of Floods in Last Three Years	Number	4	floodlists.com
P-10-4		Average Temperature	C°	NA	
	I-10-2	Monthly Drought Events	Number	NA	
	I-10-3	Annual Drought Events	Number	NA	
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP	NA	
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP	NA	
	I-10-6	Annual Human Losses Related to Floods	Number	66	EMDAT
	I-10-7	Annual Human Losses Related to Droughts	Number	NA	
	I-10-8	Unusual Weather Snow Events	Number	NA	
	I-10-9	Unusual Weather Hail Events	Number	NA	
	I-10-10	National Climate Change Adaptation Plan	Yes/No	NA	
	I-10-11	Existing Early Warning System	Number	NA	
	11	**Water & Socio-Economics**			
		Water Productivity			
	I-11-1	**Industrial Water Productivity**	**$/CM**	**206**	**Calculated from WB**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**	**0.88**	**AOAD, CEDARE (Calculated)**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**	**274**	**Calculated from ILO**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**	**8,002**	**Calculated from ILO**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM	NA	
P-11-1		GDP	Billion $	34.71	CEDARE, AOAD
		Tariffs and Affordability			
P-11-2		Water Average Tarrif	$/m3	1.26	Danilenko, et al (2014)
P-11-3		Sanitation Average Tarrif	$/m3	NA	

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%	1.35	Danilenko, et al (2014)
	12	Water & Finance			
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%	NA	
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%	NA	
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	157.40	SDG (6.a.1), (OECD.Stat (2015))
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%	NA	
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%	59	Danilenko, et al (2014)
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%	NA	
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$		SDG (6.a.2)
	I-12-8	Total Investment in Water & Sanitation	Million US$	106	
	13	Water & Trade			
	I-13-1	Agricultural Virtual Water Export	BCM/Year	0.34	CEDARE, AOAD
	I-13-2	Agricultural Virtual Water Import	BCM/Year	17.14	CEDARE, AOAD
	I-13-3	Bottled Water Export	MCM/Year	0.00001	ITC statistics/CEDARE
	I-13-4	Bottled Water Import	MCM/Year	0.003	ITC statistics/CEDARE
	14	Water & Governance			
	I-14-1	IWRM Plan	Yes/No	NA	
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number	NA	SDG (6.5.1)
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	NA	
P-14-1		Surface Water Permits Issued to Date	Number		
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	NA	
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%	NA	**Calculated**
P-14-3		Groundwater Well Permits Issued to Date	Number		
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	NA	
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	%	NA	**Calculated**
	I-14-6	Number of Unlicensed Wells	Number		
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%	NA	
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%	NA	
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%	94	IBNET (2010)
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	%	NA	**Calculated**
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	%	NA	**Calculated**
	I-14-12	Physical Domestic Water Losses	BCM/Year	0.06	Danilenko, et al (2014)
	I-14-13	Commercial Water Losses	BCM/Year	0.04	Danilenko, et al (2014)
	I-14-14	Physical Irrigation Water Losses	BCM/Year	NA	
	I-14-15	**Overall Water Use Efficiency**	**%**	**79**	**Calculated**

P Code	I Code	Water Related Indicators	Units	Yemen	Notes/ Year/ References
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**	**-4.77**	**SDG (6.4.1), Calculated**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**	**211**	**SDG (6.4.2), Calculated**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**	**64**	**Calculated**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	0.96	
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	0.96	Calculated
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	NA	
P-14-5		Number of Water Users Associations	Number	NA	
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**	**0**	**Calculated**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%	NA	SDG (6.b.1)
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%		
	15	Water & International Relations			
	I-15-1	**Transboundary Water Dependency Ratio**	**%**	**0**	**Calculated**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number	0	
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number	5	(3), Saudi Arabia (3), United Arab Emirates (1), Oman (1)
	I-15-4	Number of Shared Water Resources Bodies	Number	3	Rub' al Khali (G), Tawila-Mahra (G), Wajid (G), 1 (FP)
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**	**0**	**Calculated**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		SDG (6.5.2)
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**	NA	**Calculated**

Categories of Indicators
Sub-categories of Indicators
Total Renewable, Conventional, Non-Conventional & Available Water Resources
SDGs Indicators
Calculated Indicators

*All data and estimates are for 2015 unless otherwise mentioned.

*All data and estimates are from country Focal Point (FP) unless otherwise mentioned.

Arab Region

Arab Region SOW Indicators Datasheet

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
	1	**Water & Availability**		**2015 Region**				
	I-1-1	Annual Spatially Averaged Precipitation Depth	MM/Year		22	270.44	1.80	2,143.88
	I-1-2	Annual Precipitation Volume	BCM/Year	1461.63	22	66.44	0.04	400.00
P-1-1		Annual Hail Fall Volume	BCM/Year	73.00	10	7.30	-	52.00
P-1-2		Annual Snow Fall Volume	BCM/Year	1.97	10	0.20	-	1.00
		Blue Water						
P-1-3		Internal Renewable Surface Water (IRSW)	BCM/Year	69.11	22	3.14	-	18.34
P-1-4		Internal Renewable Groundwater (IRG)	BCM/Year	41.27	22	1.88	-	6.05
	I-1-3	**Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)**	**BCM/Year**	**91.64**	**22**	**4.17**	**-**	**19.17**
P-1-5		External Surface Water Inflow (ESWI)	BCM/Year	215.62	22	9.80	-	84.00
P-1-6		External Surface Water Outflow (ESWO)	BCM/Year	97.38	22	4.43	-	63.50
P-1-7		External Groundwater Inflow (EGI)	BCM/Year	12.86	22	0.58	-	11.13
P-1-8		External Groundwater outflow (EGO)	BCM/Year	2.36	22	0.11	-	1.00
	I-1-4	**Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)**	**BCM/Year**	**228.48**	**22**	**10.39**	**-**	**84.20**
	I-1-5	**Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)**	**BCM/Year**	**187.34**	**22**	**8.52**	**-**	**56.00**
	I-1-6	**Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)**	**BCM/Year**	**51.77**	**22**	**2.35**	**0.02**	**15.63**
P-1-9		Average Depth from Ground Surface to Groundwater Surface Level	M		11	704.95	-	5,500.00
P-1-10		Overlap between Surface Water and Groundwater (OSWG)	BCM/Year	18.74	22	0.85	-	3.00
	I-1-7	**Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)**	**BCM/Year**	**220.41**	**22**	**10.02**	**0.02**	**57.50**
	I-1-8	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	46.68	22	2.12	-	15.50
	I-1-9	**Total Blue Water Resources (TBWR)**	**BCM/Year**	**267.09**	**22**	**12.14**	**0.04**	**62.40**
		Green Water						
P-1-11		Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/Year	150.52	22	6.84	-	60.00
P-1-12		Water for Rain-fed Pasture Consumption	BCM/Year	212.07	22	9.64	-	96.54
P-1-13		Water for Rain-fed Forest Consumption	BCM/Year	80.29	22	3.65	-	35.00
	I-1-10	**Total Renewable Green Water Resources (TRGWR)**	**BCM/Year**	**442.87**	**22**	**20.13**	**0.00**	**142.00**
	I-1-11	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	**BCM/Year**	**663.29**	**22**	**30.15**	**0.04**	**171.00**
	I-1-12	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	**BCM/Year**	**709.97**	**22**	**32.27**	**0.06**	**183.00**
		Non-Conventional Water						
P-1-14		Produced Municipal Wastewater (PMW)	BCM/Year	18.14	22	0.82	0.00	6.50

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
P-1-15		Collected Municipal Wastewater	BCM/Year	11.82	22	0.54	0.00	4.60
P-1-16		Treated Municipal WasteWater	BCM/Year	8.55	22	0.39	0.00	4.10
P-1-17		Produced Industrial Wastewater (PIW)	BCM/Year	6.70	22	0.30	-	4.20
P-1-18		Collected Industrial Wastewater	BCM/Year	2.11	22	0.10	-	0.62
P-1-19		Treated Industrial WasteWater	BCM/Year	1.55	22	0.07	-	0.62
	I-1-13	**Produced Municipal and Industrial Wastewater**	**BCM/Year**	**24.84**	**22**	**1.13**	**0.00**	**10.70**
P-1-20		**Collected Municipal and Industrial Wastewater**	**BCM/Year**	**13.93**	**22**	**0.63**	**0.00**	**4.80**
	I-1-14	**Treated Municipal and Industrial Wastewater**	**BCM/Year**	**10.09**	**22**	**0.46**	**0.00**	**4.25**
	I-1-15	Proportion of Wastewater Safely Treated	%		22	48.30	6.00	98.71
P-1-21		**Untreated Municipal and Industrial Wastewater**	**BCM/Year**	**14.74**	**22**	**0.67**	**0.00**	**6.45**
	I-1-16	Produced Agricultural Drainage (PAD)	BCM/Year	28.50	22	1.30	-	9.31
	I-1-17	Produced Desalinated Water (PDW)	BCM/Year	7.09	22	0.32	-	2.23
	I-1-18	Total Exploitable Brackish Groundwater (and/or Recycled Groundwater)	BCM/Year	13.23	20	0.66	-	7.50
	I-1-19	**Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)**	**BCM/Year**	**73.55**	**22**	**3.34**	**0.01**	**27.86**
	I-1-20	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	**BCM/Year**	**783.51**	**22**	**35.61**	**0.51**	**190.13**
	2	**Water & Uses**						
P-2-1		Withdrawals for Domestic Water Use	BCM/Year	32.88	22	1.49	0.01	10.46
P-2-2		Withdrawals for Industrial Water Use	BCM/Year	11.17	22	0.51	0.00	5.40
P-2-3		Withdrawals for Agricultural Water Use	BCM/Year	190.10	22	8.64	0.00	61.10
	I-2-1	**Annual Total Water Withdrawals**	**BCM/Year**	**235.13**	**22**	**10.69**	**0.01**	**76.96**
	I-2-2	**Green Water Consumption for Agriculture Water Use**	**BCM/Year**	**150.52**	**22**	**6.84**	**-**	**60.00**
	I-2-3	**Total Agricultural Water Use**	**BCM/Year**	**340.62**	**22**	**15.48**	**0.01**	**74.84**
P-2-4		Withdrawals from Blue Surface Water	BCM/Year	141.15	22	6.42	-	55.50
P-2-5		Withdrawals from Blue Renewable Groundwater	BCM/Year	31.09	22	1.75	0.00	10.07
P-2-6		Withdrawals from Blue Non-Renewable Groundwater	BCM/Year	33.52	22	1.52	-	18.75
	I-2-4	**Total Withdrawals from Blue Water**	**BCM/Year**	**205.76**	**22**	**9.35**	**0.01**	**57.60**
	I-2-5	Agricultural Drainage Water Reuse	BCM/Year	11.22	22	0.51	-	9.31
P-2-7		Reused Treated Municipal Wastewater	BCM/Year	3.46	22	0.16	-	2.20
P-2-8		Reused Treated Industrial Wastewater	BCM/Year	0.15	22	0.01	-	0.08
	I-2-6	**Reused Treated Municipal and Industrial Wastewater**	**BCM/Year**	**3.60**	**22**	**0.16**	**-**	**2.20**
	I-2-7	Withdrawals from Desalinated Water and Brackish Groundwater	BCM/Year	7.05	22	0.32	-	2.23
	I-2-8	**Total Withdrawals from Non-Conventional Water Resources**	**BCM/Year**	**29.37**	**22**	**1.33**	**-**	**19.36**

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
P-2-9		**Rainfed Evapo-Transpiration (ET)**	**BCM/Year**	**442.87**	**22**	**20.13**	**0.00**	**142.00**
P-2-10		Irrigated Evapo-Transpiration (ET)	BCM/Year	354.43	22	16.11	0.00	114.91
	I-2-9	**Annual Volume of Total Actual Evapotranspiration**	**BCM/Year**	**797.31**	**22**	**36.24**	**0.00**	**249.80**
	I-2-10	Green Water Consumption for Livestock Fodder Water Use	BCM/Year	64.14	9	7.13	-	57.00
P-2-11		Inland Fisheries & Aquaculture Demands	BCM/Year	0.70	9	0.08	-	0.70
P-2-12		Evaporation Losses from Barren Lands (& Urban Areas)	BCM/Year	429.21	22	19.51	-	94.45
P-2-13		Evaporation Losses from Open Water Bodies	BCM/Year	23.21	22	1.05	-	8.39
	I-2-11	**Evaporation Losses**	**BCM/Year**	**452.42**	**22**	**20.56**	**0.01**	**95.20**
	I-2-12	Bottled Water Production	MCM/Year	624.29	15	41.62	-	597.43
P-2-14		Navigation Water Flows	BCM/Year	18.50	13	1.42	-	18.50
P-2-15		Environmental Water Flows	BCM/Year	0.33	20	0.02	-	0.23
P-2-16		Withdrawals for Oil & Gas Water Use	BCM/Year	0.98	22	0.04	-	0.55
	3	**Water & Land Use Changes**						
P-3-1		Green Cover Land-Use Change	ha	26086515.00	22	1,185,751	(30,951)	26,119,000
P-3-2		Change in Irrigated Agricultural Land	ha	-311515.00	22	(14,160)	(275,000)	6,100
P-3-3		Change in Rain-fed Agricultural Land	ha	9482825.00	22	431,038	(15,576)	9,447,479
P-3-4		Total Irrigated Agricultural Land	ha	13,923,600	22	632,891	18	3,738,000
P-3-5		Total Rain-fed Agricultural Land	ha	46,716,554	22	2,123,480	-	17,750,000
P-3-6		Total Pasture Area	ha	141,099,006	22	6,413,591	-	54,000,000
P-3-7		Total Forests Area	ha	36,447,947	22	1,656,725	-	22,321,000
P-3-8		**Urban Encroachment on Green Cover**	**ha**	**188267.00**	**22**	**8,557.59**	**14.00**	**32,004.00**
P-3-9		Urban Encroachment on Irrigated Agricultural Land	ha	35640.00	22	1,620.00	-	26,388.00
P-3-10		Urban Encroachment on Rain-fed Agricultural Land	ha	102074.00	22	4,639.73	-	24,080.00
P-3-11		Urban Encroachment on Rain-fed Pasture Land	ha	49086.00	22	2,231.18	-	11,322.00
P-3-12		Urban Encroachment on Rain-fed Forests Land	ha	1467.00	22	66.68	-	477.00
		Impact of Urban Encroachment on Water Resources						
	I-3-1	**Decrease in Groundwater Recharge**	**MCM/Year**	**9.30**	**22**	**0.42**	**-**	**2.63**
P-3-12		Groundwater Recharge from Precipitation before Urban Encroachment	MCM/Year	9.30	22	0.42	-	2.63
P-3-13		Groundwater Recharge from Precipitation after Urban Encroachment	MCM/Year	0.00	22	-	-	-
P-3-14		Impact of NDVI Change on Groundwater Recharge	MCM/Year	2.70	5	0.54	-	2.70
	I-3-2	Decrease in Water Consumption of Green Cover	MCM/Year	1070.00	22	48.64	-	273.00
P-3-15		Impact of NDVI Change on ET	MCM/Year	10.80	5	2.16	-	10.80
	I-3-3	**Increase in Surface Runoff**	**MCM/Year**	**11.41**	**22**	**0.52**	**-**	**3.64**

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
P-3-16		Surface Runoff from Rainfall before Urbanization	MCM/Year	52.67	22	2.39	-	29.98
P-3-17		Surface Runoff from Rainfall after Urbanization	MCM/Year	64.08	22	2.91	-	29.98
P-3-18		Impact of NDVI Change on Runoff	MCM/Year	10.80	5	2.16	-	10.80
	I-3-4	**Increase in Domestic Water Withdrawals**	**MCM/Year**	**1771.59**	**22**	**80.53**	**0.13**	**301.16**
	4	**Water & Services**						
		Water Coverage and Accessibility						
P-4-1		Piped Water on Premises	%		21	79	30.00	100.00
P-4-2		Public Taps	%		15	16	-	100.00
P-4-3		Other Improved Drinking Water	%		13	18	-	100.00
P-4-4		Improved Urban Drinking Water Coverage	%		21	89	29.00	100.00
P-4-5		Improved Rural Drinking Water Coverage	%		21	83	29.00	100.00
P-4-6		Improved Urban Sanitation Coverage	%		21	81	23.00	100.00
P-4-7		Improved Rural Sanitation Coverage	%		21	71	22.00	100.00
P-4-8		Everyday Accessibility to Drinking Water	%		21	86	29.00	100.00
	I-4-1	Proportion of Population Using Safely Managed Drinking Water Services	%		22	82	29.00	100.00
	I-4-2	Proportion of Population Using Safely Managed Sanitation Services	%		22	72	14.00	100.00
		Water Infrastructure						
	I-4-3	Length of Drinking Water Networks	km	927264.00	15	61,817.60	-	419,400.00
	I-4-4	Length of Sewage Networks	km	183607.51	16	11,475.47	-	46,173.00
	I-4-5	Length of Irrigation Networks	km	216420.00	14	15,458.57	-	70,000.00
	I-4-6	Length of Drainage Networks	km	223889.30	15	14,925.95	-	95,000.00
	I-4-7	Dam Storage Capacity	BCM	400.30	19	21.07	-	174.00
	I-4-8	Drinking Water Capacity	BCM/Year	36.20	22	1.65	0.01	12.80
	I-4-9	Desalination Capacity	BCM/Year	8.32	22	0.38	-	2.45
	I-4-10	Municipal Wastewater Treatment Capacity	BCM/Year	12.26	22	0.56	-	3.73
	I-4-11	Industrial Wastewater Treatment Capacity	BCM/Year	1.54	22	0.07	-	0.62
	I-4-12	Municipal & Industrial Wastewater Collection Capacity	BCM/Year	17.05	22	0.77	0.00	4.80
	I-4-13	Maximum Annual Dam Storage Reached	BCM	218.45	13	16.80	-	120.00
	5	**Water & Energy**						
	I-5-1	Electricity Generated Using Hydropower	GWh/Year	35127.19	19	1,848.80	-	13,545.00
	I-5-2	Hydropower as % of Total Generated Electricity	%		16	5.22	-	51.00

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
	I-5-3	Installed Hydropower Capacity	MW	9465.00	17	556.76	-	2,800.00
	I-5-4	Water Used to Generate Electricity	BCM/Year	194.40	15	12.96	-	186.00
	6	Water & Population						
P-6-1		Total Population	1000 inhabitants	395,829	22	17,992.22	806.20	91,023.39
	I-6-1	**Internal Renewable Water Resources per Capita**	**CM/capita/Year**		22	1,557.53	3.28	10,347.95
	I-6-2	**Total Renewable Blue Water Resources per Capita**	**CM/capita/Year**		22	575.10	4.72	3,144.83
	I-6-3	**Total Renewable Water Resources per Capita**	**CM/capita/Year**		22	1,958.50	10.38	10,973.40
	I-6-4	**Total Available Water Resources per Capita**	**CM/capita/Year**		22	2,123.89	235.61	11,056.19
	I-6-5	**Blue Water Withdrawal per Capita**	**CM/capita/Year**		22	355.69	12.73	1,036.23
	I-6-6	**Green Water Use per Capita**	**CM/capita/Year**		22	1,318.77	0.14	9,697.34
	I-6-7	**Total Water Abstraction per Capita**	**CM/capita/Year**		22	1,723.81	160.75	10,023.95
P-6-2		**Agricultural Water Withdrawal per Capita**	**CM/capita/Year**		22	317.28	5.89	879.96
P-6-3		**Industrial Water Withdrawal per Capita**	**CM/capita/Year**		22	17.05	0.20	59.33
P-6-4		**Domestic Water Withdrawal per Capita**	**CM/capita/Year**		22	82.92	1.87	234.78
	I-6-8	**Population Without Improved Drinking Water**	**1000 inhabitants**	51,028	22	2,319.45	-	11,873.16
	I-6-9	**Population Without Improved Sanitation**	**1000 inhabitants**	138,209	22	6,282.23	-	53,294.20
	7	Water & Health						
	I-7-1	Proportion of Population Using Handwashing Facility with Soap and Water	%		8	86.49	39.00	100.00
	I-7-2	Dracunculiasis Reported Cases	%		17	-	-	-
	I-7-3	Open Defecation Practice	Number	24405631	20	1,223,482	-	9,570,315.00
	I-7-4	Percentage of Open Defecation	%		18	7.90	-	39.00
	I-7-5	Cholera Reported Cases	Number/Year	7954	17	467.88	-	7,536.00
	I-7-6	Typhoid Reported Cases	Number/Year	6250	15	416.67	-	4,852.00
	I-7-7	Hepatitis A Reported Cases	Number/Year	9088	15	605.87	-	6,921.00
	I-7-8	Diarrhea Prevalence	%		12	11.64	-	45.00
	8	Water & Quality						
P-8-1		Dissolved Oxygen (DO)	PPM		7	2.79	-	7.30
p-8-2		pH	Dimensionless		14	5.84	-	7.90
P-8-3		Electric Conductivity (EC)	1/OHM (S/M)		12	971.58	-	8,054.50
P-8-4		Nitrogen Concentration	PPM		10	12.27	-	50.00
P-8-5		Phosphorous Concentration	PPM		9	0.62	-	5.00

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
	I-8-1	**Water Quality Index**	**Score/100**		1	85.40	85.40	85.40
	I-8-2	Total Dissolved Solids (TDS)	PPM		15	646.79	-	5,083.50
	I-8-3	Fecal Choliform	Colonies/100ML		9	2,947.79	-	26,527.00
	I-8-4	Biological Oxygen Demand (BOD)	mg/l		7	4.44	-	22.00
	I-8-5	Chemical Oxygen Demand (COD)	mg/l		7	2.06	-	14.41
	I-8-6	Chloride Concentration	mg/l		12	197.57	-	1,866.00
	I-8-7	Total Hardness ($CaCo_3$)	mg/l		9	224.77	-	1,589.00
	I-8-8	Wars & Conflict Related to Water Resources Pollution	%		6	-	-	-
	9	**Water & Ecosystems**						
	I-9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number	157.00	19	8.26	-	50.00
	I-9-2	Total Wetlands Areas	ha	8,469,268	20	423,463.40	-	2,981,421.00
	I-9-3	Total Freshwater Species Count	Number		10	82.30	-	450.00
	I-9-4	Number of Endangered Species	Number		10	3.20	-	10.00
	I-9-5	Number of Invasive Species	Number		22	39.91	-	102.00
	I-9-6	**Proportion of Bodies of Water with Good Ambient Water Quality**	**%**		**7**	**62.38**	**-**	**95.00**
	I-9-7	Change in the Extent of Water-Related Ecosystems over Time	%/Time	-0.63	22	(0.03)	(0.63)	0.20
	10	**Water & Climate**						
		Extreme Weather Events			**0**	**#DIV/0!**	**-**	**-**
P-10-1		Number of Class 1 Flood Events	Number	1	6	0.17	-	1.00
P-10-2		Number of Class 1.5 Flood Events	Number	1	6	0.17	-	1.00
P-10-3		Number of Class 2 Flood Events	Number	0	6	-	-	-
	I-10-1	Total Number of Floods in Last Three Years	Number	96	21	4.57	1.00	10.00
P-10-4		Average Temperature	C°		13	21.87	-	32.00
	I-10-2	Monthly Drought Events	Number	9	6	1.50	-	6.00
	I-10-3	Annual Drought Events	Number	22	6	3.67	-	20.00
	I-10-4	Cost of Annual Damage Caused by Floods	$ - % of GDP		17	0.10	-	0.43
	I-10-5	Cost of Annual Damage Caused by Droughts	$ - % of GDP		8	0.01	-	0.04
	I-10-6	Annual Human Losses Related to Floods	Number	671	17	39.47	1.00	169.00
	I-10-7	Annual Human Losses Related to Droughts	Number	0	10	-	-	-
	I-10-8	Unusual Weather Snow Events	Number	12	11	1.09	-	5.00
	I-10-9	Unusual Weather Hail Events	Number	15	11	1.36	-	9.00
	I-10-10	National Climate Change Adaptation Plan	Yes/No	11.00	15	0.73	-	1.00

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
	I-10-11	Existing Early Warning System	Number	7.00	9	3.89	-	29.00
	11	**Water & Socio-Economics**						
		Water Productivity						
	I-11-1	**Industrial Water Productivity**	**$/CM**		**22**	**753.35**	**15.49**	**8,864.95**
	I-11-2	**Agricultural Water Productivity "Crop per Drop"**	**$/CM**		**22**	**1.16**	**0.03**	**6.03**
	I-11-3	**Employment in Agriculture "Job per Drop"**	**Jobs/MCM**		**22**	**901.31**	**20.87**	**15,586.08**
	I-11-4	**Employment in Industry "Job per Drop"**	**Jobs/MCM**		**22**	**17,448.01**	**1,126.82**	**96,574.71**
	I-11-5	Employment in Water Sector "Job per Drop"	Jobs/MCM		7	35.39	-	200.00
P-11-1		GDP	Billion $	2,734.85	22	124.31	0.99	746.25
		Tariffs and Affordability						
P-11-2		Water Average Tarrif	$/m3		21	0.98	-	8.41
P-11-3		Sanitation Average Tarrif	$/m3		16	0.30	-	1.25
	I-11-6	Water and Sanitation Charges as % of Average Household Income	%		18	0.95	-	2.78
	12	**Water & Finance**						
	I-12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%		14	3.77	-	18.42
	I-12-2	Percentage of GDP Directed to Sanitation & Hygiene	%		9	2.00	-	10.88
	I-12-3	Foreign Aid Received for Water & Sanitation	Million US$	1,567.08	19	82.48	-	512.00
	I-12-4	Operation & Maintenance Cost Recovery for Irrigation	%		7	24.85	-	86.94
	I-12-5	Operation & Maintenance Cost Recovery for Drinking Water and Sanitation	%		12	50.14	-	104.00
	I-12-6	Operation & Maintenance Cost Recovery for Industry	%		4	37.00	-	84.00
	I-12-7	Aid Paid to Water & Sanitation in Foreign Countries	Million US$	8,396.07	14	599.72	-	7,700.00
	I-12-8	Total Investment in Water & Sanitation	Million US$	51,501.13	14	3,678.65	-	20,805.50
	13	**Water & Trade**						
	I-13-1	Agricultural Virtual Water Export	BCM/Year	33.37	22	1.52	-	7.84
	I-13-2	Agricultural Virtual Water Import	BCM/Year	288.11	22	13.10	-	59.06
	I-13-3	Bottled Water Export	MCM/Year	0.31	22	0.01	-	0.17
	I-13-4	Bottled Water Import	MCM/Year	0.62	22	0.03	-	0.15
	14	**Water & Governance**						
	I-14-1	IWRM Plan	Yes/No	11.00	17	0.65	-	1.00
	I-14-2	Degree of Integrated Water Resources Management Implementation (0-100)	Number		9	52.97	15.00	100.00
	I-14-3	National Water and Sanitation M&E & R System	Yes/No	10.00	15	0.67	-	1.00

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
P-14-1		Surface Water Permits Issued to Date	Number	1,696	8	212.00	-	1,346.00
P-14-2		Total Volumetric Water Rights Associated with Surface Water Permits	BCM/Year	49.05	8	6.13	-	35.00
	I-14-4	Total Volumetric Water Rights Assosciated with Surface Water Permits as a Percent of Annual Blue Surface Water Withdrawals	%		8	26.83	-	101.00
P-14-3		Groundwater Well Permits Issued to Date	Number	341,204	14	24,371.71	-	146,369.00
P-14-4		Total Volumetric Water Rights Associated with Well Permits	BCM/Year	8.45	9	0.94	-	5.20
	I-14-5	**Total Volumetric Water Rights Associated with Well Permits as % of Annual Blue Groundwater Abstractions**	**%**		9	35.80	-	106.78
	I-14-6	Number of Unlicensed Wells	Number	205,227	8	25,653.38	-	109,500.00
	I-14-7	Irrigation & Drainage Related Complaints as a Percentage of Irrigation Water Users	%		7	18.30	-	94.00
	I-14-8	Drinking Water and Sanitation Related Complaints as a Percentage of Serviced Households	%		8	10.76	-	45.00
	I-14-9	Number of Drinking Water Meters Installed as a Percent of Total Number of Covered Households	%		15	63.53	-	100.00
	I-14-10	**Number of Groundwater Meters Installed as a Percent of Licensed Wells**	**%**		6	70.81	1.00	100.00
	I-14-11	**Number of Surface Irrigation Meters Installed as % of Surface Irrigation Water Permits**	**%**		2	90.00	80.00	100.00
	I-14-12	Physical Domestic Water Losses	BCM/Year	5.88	22	0.27	0.00	1.90
	I-14-13	Commercial Water Losses	BCM/Year	3.22	21	0.15	-	0.90
	I-14-14	Physical Irrigation Water Losses	BCM/Year	9.79	10	0.98	-	3.49
	I-14-15	**Overall Water Use Efficiency**	**%**		**21**	**72.72**	**33.96**	**92.82**
	I-14-16	**Change in Water-Use Efficiency over Time**	**%/Time (3 years)**		**22**	**(0.57)**	**(42.08)**	**60.65**
	I-14-17	**Level of Water Stress: Freshwater Withdrawal as a Proportion of Available Freshwater Resources**	**%**		**20**	**329.58**	**9.76**	**1,996.43**
	I-14-18	**Water Sustainability/ Depletion Index**	**%**		**22**	**136.38**	**2.23**	**869.31**
	I-14-19	Wastewater and Drainage Outflows	BCM/Year	36.60	21	1.74	0.01	12.46
	I-14-20	Transboundary Wastewater and Drainage Outflows	BCM/Year	38.12	21	1.82	0.01	12.46
	I-14-21	Number of Water related citations (Water Laws Enforcement)	Number	50,835	12	4,236	-	25,322
P-14-5		Number of Water Users Associations	Number	14,845	13	1,142	-	8,253
	I-14-22	**Water Users Associations Agricultural Land Coverage**	**% of Ag. Land**		**7**	**25.36**	**-**	**80.00**
	I-14-23	Proportion of Local Administrative Units with Established and Operational Policies and Procedures for Participation of Local Communities in Water and Sanitation Management	%		5	65.70	1.00	100.00
	I-14-24	Private Sector Corporate Social Responsibility in the Water Sector	%		7	6.43	-	45.00

P Code	I Code	Water Related Indicators	Units	Total	Count	Average	Min.	Max.
	15	**Water & International Relations**						
	I-15-1	**Transboundary Water Dependency Ratio**	**%**		**22**	**36.40**	**-**	**100.00**
	I-15-2	Shared Water Related Bilateral/ Multilateral Agreements and/or MoUs and Cooperation Mechanisms	Number		21	2.52	-	9.00
	I-15-3	Number of other Riparians Sharing all Shared Water Bodies (Includes double counting for each water body)	Number		21	7.95	1.00	24.00
	I-15-4	Number of Shared Water Resources Bodies	Number		21	4.24	1.00	13.00
	I-15-5	**Ratio of Riparian Countries with Agreements to the Number of Riparian Countries**	**%**		**21**	**31.34**	**-**	**100.00**
	I-15-6	Proportion of Transboundary Basin Area with an Operational Arrangement for Water Cooperation	%		17	13.24	-	100.00
	I-15-7	**Estimated Reduction in Average Transboundary Flow Due to Upstream Structures**	**%**		12	21.57	-	100.00

Categories of Indicators

Sub-categories of Indicators

Total Renewable, Conventional, Non-Conventional & Available Water Resources

SDGs Indicators

**All data and estimates are for 2015 unless otherwise mentioned.*

**All data and estimates are from country Focal Point (FP) unless otherwise mentioned.*

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Annex: State of the Water Data Tables

Table 1. Estimated Long Term Annual Average State of the Arab Water Resources at a Glance

	Long-Term Average (FAO-AQUASTAT*)					
Country	Total Internal Renwable Water Resources	Overlap between Surface and GW	Surface Water Inflow	Surface Water Outflow	GW Inflow	GW Outflow
Algeria	11.25	0	0.39	0.32	0.03	0.1
Bahrain	0.004	0	0	0	0.112	0
Comoros	1.2	0	0	0	0	0
Djibouti	0.3	0.015	0	0	0	0
Egypt	1	0	55.5	0	1	0
Emirates	35.2	2	61.33	24.7	0.08	0
Iraq	0.682	0.253	0.4	0	0.27	0
Jordan	0	0	0	0	0.02	0
Kuwait	4.8	2.5	0	0.575	0	0.28
Lebanon	0.7	0.1	0	0	0	0.7
Libya	0.4	0	11	0	0	0
Mauritania	29	3	0	0.23	0	0.03
Morocco	1.4	0.95	0	0	0	
Oman	0.812	0	0.015	0.017	0.01	0
Palastine	0.056	0	0	0	0.002	0
Qatar	2.4	2	0	0	0	0.394
Saudi Arabia	6	3	8.7	0	0	0
Somalia	4	1	99.3	65.5	0	1
Sudan	7.132	2	35.5	27	1.33	0.34
Syria	4.195	0.4	0.32	0	0.1	0
Tunisia	0.15	0.12	0	0	0	0
Yamen	2.1	1.4	0	0	0	0
Total	112.8	18.7	272.5	118.3	3.0	2.8
			154.1		0.1	

*FAO Aquastat unless otherwise stated

Net External Renewable Water Resources	154.2

SOW1

External Renwable Blue Water to the Arab Region (BCM)			
Country	Surface	GW	Total
Djibouti	0	0	0
Iraq	37.93*	0.08	38.01
Mauritania	11	0	11
Sudan	99.3	0	99.3
Syria	35.5	1.33	36.83
Somalia	8.7	0	8.7
Total			193.8

*Difference between surface inflows to Iraq and outflows to Shat El-Arab

Evaporation from Open Water Bodies (For water bodies receiving water from outside the Arab region)	
Syria	1
Sudan	6.44
Mauritania	0.94
Iraq	6.66
Egypt	7.91
Total	22.95

Outflow (BCM)	16.67

Table 2. 2015 Annual State of the Arab Water Resources at a Glance

	Long-Term Average (FAO-AQUASTAT*)					
Country	Total Internal Renwable Water Resources	Overlap between Surface and GW	Surface Water Inflow	Surface Water Outflow	GW Inflow	GW Outflow
Algeria	12.00	1.5	0.12	0.3	0.02	0.02
Bahrain	0.004	0	0	0	0.112	0
Comoros	1.20	0	0	0	0	0
Djibouti	0.30	0.015	0.02	0.01	0.03	0.01
Egypt	1.00	0	55.5	0	1	0
Emirates	13.40	2	27.15	1	0.08	0
Iraq	0.81	0	0.06	0	0.055	0
Jordan	0	0	0	0	0.02	0
Kuwait	4.80	2.5	0	0.575	0	0.28
Lebanon	0.70	0.1	0	0	0	0
Libya	0.40	0	11	0	0	0
Mauritania	19.17	3	0	0	0	0.03
Morocco	1.32	0	0	0	0.013	0.099
Oman	0.98	0	0.25	0.0786	0	0.578
Palastine	0.04	0	0	0	0.002	0
Qatar	3.60	2	0	0	0	0
Saudi Arabia	9.05	3	8.7	0	0	0
Somalia	9.30	0.7	84	63.5	0.2	1
Sudan	7.13	2	28.52	31.73	11.13	0.34
Syria	4.20	0.4	0.3	0.19	0.1	0
Tunisia	0.14	0.12	0	0	0.1	0
Yamen	2.10	1.4	0	0	0	0
Total	**91.6**	**18.7**	**215.6**	**97.4**	**12.9**	**2.4**
			118.2		10.5	

Net External Renewable Water Resources	128.7

External Renwable Blue Water to the Arab Region (BCM)			
Country	Surface	GW	Total
Djibouti	0.02	0.03	0.05
Iraq*	27.15-4.15	0.08	23.08
Mauritania	11	0	11
Sudan	84	0.2	84.2
Syria**	28.52-3.5	11.13	36.15
Somalia	8.7	0	8.7
Total			163.2

*4.15 BCM represents flows within the Arab region

**3.5 BCM were removed from Syria Inflow as it represents inflows from Arab Countries (Jordan and Lebanon)

Evaporation from Open Water Bodies (For water bodies receiving water from outside the Arab region)	
Syria	2.2
Sudan	5.34
Mauritania	0.94
Iraq	2.14
Egypt	7.91
Total	18.528

Outflow (BCM)	15.9

Table 3. 2015 Remote Sensing Rainfall by Green Cover (BCM)

Coutries	Irrigated Agriculture	Rainfed Agriculture	Forest Lands	Pasture Lands
Algeria	0.03	19.53	14.27	37.02
Bahrain	-	0.00	0.00	0.00
Comoros	-	0.13	2.54	0.29
Djibouti	0.00	0.00	0.00	0.11
Egypt	2.18	0.05	0.00	0.00
Emirates	0.04	24.11	0.14	13.61
Iraq	0.00	1.34	0.01	0.24
Jordan	0.00	0.01	-	0.02
Kuwait	0.01	3.08	0.25	2.47
Lebanon	0.10	2.25	0.77	3.83
Libya	0.45	5.63	0.31	33.06
Mauritania	0.21	16.88	8.93	22.33
Morocco	0.03	0.01	0.06	0.26
Oman	0.00	1.19	0.23	0.27
Palastine	0.01	0.00	0.00	0.03
Qatar	0.03	0.33	0.11	3.23
Saudi Arabia	3.06	23.56	11.73	137.92
Somalia	10.08	113.62	42.22	179.53
Sudan	0.78	12.17	1.18	7.81
Syria	0.02	8.33	2.68	11.94
Tunisia	0.00	0.00	0.01	0.14
Yamen	1.15	0.63	1.16	5.74
Total	**18.18**	**232.86**	**86.61**	**459.84**

Table 4. Calculations for Green Water Consumption for each Green Cover Type

Indicator	Units	Algeria	Bahrain	Comoros	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudi Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
Rainfall on Irrigated Agriculture Lands	BCM/y	0.030	0.000	0.000	0.002	2.175	0.043	0.000	0.000	0.010	0.095	0.448	0.205	0.025	0.000	0.010	0.031	3.064	10.084	0.778	0.025	0.000	1.153	18.18
Rainfall on Rainfed Agriculture Lands	BCM/y	19.533	0.000	0.133	0.004	0.052	24.11	1.343	0.011	3.077	2.246	5.631	16.884	0.006	1.193	0.000	0.334	23.557	113.62	12.17	8.333	0.001	0.634	232.86
Rainfall on Forest Lands	BCM/y	14.266	0.000	2.540	0.001	0.000	0.14	0.013	0.000	0.250	0.774	0.309	8.933	0.060	0.233	0.000	0.113	11.725	42.221	1.177	2.682	0.012	1.165	86.61
Rainfall on Pastura Lands	BCM/y	37.022	0.001	0.292	0.107	0.001	13.61	0.240	0.016	2.474	3.825	33.063	22.329	0.262	0.268	0.026	3.228	137.92	179.53	7.811	11.938	0.142	5.738	459.84
Rainfed Agriculture Evapotranspiration (ET)	BCM/y	15.00	0.00	0.04	0.01	0.07	42.77	1.61	0.01	2.95	2.83	11.46	22.76	0.01	1.31	0.00	0.35	39.33	103.02	13.16	6.54	0.58	0.63	264.46
Water for Rain-fed Agricultural Consumption (Minimum of Rainfall and ET)	BCM/y	15.00	0.00	0.04	0.00	0.05	24.11	1.34	0.01	2.95	2.25	5.63	16.88	0.01	1.19	0.00	0.33	23.56	103.02	12.17	6.54	0.00	0.63	215.72
Water for Irrigated Agricultural Consumption (Rainfall on Irrigated Agricullture)	BCM/y	0.03	0.00	0.00	0.00	2.18	0.04	0.00	0.00	0.01	0.10	0.45	0.21	0.03	0.00	0.01	0.03	3.06	10.08	0.78	0.02	0.00	1.15	18.18
Water for Rain-fed Agricultural Consumption (includes Irrig. Ag. Effctv. rainfall)	BCM/y	15.03	0.00	0.04	0.01	2.23	24.15	1.34	0.01	2.96	2.34	6.08	17.09	0.03	1.19	0.01	0.37	26.62	113.11	12.94	6.57	0.00	1.79	233.90
Rainfed Pasture Evapotranspiration (ET)	BCM/y	9.47	0.00	0.01	0.54	0.00	7.54	0.20	0.10	2.33	1.37	67.49	11.59	0.11	0.25	0.01	0.90	223.36	159.34	1.53	0.75	0.01	4.74	491.64
Water for Rain-fed Pasture Consumption (Minimum of Rainfall and ET)	BCM/y	9.47	0.00	0.01	0.11	0.00	7.54	0.20	0.02	2.33	1.37	33.06	11.59	0.11	0.25	0.01	0.90	137.92	159.34	1.53	0.75	0.01	4.74	371.26
Rainfed Forest Evapotranspiration (ET)	BCM/y	18.26	0.00	1.19	0.01	0.00	0.40	0.02	0.00	0.33	1.04	0.81	14.34	0.06	0.26	0.01	0.21	18.58	40.36	1.42	3.82	0.02	1.15	102.30
Water for Rain-fed Forest Consumption (Minimum of Rainfall and ET)	BCM/y	14.27	0.00	1.19	0.00	0.00	0.14	0.01	0.00	0.25	0.77	0.31	8.93	0.06	0.23	0.00	0.11	11.73	40.36	1.18	2.68	0.01	1.15	83.40
Total Renewable Green Water Resources (TRGWR)	BCM/y	38.77	0.00	1.25	0.11	2.23	31.83	1.56	0.02	5.54	4.49	39.45	37.61	0.20	1.67	0.02	1.38	176.27	312.81	15.65	10.00	0.02	7.68	688.56

Table 5. Land Cover Reclassification

Value	Description	Reclassification
10	Cropland, rainfed	2
11	Herbaceous Cover	4
12	Tree or Shrub Cover	1
20	Cropland, irrigated or post-flooding	1
30	Mosaic Cropland (>50%)/Natural Vegetation (<50%)	4
40	Mosaic Natural Vegetation (>50%)/Cropland (<50%)	2
50	Tree cover, broadleaved, evergreen, closed to open (>15%)	3
60	Tree cover, broadleaved, deciduous, closed to open (>15%)	3
61	Tree cover, broadleaved, deciduous, closed (>40%)	3
62	Tree cover, broadleaved, deciduous, open (15?40%)	3
70	Tree cover, needleleaved, evergreen, closed to open (>15%)	3
80	Tree cover, needleleaved, deciduous, closed to open (>15%)	3
90	Tree cover, mixed leaf type (broadleaved and needleleaved)	3
100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	3
110	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	4
120	Shrubland	4
122	Deciduous shrubland	4
130	Grassland	4
150	Sparse vegetation (tree, shrub, herbaceous cover) (<15%)	5
152	Sparse shrub (<15%)	5
160	Tree cover, flooded, fresh or brakish water	3
170	Tree cover, flooded, saline water	3
180	Shrub or herbaceous cover, flooded, fresh/saline/brakish water	5
190	Urban areas	6
200	Bare areas	5
201	Consolidated bare areas	5
202	Unconsolidated bare areas	5
210	Water bodies	7

Description	Reclassified Value
Irrigated Agriculture	1
Rainfed Agriculture	2
Forests	3
Pasture Land	4
Desert	5
Urban Areas	6
Water Bodies	7

Table 6. 2015 Reomte Sensing Land Cover Areas (ha)

Coutries	Irrigated Agriculture	Rainfed Agriculture	Forests	Pasture Land	Barren Lands	Urban Areas	Water Bodies
Algeria	14,481	5,648,499	2,328,597	8,651,853	230,875,938	303,435	173,790
Bahrain	0.00	117	297	3,096	45,603	24,102	927
Comoros	0.00	6,930	132,984	14,256	0.00	2,574	3,735
Djibouti	1,395	3,114	1,350	88,479	1,988,505	1,926	28,296
Egypt	3,804,516	75,672	405	1,480,320	99,358,803	320,121	1,072,062
Emirates	13,500	7,851,465	33,786	3,432,546	37,988,451	271,584	554,796
Iraq	216	508,860	3,708	97,578	9,127,521	55,458	51,489
Jordan	18	14,877	0.00	28,323	1,795,725	43,326	828
Kuwait	2,088	516,618	37,557	380,619	183,717	39,105	3,969
Lebanon	72,360	953,667	142,164	1,609,911	168,745,059	121,473	53,262
Libya	158,868	1,585,008	142,317	12,219,516	90,935,028	29,232	67,662
Mauritania	72,414	5,448,168	2,284,038	6,795,666	58,897,170	220,464	89,118
Morocco	37,989	7,047	38,052	332,757	30,773,061	42,948	26,703
Oman	171	270,315	42,867	56,646	258,786	38,025	22,203
Palastine	7,605	9	2,826	26,721	1,123,785	50,589	1,188
Qatar	25,677	250,119	78,030	2,989,791	194,346,927	375,975	47,916
Saudi Arabia	811,179	4,539,555	3,437,361	40,678,938	10,906,497	46,008	39,690
Somalia	4,178,439	24,306,894	6,640,803	42,943,194	106,039,620	148,410	445,482
Sudan	221,346	3,858,525	248,949	2,405,043	14,466,690	186,885	147,933
Syria	8,424	2,878,884	446,958	2,628,288	11,503,422	128,970	54,900
Tunisia	567	1,206	33,003	259,191	7,503,489	282,483	6,750
Yamen	391,095	359,199	448,515	2,934,810	40,320,936	36,873	26,892
Total	**9,822,348**	**59,084,748**	**16,524,567**	**130,057,542**	**1,117,184,733**	**2,769,966**	**2,919,591**

Table 7. 2015 Remote Sensing Urban Encroachment

UAE		
Land Cover 2012	Land Cover 2015	Area (ha)
Irrigated Agriculture		0
Rainfed Agriculture	Urban Areas	0
Forests		0
Pasture Land		126
		126

IRAQ		
LC2012	LC2015	Area (ha)
Irrigated Agriculture		36
Rainfed Agriculture	Urban Areas	28044
Forests		0
Pasture Land		3528
		31608

BAHRAIN		
LC2012	LC2015	Area (ha)
Irrigated Agriculture		0
Rainfed Agriculture	Urban Areas	0
Forests		0
Pasture Land		0
		0

JORDAN		
LC2012	LC2015	Area (ha)
Irrigated Agriculture		0
Rainfed Agriculture	Urban Areas	5166
Forests		9
Pasture Land		540
		5715

COMOROS		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		9
Forests		225
Pasture Land		27
		261

KUWAIT		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		54
Forests		0
Pasture Land		450
		504

DJIBOUTI		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		0
Forests		0
Pasture Land		153
		153

LEBANON		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		2178
Forests		36
Pasture Land		3870
		6084

ALGERIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		19737
Forests		477
Pasture Land		7767
		27981

LIBYA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	18
Rainfed Agriculture		7173
Forests		0
Pasture Land		3402
		10593

EGYPT		
LC2012	LC2015	
Irrigated Agriculture	Urban Areas	26388
Rainfed Agriculture		2565
Forests		27
Pasture Land		2988
		31968

MOROCCO		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	288
Rainfed Agriculture		10935
Forests		405
Pasture Land		2583
		14211

MAURITANIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		0
Forests		0
Pasture Land		36
		36

SUDAN		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	4374
Rainfed Agriculture		2997
Forests		162
Pasture Land		11322
		18855

OMAN		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	153
Rainfed Agriculture		225
Forests		9
Pasture Land		3285
		3672

SYRIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	144
Rainfed Agriculture		14931
Forests		144
Pasture Land		4797
		20016

PALESTINE		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		5238
Forests		0
Pasture Land		1206
		6444

TUNISIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		4509
Forests		0
Pasture Land		270
		4779

QATAR		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	0
Rainfed Agriculture		0
Forests		0
Pasture Land		135
		135

YEMEN		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	171
Rainfed Agriculture		855
Forests		18
Pasture Land		1377
		2421

SAUDI ARABIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	9
Rainfed Agriculture		513
Forests		162
Pasture Land		45
		729

SOMALIA		
LC2012	LC2015	Area (ha)
Irrigated Agriculture	Urban Areas	81
Rainfed Agriculture		666
Forests		9
Pasture Land		1170
		1926

Table 8. Domestic Use Increase due to Urban Encroachment

Country	**Area (km2)**	**Area (m2)**	Population (Capita)	Domestic Consumption (m3/year)	Domestic Consumption (MCM/year)	Landscape Demand (m3/year)	Landscape Demand (MCM/year)	**Total Demand (MCM/year)**
Algeria	279.81	279,810,000	4,197,150	245,113,560	245.11	18,187,650	18.19	263.30
Bahrain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Comoros	2.61	2,610,000	39,150	2,286,360	2.29	169,650	0.17	2.46
Djibouti	1.53	1,530,000	22,950	1,340,280	1.34	99,450	0.10	1.44
Egypt	320.04	320,040,000	4,800,600	280,355,040	280.36	20,802,600	20.80	301.16
Iraq	316.08	316,080,000	4,741,200	276,886,080	276.89	20,545,200	20.55	297.43
Jordan	57.15	57,150,000	857,250	50,063,400	50.06	3,714,750	3.71	53.78
Kuwait	5.04	5,040,000	75,600	4,415,040	4.42	327,600	0.33	4.74
Lebanon	60.84	60,840,000	912,600	53,295,840	53.30	3,954,600	3.95	57.25
Libya	105.93	105,930,000	1,588,950	92,794,680	92.79	6,885,450	6.89	99.68
Maurtania	0.36	360,000	5,400	315,360	0.32	23,400	0.02	0.34
Morocco	142.11	142,110,000	2,131,650	124,488,360	124.49	9,237,150	9.24	133.73
Oman	36.72	36,720,000	550,800	32,166,720	32.17	2,386,800	2.39	34.55
Palestine	64.44	64,440,000	966,600	56,449,440	56.45	4,188,600	4.19	60.64
Qatar	1.35	1,350,000	20,250	1,182,600	1.18	87,750	0.09	1.27
Saudi Arabia	7.29	7,290,000	109,350	6,386,040	6.39	473,850	0.47	6.86
Somalia	19.26	19,260,000	288,900	16,871,760	16.87	1,251,900	1.25	18.12

Sudan	188.55	188,550,000	2,828,250	165,169,800	165.17	12,255,750	12.26	177.43
Syria	200.16	200,160,000	3,002,400	175,340,160	175.34	13,010,400	13.01	188.35
Tunisia	47.79	47,790,000	716,850	41,864,040	41.86	3,106,350	3.11	44.97
UAE	1.26	1,260,000	18,900	1,103,760	1.10	81,900	0.08	1.19
Yemen	24.21	24,210,000	363,150	21,207,960	21.21	1,573,650	1.57	22.78

Population Density	15000	Capita/km2
Consumption	160	l/c/d
Landscap demand	1.3	m3/m2/year
Landscape Area	5%	% of Urban Area
Landscape assumed to cover 10% of the area		

Table 9. Desert Encrochment Areas by Country

Country	Area (ha)
Algeria	279
Bahrain	0
Comoros	0
Djibouti	378
Egypt	4536
Iraq	261
Jordan	0
Kuwait	0
Lebanon	0
Libya	72
Maurtania	7623
Morocco	1566
Oman	99
Palestine	0
Qatar	45
Saudi Arabia	2898
Somalia	5796
Sudan	4221
Syria	10287
Tunisia	36
UAE	72
Yemen	5652

Table 10. Desert Encroachment Areas by Land Cover

Desert Encroachment	
Land Cover	**Area (ha)**
Irrigated Agriculture	774
Rainfed Agriculture	4743
Forest	54
Pasture Lands	26055
Water Bodies	12195
	43821

Table 11. Water Supply Coverage (JMP)

Population							Drinking Water without Coverage (%)	Drinking Water Coverage (%)			Drinking Water Coverage (1000 inhabitants)			MDG Achievment (% Coverage Reduction)	Population gained access to drinking water 1990 - 2015 (x1000)
Country	Year	Total (x1000)	Urban %	Urban (x1000)	Rural %	Rural (x1000)	Total	Total	Urban	Rural	Total	Urban	Rural		
Algeria	1990	25,299.00	52	13,155.48	48	12,143.52	9	91	100	88	23,841.78	13,155.48	10,686.30	-78	9,989.26
	2012	38,482.00	74	28,476.68	26	10,005.32	16	84	93	84	34,887.78	26,483.31	8,404.47		
	2015	40,633.00	71	28,849.43	29	11,783.57	16	84	85	79	33,831.04	24,522.02	9,309.02		
Bahrain	1990	493.00	88	433.84	12	59.16	5	95	100	90	487.08	433.84	53.24	100	872.92
	2012	1,318.00	89	1,173.02	11	144.98	0	100	100	99	1,316.55	1,173.02	143.53		
	2015	1,360.00	89	1,210.40	11	149.60	0	100	100	100	1,360.00	1,210.40	149.60		
Comoros	1990	438.00	28	122.64	72	315.36	83	17	98	83	381.94	120.19	261.75	88	361.88
	2012	718.00	28	201.04	72	516.96	5	95	93	97	688.42	186.97	501.45		
	2015	770.00	28	215.60	72	554.40	10	90	93	89	743.82	200.51	543.31		
Djibouti	1990	562.00	76	427.12	24	134.88	34	66	82	60	431.17	350.24	80.93	71	375.59
	2012	860.00	77	662.20	23	197.80	8	92	100	65	790.77	662.20	128.57		
	2015	900.00	77	693.00	23	207.00	10	90	97	65	806.76	672.21	134.55		
Egypt	1990	56,843.00	43	24,442.49	57	32,400.51	28	72	96	90	52,625.25	23,464.79	29,160.46	96	31,597.93
	2012	80,722.00	44	35,517.68	56	45,204.32	1	99	100	99	80,269.96	35,517.68	44,752.28		
	2015	84,706.00	43	36,423.58	57	48,282.42	1	99	100	99	84,223.18	36,423.58	47,799.60		
Iraq	1990	17,374.00	70	12,161.80	30	5,212.20	19	81	95	39	13,586.47	11,553.71	2,032.76	32	17,373.45
	2012	32,778.00	66	21,633.48	34	11,144.52	15	85	94	69	28,025.19	20,335.47	7,689.72		
	2015	35,767.00	69	24,679.23	31	11,087.77	13	87	94	70	30,959.92	23,198.48	7,761.44		
Jordan	1990	3,416.00	72	2,459.52	28	956.48	3	97	99	91	3,305.32	2,434.92	870.40	0	3,843.30
	2012	7,009.00	83	5,817.47	17	1,191.53	4	96	97	90	6,715.32	5,642.95	1,072.38		
	2015	7,690.00	84	6,459.60	16	1,230.40	3	97	92	98	7,148.62	5,942.83	1,205.79		
Kuwait	1990	2,088.00	98	2,046.24	2	41.76	1	99	99	99	2,067.12	2,025.78	41.34	0	1,480.05
	2012	3,250.00	98	3,185.00	2	65.00	1	99	99	99	3,217.50	3,153.15	64.35		
	2015	3,583.00	98	3,511.34	2	71.66	1	99	99	99	3,547.17	3,476.23	70.94		
Lebanon	1990	2,948.00	83	2,446.84	17	501.16	0	100	100	100	2,948.00	2,446.84	501.16	100	2,106.00
	2012	4,647.00	87	4,042.89	13	604.11	0	100	100	100	4,647.00	4,042.89	604.11		
	2015	5,054.00	88	4,447.52	12	606.48	1	99	100	100	5,054.00	4,447.52	606.48		
Libya	1990	4,334.00	76	3,293.84	24	1,040.16	29	71	97	96	4,193.58	3,195.02	998.55	-3	228.32
	2012	6,155.00	78	4,800.90	22	1,354.10	30	70	87	11	4,316.87	4,171.98	144.89		
	2015	6,317.00	79	4,990.43	21	1,326.57	30	70	70	70	4,421.90	3,493.30	928.60		
Mauritania	1990	1,996.00	40	798.40	60	1,197.60	70	30	36	26	598.80	287.42	311.38	40	1,751.28
	2012	3,796.00	52	1,973.92	48	1,822.08	50	50	52	48	1,901.04	1,026.44	874.60		
	2015	4,080.00	60	2,448.00	40	1,632.00	42	58	58	57	2,350.08	1,419.84	930.24		
	1990	24,781.00	48	11,894.88	52	12,886.12	47	53	94	53	18,010.83	11,181.19	6,829.64		

Morocco	2012	32,521.00	57	18,536.97	43	13,984.03	16	84	98	64	27,116.01	18,166.23	8,949.78	68	10,986.74
	2015	33,955.00	60	20,373.00	40	13,582.00	15	85	99	65	28,997.57	20,169.27	8,828.30		
Oman	1990	1,868.00	66	1,232.88	34	635.12	21	79	96	55	1,532.88	1,183.56	349.32	67	2,334.89
	2012	3,314.00	74	2,452.36	26	861.64	7	93	93	78	2,952.77	2,280.69	672.08		
	2015	4,158.00	78	3,243.24	22	914.76	7	93	95	86	3,867.77	3,081.08	786.69		
Palestine	1990	2,000.00	68	1,360.00	32	640.00	8	92	100	75	1,840.00	1,360.00	480.00	-425	500.00
	2012	3,981.00	75	2,985.75	25	995.25	18	82	82	82	3,264.42	2,448.32	816.11		
	2015	4,000.00	75	3,000.00	25	1,000.00	42	58	51	81	2,340.00	1,530.00	810.00		
Qatar	1990	474.00	92	436.08	8	37.92	0	100	100	100	474.00	436.08	37.92	100	1,877.00
	2012	2,051.00	99	2,030.49	1	20.51	0	100	100	100	2,051.00	2,030.49	20.51		
	2015	2,351.00	99	2,327.49	1	23.51	0	100	100	100	2,351.00	2,327.49	23.51		
Saudi Arabia	1990	16,139.00	77	12,427.03	23	3,711.97	8	92	97	63	14,392.76	12,054.22	2,338.54	63	14,608.30
	2012	28,288.00	83	23,479.04	17	4,808.96	3	97	97	97	27,439.36	22,774.67	4,664.69		
	2015	29,898.00	83	24,815.34	17	5,082.66	3	97	97	97	29,001.06	24,070.88	4,930.18		
Somalia	1990	6,599.00	30	1,979.70	70	4,619.30	77	23	23	23	1,517.77	455.33	1,062.44	8	1,707.90
	2012	10,195.00	38	3,874.10	62	6,320.90	71	29	29	29	2,956.55	1,123.49	1,833.06		
	2015	11,123.00	40	4,449.20	60	6,673.80	71	29	29	29	3,225.67	1,290.27	1,935.40		
Sudan	1990	26,494.00	27	7,153.38	73	19,340.62	33	67	86	61	17,949.69	6,151.91	11,797.78	-36	4,669.34
	2012	37,195.00	33	12,274.35	67	24,920.65	45	55	66	50	20,561.40	8,101.07	12,460.33		
	2015	39,613.00	34	13,468.42	66	26,144.58	45	55	67	52	22,619.02	9,023.84	13,595.18		
Syria	1990	12,324.00	49	6,038.76	51	6,285.24	14	86	97	75	10,571.53	5,857.60	4,713.93	29	9,444.71
	2012	21,890.00	56	12,258.40	44	9,631.60	10	90	92	87	19,657.22	11,277.73	8,379.49		
	2015	22,265.00	58	12,913.70	42	9,351.30	10	90	92	87	20,016.24	11,880.60	8,135.63		
Tunisia	1990	8,215.00	58	4,764.70	42	3,450.30	18	82	95	63	6,700.15	4,526.47	2,173.69	89	4,275.32
	2012	10,875.00	67	7,286.25	33	3,588.75	3	97	100	90	10,516.13	7,286.25	3,229.88		
	2015	11,235.00	67	7,527.45	33	3,707.55	2	98	100	93	10,975.47	7,527.45	3,448.02		
UAE	1990	1,809.00	79	1,429.11	21	379.89	3	97	100	100	1,809.00	1,429.11	379.89	100	7,768.00
	2012	9,206.00	85	7,825.10	15	1,380.90	0	100	100	100	9,206.00	7,825.10	1,380.90		
	2015	9,577.00	86	8,236.22	14	1,340.78	0	100	100	100	9,577.00	8,236.22	1,340.78		
Yemen	1990	11,948.00	21	2,509.08	79	9,438.92	34	66	96	59	7,977.68	2,408.72	5,568.96	-32	6,258.08
	2012	23,852.00	33	7,871.16	67	15,980.84	45	55	72	47	13,178.23	5,667.24	7,510.99		
	2015	25,535.00	35	8,937.25	65	16,597.75	45	55	72	47	14,235.76	6,434.82	7,800.94		
Arab Region	1990	228,442.00	49	113,013.81	51	115,428.19	18	82	94	70	187,242.79	106,512.42	80,730.37	11	134,410.26
	2012	363,103.00	57	208,358.25	43	154,744.75	16	84	92	74	305,675.48	191,377.33	114,298.15		
	2015	384,570.00	58	223,219.44	42	161,350.56	16	84	90	75	321,653.04	200,578.83	121,074.21		

Table 12. Sanitation Coverage (JMP)

Population							Sanitation without Coverage (%)	Improved Sanitation Coverage (%)			Improved Sanitation Coverage (1000 inhabitants)			MDG Achievment (% Coverage Reduction)	Population gained access to sanitation 1990 - 2015 (x1000)
Country	Year	Total (x1000)	Urban %	Urban (x1000)	Rural %	Rural (x1000)	Total	Total	Urban	Rural	Total	Urban	Rural		
Algeria	1990	25,299.00	52	13,155.48	48	12,143.52	11	89	99	68	21,281.52	13,023.93	8,257.59	-9	14,345.50
	2012	38,482.00	74	28,476.68	26	10,005.32	5	95	98	88	36,711.83	27,907.15	8,804.68		
	2015	40,633.00	71	28,849.43	29	11,783.57	12	88	90	82	35,627.01	25,964.49	9,662.53		
Bahrain	1990	493.00	88	433.84	12	59.16	1	99	100	99	492.41	433.84	58.57	0	866.10
	2012	1,318.00	89	1,173.02	11	144.98	1	99	100	99	1,316.55	1,173.02	143.53		
	2015	1,360.00	89	1,210.40	11	149.60	1	99	100	99	1,358.50	1,210.40	148.10		
Comoros	1990	438.00	28	122.64	72	315.36	83	17	34	11	76.39	41.70	34.69	23	198.96
	2012	718.00	28	201.04	72	516.96	64	36	50	30	255.61	100.52	155.09		
	2015	770.00	28	215.60	72	554.40	64	36	48	31	275.35	103.49	171.86		
Djibouti	1990	562.00	76	427.12	24	134.88	38	62	73	45	372.49	311.80	60.70	-39	53.66
	2012	860.00	77	662.20	23	197.80	39	61	73	22	526.92	483.41	43.52		
	2015	900.00	77	693.00	23	207.00	53	47	60	5	426.15	415.80	10.35		
Egypt	1990	56,843.00	43	24,442.49	57	32,400.51	28	72	91	57	40,710.96	22,242.67	18,468.29	82	39,522.57
	2012	80,722.00	44	35,517.68	56	45,204.32	4	96	98	94	77,299.39	34,807.33	42,492.06		
	2015	84,706.00	43	36,423.58	57	48,282.42	5	95	97	93	80,233.52	35,330.87	44,902.65		
Iraq	1990	17,374.00	70	12,161.80	30	5,212.20	28	72	81	81	14,072.94	9,851.06	4,221.88	50	16,464.92
	2012	32,778.00	66	21,633.48	34	11,144.52	15	85	86	82	27,743.30	18,604.79	9,138.51		
	2015	35,767.00	69	24,679.23	31	11,087.77	14	86	86	84	30,537.86	21,224.14	9,313.73		
Jordan	1990	3,416.00	72	2,459.52	28	956.48	3	97	98	95	3,318.99	2,410.33	908.66	67	4,294.11
	2012	7,009.00	83	5,817.47	17	1,191.53	2	98	98	98	6,868.82	5,701.12	1,167.70		
	2015	7,690.00	84	6,459.60	16	1,230.40	1	99	99	99	7,613.10	6,395.00	1,218.10		
Kuwait	1990	2,088.00	98	2,046.24	2	41.76	0	100	100	100	2,088.00	2,046.24	41.76	100	1,495.00
	2012	3,250.00	98	3,185.00	2	65.00	0	100	100	100	3,250.00	3,185.00	65.00		
	2015	3,583.00	98	3,511.34	2	71.66	0	100	100	100	3,583.00	3,511.34	71.66		
Lebanon	1990	2,948.00	83	2,446.84	17	501.16	5	95	100	94	2,917.81	2,446.84	470.97	-280	2,136.19
	2012	4,647.00	87	4,042.89	13	604.11	16	84	100	82	4,535.90	4,042.89	493.01		
	2015	5,054.00	88	4,447.52	12	606.48	19	81	100	100	5,054.00	4,447.52	606.48		
Libya	1990	4,334.00	76	3,293.84	24	1,040.16	3	97	97	96	4,193.58	3,195.02	998.55	0	1,920.65
	2012	6,155.00	78	4,800.90	22	1,354.10	3	97	97	96	5,956.81	4,656.87	1,299.94		
	2015	6,317.00	79	4,990.43	21	1,326.57	3	97	97	96	6,114.22	4,840.72	1,273.51		
Mauritania	1990	1,996.00	40	798.40	60	1,197.60	84	16	29	8	327.34	231.54	95.81	29	1,320.98
	2012	3,796.00	52	1,973.92	48	1,822.08	73	27	51	9	1,170.69	1,006.70	163.99		
	2015	4,080.00	60	2,448.00	40	1,632.00	60	40	58	14	1,648.32	1,419.84	228.48		

Morocco	1990	24,781.00	48	11,894.88	52	12,886.12	48	52	81	26	12,985.24	9,634.85	3,350.39	52	13,092.20
	2012	32,521.00	57	18,536.97	43	13,984.03	25	75	85	63	24,566.36	15,756.42	8,809.94		
	2015	33,955.00	60	20,373.00	40	13,582.00	23	77	84	66	26,077.44	17,113.32	8,964.12		
Oman	1990	1,868.00	66	1,232.88	34	635.12	18	82	95	55	1,520.55	1,171.24	349.32	83	2,494.41
	2012	3,314.00	74	2,452.36	26	861.64	3	97	97	95	3,197.35	2,378.79	818.56		
	2015	4,158.00	78	3,243.24	22	914.76	3	97	97	95	4,014.96	3,145.94	869.02		
Palestine	1990	2,000.00	68	1,360.00	32	640.00	10	90	90	90	1,800.00	1,224.00	576.00	20	1,890.00
	2012	3,981.00	75	2,985.75	25	995.25	6	94	95	93	3,762.05	2,836.46	925.58		
	2015	4,000.00	75	3,000.00	25	1,000.00	8	92	93	90	3,690.00	2,790.00	900.00		
Qatar	1990	474.00	92	436.08	8	37.92	0	100	100	100	474.00	436.08	37.92	100	1,877.00
	2012	2,051.00	99	2,030.49	1	20.51	0	100	100	100	2,051.00	2,030.49	20.51		
	2015	2,351.00	99	2,327.49	1	23.51	2	98	100	100	2,351.00	2,327.49	23.51		
Saudi Arabia	1990	16,139.00	77	12,427.03	23	3,711.97	8	92	100	65	14,847.89	12,427.03	2,420.86	100	15,050.11
	2012	28,288.00	83	23,479.04	17	4,808.96	0	100	100	100	28,288.00	23,479.04	4,808.96		
	2015	29,898.00	83	24,815.34	17	5,082.66	0	100	100	100	29,898.00	24,815.34	5,082.66		
Somalia	1990	6,599.00	30	1,979.70	70	4,619.30	80	20	20	20	1,319.80	395.94	923.86	4	1,238.49
	2012	10,195.00	38	3,874.10	62	6,320.90	77	23	23	23	2,344.85	891.04	1,453.81		
	2015	11,123.00	40	4,449.20	60	6,673.80	77	23	23	23	2,558.29	1,023.32	1,534.97		
Sudan	1990	26,494.00	27	7,153.38	73	19,340.62	73	27	52	18	7,201.07	3,719.76	3,481.31	-4	2,385.28
	2012	37,195.00	33	12,274.35	67	24,920.65	76	24	44	13	8,640.40	5,400.71	3,239.68		
	2015	39,613.00	34	13,468.42	66	26,144.58	76	24	44	14	9,586.35	5,926.10	3,660.24		
Syria	1990	12,324.00	49	6,038.76	51	6,285.24	15	85	95	75	10,450.75	5,736.82	4,713.93	73	10,830.14
	2012	21,890.00	56	12,258.40	44	9,631.60	4	96	96	95	20,918.08	11,768.06	9,150.02		
	2015	22,265.00	58	12,913.70	42	9,351.30	4	96	96	95	21,280.89	12,397.15	8,883.74		
Tunisia	1990	8,215.00	58	4,764.70	42	3,450.30	27	73	94	43	5,962.45	4,478.82	1,483.63	70	4,305.22
	2012	10,875.00	67	7,286.25	33	3,588.75	10	90	97	77	9,831.00	7,067.66	2,763.34		
	2015	11,235.00	67	7,527.45	33	3,707.55	8	92	97	80	10,267.67	7,301.63	2,966.04		
UAE	1990	1,809.00	79	1,429.11	21	379.89	3	97	98	95	1,761.42	1,400.53	360.90	33	7,583.81
	2012	9,206.00	85	7,825.10	15	1,380.90	2	98	98	95	8,980.45	7,668.60	1,311.86		
	2015	9,577.00	86	8,236.22	14	1,340.78	2	98	98	95	9,345.24	8,071.50	1,273.74		
Yemen	1990	11,948.00	21	2,509.08	79	9,438.92	76	24	70	12	2,889.03	1,756.36	1,132.67	39	11,065.85
	2012	23,852.00	33	7,871.16	67	15,980.84	47	53	93	34	12,753.66	7,320.18	5,433.49		
	2015	25,535.00	35	8,937.25	65	16,597.75	46	54	93	34	13,954.88	8,311.64	5,643.24		
Arab Region	1990	228,442.00	49	113,013.81	51	115,428.19	34	66	87	45	151,064.63	98,616.37	52,448.25	38	154,431.13
	2012	363,103.00	57	208,358.25	43	154,744.75	20	80	90	66	290,969.02	188,266.26	102,702.76		
	2015	384,570.00	58	223,219.44	42	161,350.56	21	79	89	67	305,495.76	198,087.04	107,408.72		

*Source: 2014 JMP Report, except for the following:

* For Iraq, 1990 Rural and Urban Water Supply Coverage is taken as being the same as the Total Coverage of 81%
* For Libya, 2012 Rural and Urban Water Supply Coverage was provided by the Government Sector in charge.
* For Saudi Arabia, 2012 Urban and Rural Water Supply Coverage was taken as being the same as the Total Coverage of 97%
* For Somalia, 1990 and 2012 Rural and Urban Water Supply Coverage was taken as being the same as the Total Coverage of 23% in 1990 and 29% in 2012
* For Somalia, 1990 and 2012 Rural and Urban Sanitation Coverage was taken as being the same as the Total Coverage of 20% in 1990 and 23% in 2012
* For Palestine, 1990 Rural Water Supply and Sanitation Coverage were calculated as: RIWC= (TIWC x TP - UIWC x UP) / (RP) & RISC= (TISC x TP - UISC x UP) / (RP)
* For Lebanon, 1990 and 2012 Rural Sanitation Coverage was calculated as: RISC= (TISC x TP - UISC x UP) / (RP)
* For Saudi Arabia, 1990 Rural Sanitation was calculated as: RISC= (TISC x TP - UISC x UP) / (RP)
* For Saudi Arabia, 2012 Urban and Rural Sanitation Coverage was taken as being the same as the Total Coverage of 100%

WC: Water Supply Coverage, **SC**: Sanitation Coverage, **R**: Rural, **U**: Urban, **T**: Total, **I**: Improved, **P**: Population

Table 13. List of Flooging Events & the Associated Human & Economic Losses in the Arab Region

Coutries	Flood Events (2013 - 2015)	Number of Events	Total Mortality (EMDAT)	Average Annual Loss (AAL) Absolute Million USD	Economic Loss (EMDAT) Million USD
Algeria	16 Oct. 2015, 24 Aug. 2015, 24 Mar. 2015, 09 Oct. 2013, 11 Aug. 2013	5	12	178	0
Bahrain	20 Nov. 2013	1		NA	
Comoros	20 Apr. 2012	1	4		5
Djibouti		NA		0	
Egypt	03 Nov. 2015, 25 Oct. 2015, 09 May 2014, 09 Mar. 2014, 13 Dec. 2013, 08 Jan. 2013	6	31	161	100
Iraq	08 Nov. 2015, 30 Oct. 2015, 09 May 2014, 30 Jan. 2014, 21 Nov. 2013, 06 May 2013	6	69	344	
Jordan	05 Nov. 2015, 26 Oct. 2015, 03 Nov. 2014, 07 May 2014, 13 Dec. 2013, 13 May 2013, 08 Jan. 2013	7		4328	
Kuwait	28 Oct. 2015, 18 Nov. 2013	2	1	NA	
Lebanon	25 Oct. 2015, 19 Feb. 2015, 17 Nov. 2014, 08 May 2014, 04 Dec. 2013, 07 Jan. 2013	6	5	8	
Libya	26 Sep. 2015, 09 Dec. 2013, 30 Nov. 2013, 08 Nov. 2013	4	16	13	
Mauritania	24 Aug. 2014, 03 Oct. 2013	2	8	19	2
Morocco	12 Aug. 2015, 16 Dec. 2014, 03 Dec. 2014, 25 Nov. 2014	4	60	132	300
Oman	16 Oct. 2015, 07 Sep. 2015, 12 Jun. 2015, 04 Sep. 2014, 20 Mar. 2014, 24 Apr. 2013	6		NA	221
Palestine	17 Nov. 2015, 16 Oct. 2015, 13 Dec. 2013	4	10	0	
Qatar	25 Nov. 2015	1		NA	
Saudi Arabia	25 Nov. 2015, 17 Nov. 2015, 30 Oct. 2015, 27 Mar. 2015, 08 May 2014, 12 Mar. 2014, 05 Jan. 2014, 01 May 2013, 22 Nov. 2013	9	62	NA	2
Somalia	24 Nov. 2015, 28 Oct. 2015, 10 Nov. 2014, 27 Oct. 2014, 21 Oct. 2014, 10 Jun. 2014, 02 Dec. 2013, 14 Nov. 2013, 12 Nov. 2013, 20 May 2013	10	169	28	2
Sudan	29 Sep. 2014, 14 Aug. 2014, 04 Aug. 2014, 01 Aug. 2014, 10 Sep. 2013, 27 Aug. 2013, 16 Aug. 2013, 15 Aug. 2013, 05 Aug. 2013, 04 Aug. 2013	10	135	72	7
Syria	10 Jan. 2013, 11 Dec. 2013	2	13	115	
Tunisia	28 Mar. 2015, 05 Sep 2013	2	4	41	

Coutries	Flood Events (2013 - 2015)	Number of Events	Total Mortality (EMDAT)	Average Annual Loss (AAL) Absolute Million USD	Economic Loss (EMDAT) Million USD
UAE	17 Mar. 2014, 25 Mar. 2014, 08 Jan 2014, 20 Nov. 2013	4		NA	
Yemen	04 Nov. 2015, 19 Nov. 2014, 19 May 2014, 19 Aug. 2013	4	66		200
Total		96	665	5440	839

* floodlist.com, GAR (2015), EM-DAT (2015)

Table 14. Estimated Industrial GDP and Agricultural GDP

Coutries	2012 Agricultural GDP Million USD$	2015 Agricultural GDP Million USD$	2012 Industrial GDP Million USD$	2015 Industrial GDP Million USD$
Algeria	18,334	19,718	100	59
Bahrain	84	93	15	13
Comoros	307 (World Bank)	297 (World Bank)	0	0
Djibouti	45	49	0	0
Egypt	35,787	36,405	110	122
Emirates	2,582	2,709	132	74
Iraq	8,568	9,350	8	10
Jordan	852	1,384	130	64
Kuwait	528	627	7	8
Lebanon	1,600	1,900		
Libya	737	885	2	1
Mauritania	561	1,204	26	26
Morocco	11,886	14,777	56	33
Oman	516	591	2	2
Palastine	525	417	137	93
Qatar	176	263	461	296
Saudi Arabia	13,307	14,325		
Somalia	820	820	2	2
Sudan	22,662	25,136		
Syria	12,221	12,221	13	11
Tunisia	3,900	3,037	215	157
Yamen	4,733	5,127	16	17

* AOAD (2016), * World Bank Database Indicators

Table 15. Agricultural Labour

Country	Agricultural Labour (1000)
Algeria	4,960
Bahrain	10
Comoros	NA
Djibouti	287
Egypt	6,403
Emirates	154

Iraq	1,623
Jordan	243
Kuwait	321
Lebanon	26
Libya	54
Mauritania	171
Morocco	4,119
Oman	345
Palastine	84
Qatar	24
Saudi Arabia	495
Somalia	2,870
Sudan	3,495
Syria	1,352
Tunisia	505
Yamen	2,216

* AOAD (2016)

Table 16. Estimated Industrial and Agricultural Employment, (thousands)

Coutries	Employment in Agriculture	Employment in Industry
Algeria	907	3,262
Bahrain	8	271
Comoros	111	27
Djibouti	181	28
Egypt	6,805	6,612
Emirates	1,637	2,002
Iraq	72	500
Jordan	52	575
Kuwait	246	449
Lebanon	163	524
Libya	570	115
Mauritania	4,159	2,315
Morocco	106	805
Oman	81	274
Palastine	23	1,012
Qatar	748	2,788
Saudi Arabia	2,128	187
Somalia	4,050	1,389
Sudan	645	1,298
Syria	515	1,142
Tunisia	252	1,538
Yamen	1,586	645

* International Labor Organization (ILO) modelled

Table 17. Virtual Water Embedded in Agricultural Products

FOOD Product	Virtual Water (Cubic Meters/Ton)
CEREALS AND FLOUR	
WHEAT	**1,334**
FLOUR OF WHEAT	**1,334**
BARLEY	**1,910**
MAIZE	**909**
SORGHUM	**1,910**
RICE	**2,291**
OTHER CEREALS	**900**
POTATOES	**255**
SUGAR (REFINED)	**1,780**
PULSES (TOTAL)	**1,754**
LENTILS	
CHICK-PEAS	
BROAD BEANS (DRY)	
OIL SEEDS	**2,400**
GROUNDNUTS SHELLED	2,782
SESAME SEED	2,400
SOYBEANS	2,400
COTTON SEED OIL	2,400
SUNFLOWER SEED	2,407
MAIZE OIL	909
LINSEED OIL	2,406
FRESH, PRESERVED OR CANNED OLIVE	3,015
VEGETABLE OILS	**8,728**
SOYBEAN OIL	13,272
COTTON SEED OIL	10,952
GROUNDNUT OIL	5,323
OLIVE OIL	6,456
SESAME OIL	5,198
MAIZE OIL	21,260
LINSEED OIL	6,711
SUNFLOWER OIL	3,834
MARGARINE	5,550
VEGETABLES (TOTAL)	**195**
FRESH TOMATOES	214
ONION,DRY	
GREEN BEANS	
WATER MELON & MELONS	
CUCUMBER AND GHERKIN	353

FOOD Product	Virtual Water (Cubic Meters/Ton)
PROCESSED AND PRESERVED VEGETABLES	
FRUITS (TOTAL)	**455**
ORANGE AND MANDARIN	560
LEMONS	
BANANA	790
APPLE	822
FRESH GRAPES	
MANGOES	1800
DATES DRIED AND FRESH	2277
CATTLE AND BUFFALOES (LIVE)	**7,749**
GOAT AND SHEEP (LIVE)	**3,980**
RED MEAT	**10,440**
BEEF (FRESH, CHILLED OR FROZEN)	15,400
SHEEP AND GOATS MEAT (FRESH, CHILLED OR FROZEN)	7,960
OTHER MEAT (FRESH, CHILLED OR FROZEN)	
MEAT (DRIED, SALTED AND CANNED) AND MEAT PREPARATION	
LIVE POULTRY MEAT	**2,046**
CHICKEN MEAT (FRESH, CHILLED OR FROZEN)	**4,092**
MILK & DAIRY PROD.	**3,600**
FRESH MILK	1,020
CREAM FRESH	
DRIED MILK	4,745
EVAPORATED AND CONDENSED MILK	
CHEESE	3,178
BUTTER AND MARGARINE	5,550
EGGS	**2,700**
TOBACCO	**9,000**
TEA	**6,470**
COCOA	**20,000**
COFFEE	**18,900**
ANIMAL FODDERS	**1,910**

*Mekonnen, M.M. and Hoekstra, A.Y. (2010),

Table 18. Imported Amounts of Agricultural Products in the Arab Countries

Food Imported (1000 MT)	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
WHEAT	8,504.86	55.85	121.86	8,984.01	50.08	819.28	305.17	632.33	1,149.13	324.57	3,214.63	503.26	139.09	238.63	2,943.30	1.68	1,697.55	541.55	1,983.73	933.45	8,332.77	41,476.78
FLOUR OF WHEAT	0.02	2.20	44.42	6.05	22.41	6.94	0.78	17.76	4.51	0.20	0.25	131.57	61.34	20.49	127.86	117.68	65.64	8.09	0.01	70.53	119.92	828.67
BARLEY	750.03	1.14	-	28.24	-	661.04	461.56	82.17	472.24	0.01	180.19	113.88	40.20	1.79	6,494.46	-	-	381.00	556.47	399.00	0.06	10,623.48
MAIZE	4,417.61	17.11	1.78	6,775.35	-	636.64	112.02	0.02	638.63	4.78	2,081.35	160.23	38.00	20.98	2,674.00	8.96	39.92	287.47	1,109.99	168.13	524.82	19,717.79
SORGHUM	0.50	2.64		0.01		0.93		500.03	1.03	0.04	0.22	3.38		1.25	13.55	124.49	2.58	0.25	-	3.30	29.44	683.64
RICE	113.86	127.39	28.02	31.58	201.95	0.83	228.72	69.67	66.72	15.98	3.07	276.89	56.77	184.76	1,657.87	293.20	37.36	69.01	23.60	1,027.99	443.35	4,958.59
OTHER CEREALS	37.38	0.06	-	36.88	-	0.07	-	0.15	-	-	(0.01)	54.52	0.01	224.20	(0.04)	-	0.01	-	17.94	-	(5,579.13)	(5,207.96)
POTATOES	152.94	26.56	15.38	174.74	46.30	43.08	148.18	67.91	2.78	41.49	52.12	65.75	4.70	16.93	71.89	7.51	6.28	51.90	39.90	38.39	0.92	1,075.65
SUGAR (REFINED)	1,937.14	274.89	144.93	941.11	436.28	325.34	143.35	155.46	185.61	212.11	920.86	111.06	37.32	69.85	570.76	138.59	810.63	896.38	497.07	758.48	691.29	10,258.51
PULSES (TOTAL)	228.24	7.49	0.80	381.34	8.84	66.49	26.37	35.55	1.22	0.12	9.59	17.16	6.16	27.71	194.41	5.00	86.12	23.08	27.91	224.96	33.45	1,412.01
OIL SEEDS	53.12	9.90	0.43	714.21	99.53	46.51	9.42	49.55	5.92	0.03	102.35	1.59	12.60	19.96	809.25		3.08	319.66	514.81	262.90	6.39	3,041.21
VEGETABLE OILS	802.26	25.95	6.56	663.25	105.07	160.50	82.00	156.28	55.67	12.01	486.71	232.98	4.43	60.34	808.26	7.72	18.96	155.62	175.12	151.46	18.43	4,189.58
VEGETABLES (TOTAL)	30.75	123.60	17.89	143.70	128.61	35.33	302.65	74.20	4.85	50.32	15.14	136.57	31.28	230.61	592.54	4.00	10.18	115.00	27.69	439.83	78.12	2,592.86
FRUITS (TOTAL)	440.64	91.38	10.65	522.43	288.39	167.48	426.19	35.42	58.88	7.75	106.42	200.10	35.46	141.09	1,306.11	7.08	48.64	246.79	78.33	809.49	50.59	5,079.31
CATTLE AND BUFFALOES (LIVE)	11.38	0.86	-	62.32	-	34.28	1.24	67.90	82.50	-	7.36	56.01	13.06	7.50	31.68	-	1.50	1.25	6.84	4.57	190.85	581.07
GOAT AND SHEEP (LIVE)	0.00	22.35	-	0.38	0.00	77.90	79.85	1.03	6.25	-	-	66.51	1.65	1.00	500.70	-	0.00	0.00	-	41.00	10.50	809.13
RED MEAT	68.95	23.10	2.19	793.90	0.70	66.06	46.05	1.19	10.63	0.01	10.51	32.21	5.30	45.98	202.52	0.32	0.21	24.07	3.41	82.50	4.96	1,424.77
LIVE POULTRY MEAT	0.51	3.46		0.11		0.04	2.36	0.12	1.18		10.77	0.04	3.58	0.10	0.02		0.83		1.66	0.70	3.51	28.99
CHICKEN MEAT (FRESH, CHILLED OR FROZEN)	0.07	33.95	1.78	98.17	70.84	84.51	129.17	13.31	8.80	24.26	0.61	80.72	7.18	112.37	935.32	1.41	4.39	10.02	0.77	309.86	57.03	1,984.54
MILK & DAIRY PROD.	3,373.15	259.99	24.36	1,423.77	319.06	372.03	707.76	550.84	336.99	149.75	549.22	511.44	57.15	162.25	3,363.27	6.53	288.75	228.70	106.84	471.87	116.45	13,380.17
EGGS	0.23	11.21	0.42	0.04	61.38	4.55	0.79	0.14	9.09	1.11	0.07	12.61	3.77	17.28	20.27			4.01	0.04	30.91	0.15	178.07
TOBACCO	5.58	17.52	2.69	214.36	1.36	13.69	2.24	1.87	1.29	0.54	5.83	0.04	6.85	4.34	62.81	0.06	7.25		10.67	98.94	19.01	476.94
TEA	14.91	1.56	2.71	100.15	15.87	7.18	5.43	3.40	13.10	7.93	57.47	5.67		3.29	37.20	3.07	29.67	29.88	12.90	67.26	18.93	437.58
COCOA	11.01	0.04		20.45		15.15	20.13	0.01	0.27		5.12	0.44		11.71	5.03		0.07	2.39	9.02	79.20	0.60	180.64
COFFEE	129.20	0.46		35.77		17.45	4.85	25.05	3.95		42.35	3.93		2.92	57.96		27.70	31.94	24.19	7.44	0.08	415.24
ANIMAL FODDERS	3.01	18.90	0.06	1,498.31		418.08	138.70	38.45	377.36	9.32	1,583.19	314.74	342.72	68.01	1,506.65			684.92	303.62	270.58	141.31	7,717.93
Total	21,087.35	1,159.55	426.93	23,650.63	1,856.67	4,081.38	3,384.98	2,579.80	3,498.60	862.33	9,445.39	3,093.30	908.62	1,695.34	24,987.65	727.30	3,187.32	4,112.98	5,532.53	6,752.74	5,313.80	128,345.19

* AOAD (2016) / CEDARE

Table 19. Exported Amounts of Agricultural Products in the Arab Countries

Food Exported (1000 MT)	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
WHEAT		0.85	4.72	0.5	0.58	0		45.82			0.12	1.05	0.49	0	0.39			28.78	0	34.87	0.28	118.45
FLOUR OF WHEAT	2.25	0.4		254.03	50	3.2	68.99	10.38			87	150.52	0.19	15.39	0			0.03	3.38	57.68	4	707.44
BARLEY				0.02		0.55		0			0.01	0.57	0.09	0.72	0.22					28.61	0.2	30.99
MAIZE				0.14				0.02			34.02	0.0003	0.43		0.91		2.76	0.1	5.56	49.75	15.42	109.1103
SORGHUM				0.16				0.04									19.07			1.71	1.71	22.69
RICE		0.92		172.94		0.49	0.6	0.6			1.97	27.99		0.42	15.48					390.28	0.39	612.08
OTHER CEREALS	0.89	0.16	0	106.6	19.5	1.25	26.91	4.05	0	0	33.93	31.4297	0.88	6.19	-0.23	0	3.24	14.21	33.94	22.49	60.78	366.2197
POTATOES	0.03	0.06		595.33		9.35	9.72	140.88	10.67		28.98	0.02	10.31	11	3.21		0.03	67.23	0.66	16.93	0.11	904.52
SUGAR (REFINED)	372.88	246	0.14	327.16	0	4.48	13.42	70.15			18.76	0.14	1.04	0.03	200.73		17.73	1.99	45.21	873.09	1.12	2194.07
PULSES (TOTAL)	0	0.01		126.48	3.1	4.9	1	8.12	0.11		2.2	0	1.44	0.04	12.25		7.54	20.27	2.86	41.24	0.2	231.76
OIL SEEDS			0.89	107.98		4.44	2.91	1.19	0.2		72.16		2.69		4.67	46	305.7	7.74	4.69	62.75	0.71	624.72
VEGETABLE OILS	0.87	1.73	0	100.98	0.02	5.82	1.91	10.54	2		42.47	137.98	10.18	0.2	222.72	0	0.49	11.9	378.89	38.19	1.02	967.91
VEGETABLES (TOTAL)	3.55	4.77	10.61	1033.34	0.02	695.12	15.59	12.93	0.2		686.8	65.65	38.01	0.01	138.52		3.58	515.05	55.72	247.84	125.67	3652.98
FRUITS (TOTAL)	28.52	4	0.34	1625.19	37.08	133.81	33.85	183.2	0.05	1.72	643.4	11.92	17.78	1.7	208.39	14.68	10.91	499.03	194.14	580.51	150.72	4380.94
CATTLE AND BUFFALOES (LIVE)	0	0	0.635	0.265	0	0	0.015	2.76	0	1.305	0	0.175	1.25	1.25	0.5	50	8.195	0	0	0.5	0	66.85
GOAT AND SHEEP (LIVE)	0	0.623	0	0.0015	0	28.631	0.7355	0.0475	0	22.75	0	1.139	0.175	0.0445	1.0945	68.018	219.14	1.136	0	1.196	0	344.7265
RED MEAT	1.82	0.88		0.29	0.08	6.06	0.19	0.84			0.01	0.11	0.12	0	34.48	0.36	4.15	0.75	0.27	30.05		80.46
POULTRY MEAT	0	20.67		0.5	0.29	5.65	1.13	1.46			0.51	7.22	0.36	1.15	28.26			8.93	3.27	21.81		101.21
MILK & DAIRY PROD.	0.6	230.17		1072.55	0.73	41.57	180.06	0.75			148.4	58.26	4.22	1.4	353.61		6.06	312.57	51.69	168.75	24.27	2655.66
EGGS		0.05		0.59	0.07	1.63	10.91	0.93			1.28	2.67		0.05	39.03		0	0	0.38	4.15		61.74
TOBACCO	0.01	9.33		1.71		11.14	0	5.55	0.03		0	0.44			0.3		0.01	0.4	0.21	0.04	1.16	30.33
COFFEE		0.1		4.64		0.51	0.1	2.69			0.02	0.01						0.36	0.02	0.41	3.02	11.88
Total	411.42	520.723	17.335	5531.3965	111.47	958.601	368.0405	502.9475	13.23	25.775	1802.04	497.294	89.655	39.5945	1264.5345	179.058	608.6	1490.476	780.89	2672.846	386.6	18234.5265

* AOAD (2016) / CEDARE

Table 20. Value of Food Imports

Food Imported (Million U.S. $)	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
WHEAT	2,406.00	29.06	24.23	2,569.18	122.11	211.02	89.38	150.44	233.25	82.18	876.42	135.59	37.33	63.49	726.04	0.37	659.29	96.94	620.63	258.69	811.34	10,202.98
FLOUR OF WHEAT	0.02	1.82	14.32	3.18	6.00	4.39	0.63	8.76	1.86	0.09	0.12	104.15	69.47	11.59	70.07	37.00	36.12	3.27	0.01	35.77	16.72	425.36
BARLEY	165.31	0.39		6.18		156.39	110.60	18.20	77.00	0.01	51.20	28.16	10.75	0.58	1,469.67			52.00	119.74	73.21	0.01	2,339.40
MAIZE	876.13	5.50	0.47	1,784.98		153.79	46.98	0.27	107.22	0.80	427.80	47.59	13.64	5.96	606.40	2.06	11.25	49.01	221.21	52.08	132.74	4,545.88
SORGHUM	0.51	0.99		0.02		0.34		102.97	0.23	0.13	0.26	1.15		0.33	4.31	27.78	1.02	0.04	-	1.36	11.24	152.68
RICE	62.49	65.18	14.95	28.61	225.25	0.31	296.03	60.10	59.55	2.32	2.90	253.99	55.33	165.14	1,557.24	110.38	19.12	47.08	11.00	750.59	313.33	4,100.89
OTHER CEREALS	13.30	0.07	-	33.04	8.57	0.23	-	0.10	-	-	-	43.63	-	70.59	-	-		-	6.18	-		175.71
POTATOES	93.38	10.21	3.55	78.97	16.49	17.21	73.43	35.55	2.29	8.80	24.09	24.36	2.96	20.02	33.53	2.72	0.50	22.52	17.78	24.50	0.76	513.62
SUGAR (REFINED)	717.49	117.11	74.93	464.17	306.58	154.98	61.08	72.34	102.23	46.13	439.98	55.99	1.17	34.74	253.63	56.60	460.00	696.32	202.16	513.49	411.49	5,242.61
PULSES (TOTAL)	239.45	8.91	0.60	451.41	5.04	55.91	26.67	33.75	1.13	0.07	8.19	17.56	4.28	27.38	158.31	2.50	73.45	14.61	7.52	188.55	19.37	1,344.66
OIL SEEDS	73.20	6.81	0.52	887.56	39.01	70.16	13.70	84.88	9.52	0.02	66.66	2.36	4.63	9.47	436.00		3.45	192.83	236.03	189.81	7.60	2,334.22
VEGETABLE OILS	612.57	38.36	5.79	1,293.77	62.04	174.92	109.96	257.89	71.99	12.62	385.19	217.17	6.03	90.09	788.78	11.83	15.73	180.57	139.77	143.76	27.26	4,646.09
VEGETABLES (TOTAL)	29.51	63.97	4.41	50.19	67.66	26.46	180.55	39.88	1.69	11.09	21.96	74.73	15.18	170.25	282.06	5.00	5.21	60.02	12.58	193.16	37.66	1,353.22
FRUITS (TOTAL)	326.32	89.60	3.17	562.63	91.95	160.29	342.48	35.50	57.49	2.49	136.09	146.92	20.11	136.67	889.87	2.91	31.06	102.13	35.48	457.96	27.64	3,658.76
CATTLE AND BUFFALOES (LIVE)	78.74	1.24		123.49		73.47	7.20	350.68	96.40		12.94	42.90	70.93	9.13	20.92		7.05	6.31	17.76	6.62	33.67	959.45
GOAT AND SHEEP (LIVE)	0.37	55.85		1.09	0.14	136.85	137.96	20.80	15.29		-	128.63	1.57	39.89	974.32		0.12	0.01		57.12	5.93	1,575.94
RED MEAT	260.30	140.53	4.82	1,934.86	3.01	317.75	214.22	5.21	34.87	0.01	54.35	114.28	26.57	241.45	896.10	0.90	0.52	68.88	15.63	496.95	11.13	4,842.34
LIVE POULTRY MEAT	5.35	0.38		0.20		3.87	5.76	5.13	1.49		19.96	1.65	8.75	0.56	0.88		2.98		4.05	3.23	7.63	71.87
CHICKEN MEAT (FRESH, CHILLED OR FROZEN)	0.15	162.38	2.70	164.89	110.11	131.35	287.99	38.87	12.96	21.94	1.07	149.02	20.13	243.87	1,930.78	1.70	6.32	12.05	2.97	512.74	118.14	3,932.13
MILK & DAIRY PROD.	1,168.59	158.07	15.25	839.42	45.15	226.21	412.36	373.96	193.81	48.30	256.99	211.25	41.96	361.59	1,591.39	9.09	26.85	80.37	25.22	912.60	342.16	7,340.59
EGGS	1.16	21.90	0.84	2.60	53.45	8.19	5.99	1.00	16.00	5.52	0.54	49.67	10.29	73.46	86.85			5.80	2.97	49.09	1.40	396.72
TOBACCO	21.46	196.52	14.38	335.25	1.45	87.42	5.65	10.58	7.99	0.56	69.11	0.20	33.00	84.82	1,208.62	0.02	46.10		103.99	470.35	70.37	2,767.84
TEA	32.73	12.73	3.26	293.52	62.23	46.11	43.32	22.99	43.92	10.00	189.89	30.00		28.86	257.90	3.87	30.07	70.86	5.36	230.14	38.21	1,455.97
COCOA	26.25	0.22		55.83		77.06	125.19	0.05	0.71		11.95	2.31		82.52	14.73		0.17	4.95	25.56	405.61	1.39	834.50
COFFEE	298.57	4.08		111.26		62.14	14.02	74.94	10.38		108.00	10.67		23.34	199.94		33.92	48.89	51.54	31.88	0.39	1,083.96
ANIMAL FODDERS	0.59	8.38	0.29	1,155.43		187.64	62.44	10.65	143.76	1.50	693.74	813.45	132.82	29.33	575.19			243.19	124.02	154.52	91.65	4,428.59
Total	7,509.94	1,200.26	188.48	13,231.73	1,226.24	2,544.46	2,673.59	1,815.49	1,303.03	254.58	3,859.40	2,707.38	586.90	2,025.12	15,033.53	274.73	1,470.30	2,058.65	2,009.16	6,213.78	2,539.23	**70,726**

* AOAD (2016) / CEDARE

Table 21. Imported Virtual Water In Agricultural Products

Imported Virtual Water	Cubic meters/ ton	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total Imports
WHEAT	1,334	11,345.48	74.50	162.56	11,984.67	66.81	1,092.92	407.10	843.53	1,532.94	432.98	4,288.32	671.35	185.55	318.33	3,926.36	2.24	2,264.53	722.43	2,646.30	1,245.22	11,115.92	55,330.02
FLOUR OF WHEAT	1,334	0.03	2.93	59.26	8.07	29.89	9.26	1.04	23.69	6.02	0.27	0.33	175.51	81.83	27.33	170.57	156.99	87.56	10.79	0.01	94.09	159.97	1,105.45
BARLEY	1,910	1,432.56	2.18	-	53.94	-	1,262.59	881.58	156.94	901.98	0.02	344.16	217.51	76.78	3.42	12,404.42	-	-	727.71	1,062.86	762.09	0.11	20,290.85
MAIZE	909	4,015.61	15.55	1.62	6,158.79	-	578.71	101.83	0.02	580.51	4.35	1,891.95	145.65	34.54	19.07	2,430.67	8.14	36.29	261.31	1,008.98	152.83	477.06	17,923.47
SORGHUM	1,910	0.96	5.04	-	0.02	-	1.78	-	955.06	1.97	0.08	0.42	6.46	-	2.39	25.88	237.78	4.93	0.48	-	6.30	56.23	1,305.75
RICE	2,291	260.85	291.85	64.19	72.35	462.67	1.90	524.00	159.61	152.86	36.61	7.03	634.35	130.06	423.29	3,798.18	671.72	85.59	158.10	54.07	2,355.13	1,015.71	11,360.13
OTHER CEREALS	900	33.64	0.05	-	33.19	-	0.06	-	0.14	-	-	-	49.07	0.01	201.78	-	-	0.01	-	16.15	-	-	334.10
POTATOES	255	39.00	6.77	3.92	44.56	11.81	10.99	37.79	17.32	0.71	10.58	13.29	16.77	1.20	4.32	18.33	1.92	1.60	13.23	10.17	9.79	0.23	274.29
SUGAR (REFINED)	1,780	3,448.11	489.30	257.98	1,675.18	776.58	579.11	255.16	276.72	330.39	377.56	1,639.13	197.69	66.43	124.33	1,015.95	246.69	1,442.92	1,595.56	884.78	1,350.09	1,230.50	18,260.15
PULSES (TOTAL)	1,754	400.33	13.14	1.40	668.87	15.51	116.62	46.25	62.35	2.14	0.21	16.82	30.10	10.80	48.60	341.00	8.77	151.05	40.48	48.95	394.58	58.67	2,476.67
OIL SEEDS	2,400	127.49	23.76	1.03	1,714.10	238.87	111.62	22.61	118.92	14.21	0.07	245.64	3.82	30.24	47.90	1,942.20		7.39	767.18	1,235.54	630.96	15.34	7,298.90
VEGETABLE OILS	8,728	7,002.13	226.49	57.26	5,788.85	917.05	1,400.84	715.70	1,364.01	485.89	104.82	4,248.00	2,033.45	38.67	526.65	7,054.49	67.38	165.48	1,358.25	1,528.45	1,321.94	160.86	36,566.65
VEGETABLES (TOTAL)	195	6.00	24.10	3.49	28.02	25.08	6.89	59.02	14.47	0.95	9.81	2.95	26.63	6.10	44.97	115.55	0.78	1.99	22.43	5.40	85.77	15.23	505.61
FRUITS (TOTAL)	455	200.49	41.58	4.85	237.71	131.22	76.20	193.92	16.12	26.79	3.53	48.42	91.05	16.13	64.20	594.28	3.22	22.13	112.29	35.64	368.32	23.02	2,311.09
CATTLE AND BUFFALOES (LIVE)	7,749	88.14	6.63		482.88		265.64	9.57	526.12	639.29		57.03	434.02	101.16	58.12	245.49		11.62	9.69	52.96	35.41	1,478.90	4,502.67
GOAT AND SHEEP (LIVE)	3980	0.01	88.95		1.53		310.04	317.80	4.10	24.88		-	264.72	6.57	3.98	1,992.79		0.01	0.00	-	163.18	41.79	3,220.34
RED MEAT	10,440	719.84	241.16	22.86	8,288.32	7.31	689.67	480.76	12.42	110.98	0.10	109.72	336.27	55.33	480.03	2,114.31	3.38	2.19	251.29	35.60	861.30	51.78	14,874.64
LIVE POULTRY MEAT	2,046	1.04	7.08	-	0.23	-	0.08	4.83	0.25	2.41	-	22.04	0.08	7.32	0.20	0.04	-	1.70	-	3.40	1.43	7.18	59.31
CHICKEN MEAT (FRESH, CHILLED OR FROZEN)	4,092	0.29	138.92	7.28	401.71	289.88	345.81	528.56	54.46	36.01	99.27	2.50	330.31	29.38	459.82	3,827.33	5.77	17.96	41.00	3.15	1,267.95	233.37	8,120.74
MILK & DAIRY PROD.	3,600	12,143.34	935.96	87.70	5,125.57	1,148.62	1,339.31	2,547.94	1,983.02	1,213.16	539.10	1,977.19	1,841.18	205.74	584.10	12,107.77	23.51	1,039.50	823.32	384.62	1,698.73	419.22	48,168.61
EGGS	2,700	0.62	30.27	1.13	0.11	165.73	12.29	2.13	0.38	24.54	3.00	0.19	34.05	10.18	46.66	54.73	-	-	10.83	0.11	83.46	0.41	480.79
TOBACCO	9,000	50.22	157.68	24.21	1,929.24	12.24	123.21	20.16	16.83	11.61	4.86	52.47	0.36	61.65	39.06	565.29	0.54	65.25	-	96.03	890.46	171.09	4,292.46
TEA	6,470	96.47	10.09	17.53	647.97	102.68	46.45	35.13	22.00	84.76	51.31	371.83	36.68	-	21.29	240.68	19.86	191.96	193.32	83.46	435.17	122.48	2,831.14
COCOA	20,000	220.20	0.80	-	409.00	-	303.00	402.60	0.20	5.40	-	102.40	8.80	-	234.20	100.60	-	1.40	47.80	180.40	1,584.00	12.00	3,612.80
COFFEE	18,900	2,441.88	8.69	-	676.05	-	329.81	91.67	473.45	74.66	-	800.42	74.28	-	55.19	1,095.44	-	523.53	603.67	457.19	140.62	1.51	7,848.04
ANIMAL FODDERS	1,910	5.75	36.10	0.11	2,861.77	-	798.53	264.92	73.44	720.76	17.80	3,023.89	601.15	654.60	129.90	2,877.70	-	-	1,308.20	579.91	516.81	269.90	14,741.25
Total	Total in MCM	44,080.46	2,879.60	778.39	49,292.69	4,401.92	9,813.32	7,952.05	7,175.56	6,985.79	1,696.32	19,266.15	8,261.30	1,810.27	3,969.12	59,060.05	1,458.69	6,126.61	9,079.36	########	16,455.63	17,138.48	288,095.91
Total in BCM	Total in BCM	44.08	2.88	0.78	49.29	4.40	9.81	7.95	7.18	6.99	1.70	19.27	8.26	1.81	3.97	59.06	1.46	6.13	9.08	10.41	16.46	17.14	288.10

* AOAD (2016) / CEDARE

Table 22. Value of Food Exports

Food Exported (Million U.S. $)	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
WHEAT		0.76	1.7	0.34	0.1	0		12.27			0.1	0.41	0.25	0	0.8			10.06	0	16.31	0.92	44.02
FLOUR OF WHEAT	0.87	0.11		94.02	13.56	1.31	39.6	3.91			31.97	70.43	0.09	9.72	0			0.01	1.42	27.79	1.71	296.52
BARLEY				0.03		0.12		0			0.01	0.17	0.03	0.18	0.53					9.91	0.13	11.11
MAIZE				0.35				0.03			10.8	0	0.1		0.53		1.2	0.04	1.53	18.39	10.79	43.76
SORGHUM				0.21				0.07									6.04			0.85	0.53	7.7
RICE		1.24		78.25		0.53	0.96	0.78			1.2	16.83		0.35	10.96					197.64	0.22	308.96
OTHER CEREALS	0.01	0	0	7.47	0	0	0	0	0	0	0	0	0.29	0.1	0	0	0.8	35.8	19.03	0	46.2	109.7
POTATOES	0.01	0.03		235.92		5.2	1.86	33.51	1.59		7.84	0.02	3.9	14	4.81		0.01	35.96	0.29	7.99	0.08	353.02
SUGAR (REFINED)	150.53	108.09	0.05	145.32		12.77	16.92	35.63			33.36	0.35	4.13	0.07	95.05		8.91	3.63	23.28	709.64	1.66	1349.39
PULSES (TOTAL)	0	0.01		173.88	0.89	8.02	0.63	6.29	0.03		2.78	0	1.28	0.02	7.74		5.8	25.44	1.88	36.98	0.09	271.76
OIL SEEDS			0.98	171.43		5.03	0.68	1.51	0.05		136.27		1.86		0.81	4.01	472.4	9.33	5.17	96.31	0.25	906.09
VEGETABLE OILS	1.04	0.6	0	120.46	0.02	7.1	2.58	33.03	2.9	13.23	96.62	199.03	41.51	0.7	241.64	0	1.68	33.34	1026.95	42.86	1.03	1866.32
VEGETABLES (TOTAL)	5.49	1.08	2.84	935.71	0.02	545.11	2.8	6.62	0.17		653.67	47.28	40.25	0.03	53.93		2.8	249.43	50.65	207.35	22.4	2827.63
FRUITS (TOTAL)	34.59	4.79	0.12	941.04	9.54	191.68	23.72	58.94	0.11	0.55	559.63	13.3	14.3	0.84	187.43	6.06	4.65	333.22	280.39	786.08	50.37	3501.35
CATTLE AND BUFFALOES (LIVE)		0	0.54	1.06		0	0.01	17.48		0.24		0.12	1.6	1.6	0.27	25	10.47			0.37		58.76
GOAT AND SHEEP (LIVE)		2.12		0.01		200.64	2	1.45		17.5		26.02	0.25	4.24	2.4	36.71	572.08	125.81		2.71		993.94
RED MEAT	0.24	2.06		1.43	0.25	20.51	0.79	0.58			0.15	0.37	0.34	0	105.2	1	19.8	1.73	0.49	66.08		221.02
POULTRY MEAT	0	4.96		0.68	0.45	14.6	2.58	1.07			0.63	21.83	0.56	1.57	129.5			11.53	2.53	59.2		251.69
MILK & DAIRY PROD.	0.44	203.09		408.69	0.1	23.26	67.42	4.49			143.98	25.94	3.91	2.97	675.51		0.08	112.69	28.57	425.31	16.06	2142.51
EGGS		0.09		2.29	0.06	7.62	16.67	2.39			5.04	12.1		0.11	65.15		0	0	10.47	1.89		123.88
TOBACCO	0.08	93.03		5.92		68.21	0	13.73	0.16		0	0.99			1.87		0.02	1.11	0.6	0.59	1.16	187.47
COFFEE		0.24		18.56		5.46	0.6	23.29			0.18	0.03		1.56	8.27			1.27	0.14	3.05	17.17	79.82
Total	193.3	422.3	6.23	3343.07	24.99	1117.17	179.82	257.07	5.01	31.52	1684.23	435.22	114.65	38.06	1592.4	72.78	1106.74	990.4	1453.39	2717.3	170.77	**15,956**

* AOAD (2016) / CEDARE

Table 23. Exported Virtual Water In Agricultural Products

Exported Virtual Water	Cubic meters/ ton	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
WHEAT	1,334	-	1.13	6.30	0.67	0.77	-	-	61.12	-	-	0.16	1.40	0.65	-	0.52	-	-	38.39	-	46.52	0.37	158.01
FLOUR OF WHEAT	1,334	3.00	0.53	-	338.88	66.70	4.27	92.03	13.85	-	-	116.06	200.79	0.25	20.53	-	-	-	0.04	4.51	76.95	5.34	943.72
BARLEY	1,910	-	-	-	0.04	-	1.05	-	-	-	-	0.02	1.09	0.17	1.38	0.42	-	-	-	-	54.65	0.38	59.19
MAIZE	909	-	-	-	0.13	-	-	-	0.02	-	-	30.92	0.00	0.39	-	0.83	-	2.51	0.09	5.05	45.22	14.02	99.18
SORGHUM	1,910	-	-	-	0.31	-	-	-	0.08	-	-	-	-	-	-	-	-	36.42	-	-	3.27	3.27	43.34
RICE	2291	-	2.11	-	396.21	-	1.12	1.37	1.37	-	-	4.51	64.13	-	0.96	35.46	-	-	-	-	894.13	0.89	1,402.28
OTHER CEREALS	900	0.80	0.14	-	95.94	17.55	1.13	24.22	3.64	-	-	30.54	28.29	0.79	5.57	(0.21)	-	2.92	12.79	30.55	20.24	54.70	329.60
POTATOES	255	0.01	0.02	-	151.81	-	2.38	2.48	35.92	2.72	-	7.39	0.01	2.63	2.81	0.82	-	0.01	17.14	0.17	4.32	0.03	230.65
SUGAR (REFINED)	1,780	663.73	437.88	0.25	582.34	-	7.97	23.89	124.87	-	-	33.39	0.25	1.85	0.05	357.30	-	31.56	3.54	80.47	1,554.10	1.99	3,905.44
PULSES (TOTAL)	1,754	-	0.02	-	221.85	5.44	8.59	1.75	14.24	0.19	-	3.86	-	2.53	0.07	21.49	-	13.23	35.55	5.02	72.33	0.35	406.51
OIL SEEDS	2,400	-	-	2.14	259.15	-	10.66	6.98	2.86	0.48	-	173.18	-	6.46	-	11.21	110.40	733.68	18.58	11.26	150.60	1.70	1,499.33
VEGETABLE OILS	8,728	7.59	15.10	-	881.35	0.17	50.80	16.67	91.99	17.46	-	370.68	1,204.29	88.85	1.75	1,943.90	-	4.28	103.86	3,306.95	333.32	8.90	8,447.92
VEGETABLES (TOTAL)	195	0.69	0.93	2.07	201.50	0.00	135.55	3.04	2.52	0.04	-	133.93	12.80	7.41	0.00	27.01	-	0.70	100.43	10.87	48.33	24.51	712.33
FRUITS (TOTAL)	455	12.98	1.82	0.15	739.46	16.87	60.88	15.40	83.36	0.02	0.78	292.75	5.42	8.09	0.77	94.82	6.68	4.96	227.06	88.33	264.13	68.58	1,993.33
CATTLE AND BUFFALOES (LIVE)	7,749	-	-	4.92	2.05	-	-	0.12	21.39	-	10.11	-	1.36	9.69	9.69	3.87	387.45	63.50	-	-	3.87	-	518.02
GOAT AND SHEEP (LIVE)	3980	-	2.48	-	0.01	-	113.95	2.93	0.19	-	90.55	-	4.53	0.70	0.18	4.36	270.71	872.16	4.52	-	4.76	-	1,372.01
RED MEAT	10,440	19.00	9.19	-	3.03	0.84	63.27	1.98	8.77	-	-	0.10	1.15	1.25	-	359.97	3.76	43.33	7.83	2.82	313.72	-	840.00
POULTRY MEAT	2,046	-	42.29	-	1.02	0.59	11.56	2.31	2.99	-	-	1.04	14.77	0.74	2.35	57.82	-	-	18.27	6.69	44.62	-	207.08
MILK & DAIRY PROD.	3,600	2.16	828.61	-	3,861.18	2.63	149.65	648.22	2.70	-	-	534.24	209.74	15.19	5.04	1,273.00	-	21.82	1,125.25	186.08	607.50	87.37	9,560.38
EGGS	2,700	-	0.14	-	1.59	0.19	4.40	29.46	2.51	-	-	3.46	7.21	-	0.14	105.38	-	-	-	1.03	11.21	-	166.70
TOBACCO	9,000	0.09	83.97	-	15.39	-	100.26	-	49.95	0.27	-	-	3.96	-	-	2.70	-	0.09	3.60	1.89	0.36	10.44	272.97
COFFEE	18,900	-	1.89	-	87.70	-	9.64	1.89	50.84	-	-	0.38	0.19	-	-	-	-	-	6.80	0.38	7.75	57.08	224.53
Total	Total in MCM	709.96	1,428.25	15.83	7,841.60	111.76	737.13	874.74	575.18	20.91	101.44	1,736.61	1,761.37	147.64	51.28	4,300.67	779.00	1,831.15	1,723.76	3,742.06	4,561.90	339.92	33,392.52
Total in BCM	Total in BCM	0.71	1.43	0.02	7.84	0.11	0.74	0.87	0.58	0.02	0.10	1.74	1.76	0.15	0.05	4.30	0.78	1.83	1.72	3.74	4.56	0.34	33.39

* AOAD (2016) / CEDARE

Table 24. Local Food Production

Food Local Production (1000 MT)	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Arabia	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total
Wheat	2,656.73			9,788.38	0.04	2,645.00	40.72	0.06	140.00	200.00	3.45	8,064.90	2.53	26.32	0.03	739.04	1.06	192.00	2,024.33	912.36	192.92	27,629.87
Barley	1,030.56			121.64		3,297.00	44.67	5.45	33.00	95.00	1.43	3,393.78	2.31	22.80	0.58	22.00			600.10	359.24	27.97	9,057.53
Maize	2.79			6,038.69		289.00	20.48	48.00	3.00	3.44	93.98	97.38	15.76	0.10	1.73	80.00	95.00	43.00	260.00		65.33	7,157.68
Sorghum	2.67			720.29		65.00	20.06		0.48	6.00	19.17	4.80				169.59	132.19	2,608.00	1.85		414.45	4,164.55
Rice				4,817.96		1,092.00					221.78	33.05					2.00	28.00				6,194.79
Other Cereals	68.20	-	-	1,761.47	52.59	-	0.54	0.56	11.97	7.96	0.01	(4.80)	12.15	26.48	0.12	-	152.50	5.00	1,718.66	94.99	163.26	4,071.66
Roots & tubers	4,539.58	0.19		5,363.73	10.00	1,629.00	377.11	47.55	451.86	295.00	7.70	1,814.36	23.14	74.70	-	471.80	9.53	374.71	539.61	400.00	264.99	(5,207.96)
Potatoes	4,539.58	0.19		4,955.45	10.06	1,629.00	377.11	47.55	451.86	284.03	2.22	1,814.36	23.14	65.07	-	471.80		346.46	539.61	400.00	264.99	16,222.48
Sugar Crops				246.56		0.50			0.06			51.27	0.16				6.10	79.04	23.00	1.20		407.89
Raw Sugar				2,796.09		1.38			3.80			405.42					21.91	800.21	168.84			4,197.65
Pulses	87.00		3.00	255.00		6.00	23.00		11.00	9.00	56.00	297.00	2.00				43.00	212.00	215.00	59.00	95.77	1,373.77
Oil Seeds	423.74			1,096.73		74.92	201.89	0.07	113.89	205.42	0.96	1,257.41		122.59		4.75	102.45	1,329.30	521.49	1,707.08	38.67	7,201.36
Vegetable	12,469.33	10.53		15,373.38	133.99	3,159.00	3,427.37	232.21	858.04	785.85	57.50	5,151.58	404.11	478.07	58.08	1,813.30	71.94	2,676.66	1,996.72	3,003.72	730.92	52,892.30
Fruits	4,323.11	21.78		12,838.99	263.74	1,373.70	500.60	37.61	777.03	402.55	24.48	3,892.80	432.25	108.70	28.24	1,674.88	223.32	2,844.96	3,242.99	1,430.78	939.18	35,381.69
Dates	990.38	15.00		1,684.92	245.00	662.00	20.14	36.98		174.04	18.86	107.61	344.70	3.60	27.60	1,065.03		440.36	4.04	223.00	54.20	6,117.46
Fibers				191.79		18.00						1.66					1.99	162.00	670.00		18.12	1,063.56
Tobacco	8.80				0.27	2.01	1.81		10.51			2.01		1.42					15.50	1.24	23.09	66.66
Red Meat	256.80	16.40	11.41	797.49	6.74	236.13	21.41	45.39	139.02	164.24	232.85	387.14	23.49	9.55	13.64	130.74	201.88	974.99	250.62	117.60	99.32	4,136.85
Poultry Meat	512.20	6.55		1,319.00	50.00	74.00	275.00	46.19	100.80	120.00	4.66	610.00	65.50	57.00	8.50	576.00	3.60	55.00	100.00	219.70	132.00	4,335.70
Milk	3,895.00	10.40		5,598.48	153.71	315.84	261.22	56.71	268.88	232.10	395.00	2,410.00	79.46	217.91	116.44	1,722.42	1,053.90	6,312.86	2,452.25	1,247.00	300.00	27,099.58
Eggs	335.00	3.00		292.58	44.30	33.87	43.20	43.00	23.65	60.00	5.81	278.00	14.25	35.00	3.39	225.00	2.45	52.00	112.00	117.40	67.30	1,791.20
Green Fodders	402.96	0.58	-	811.19	4.85	105.85	27.41	3.93	3.18	88.03	-	440.16	33.27	15.21	6.99	132.99	-	108.22	86.98	57.43	166.63	2,495.85
Total	36,544.43	84.62	14.41	76,869.81	975.29	16,709.20	5,683.74	651.26	3,402.03	3,132.66	1,145.86	30,509.89	1,478.22	1,264.52	265.34	9,299.34	2,124.82	19,644.77	15,543.59	10,351.74	4,059.11	**217,852**

* AOAD (2016) / CEDARE

Table 25. Virtual Water Local Food Production

Virtual Water Local Product	Cubic meters/ t	Algeria	Bahrain	Djibouti	Egypt	Iraq	Jordan	Kuwait	Lebanon	Libya	Mauritania	Morocco	Oman	Palestine	Qatar	Saudia Ara	Somalia	Sudan	Syria	Tunisia	UAE	Yemen	Total	Total Impo
Wheat	1,334	3,544.08	-	-	13,057.70	0.05	3,528.43	54.32	0.08	186.76	266.80	4.60	10,758.58	3.38	35.11	0.04	985.88	1.41	256.13	2,700.46	1,217.09	257.36	36,858.25	36.86
Barley	1,910	1,968.37	-	-	232.33	-	6,297.27	85.32	10.41	63.03	181.45	2.73	6,482.12	4.41	43.55	1.11	42.02	-	-	1,146.19	686.15	53.42	17,299.88	17.30
Maize	909	2.54	-	-	5,489.17	-	262.70	18.62	43.63	2.73	3.13	85.43	88.52	14.33	0.09	1.57	72.72	86.36	39.09	236.34	-	59.38	6,506.33	6.51
Sorghum	1,910	5.10	-	-	1,375.75	-	124.15	38.31	-	0.92	11.46	36.61	9.17	-	-	-	323.92	252.48	4,981.28	3.53	-	791.60	7,954.29	7.95
Rice	2,291	-	-	-	11,037.95	-	2,501.77	-	-	-	-	508.10	75.72	-	-	-	-	4.58	64.15	-	-	-	14,192.26	14.19
Other Cereals	900	61.38	-	-	1,585.32	47.33	-	0.49	0.50	10.77	7.16	0.01	(4.32)	10.94	23.83	0.11	-	137.25	4.50	1,546.79	85.49	146.93	3,664.49	3.66
Roots & tubers	500	2,269.79	0.10	-	2,681.87	5.00	814.50	188.56	23.78	225.93	147.50	-	907.18	11.57	37.35	-	235.90	4.77	187.36	269.81	200.00	-	8,210.94	8.21
Potatoes	255	1,157.59	0.05	-	1,263.64	2.57	415.40	96.16	12.13	115.22	72.43	0.57	462.66	5.90	16.59	-	120.31	-	88.35	137.60	102.00	67.57	4,136.73	4.14
Sugar Crops	800	-	-	-	197.25	-	0.40	-	-	0.05	-	-	41.02	0.13	-	-	-	4.88	63.23	18.40	0.96	-	326.31	0.33
Raw Sugar	1,780	-	-	-	4,977.04	-	2.46	-	-	6.76	-	-	721.65	-	-	-	-	39.00	1,424.37	300.54	-	-	7,471.82	7.47
Pulses	1,754	152.60	-	5.26	447.27	-	10.52	40.34	-	19.29	15.79	98.22	520.94	3.51	-	-		75.42	371.85	377.11	103.49	167.98	2,409.59	2.41
Oil Seeds	2,400	1,016.98	-	-	2,632.15	-	179.81	484.54	0.17	273.34	493.01	2.30	3,017.78	-	294.22	-	11.40	245.88	3,190.32	1,251.58	4,096.99	92.81	17,283.26	17.28
Vegetable	195	2,431.52	2.05	-	2,997.81	26.13	616.01	668.34	45.28	167.32	153.24	11.21	1,004.56	78.80	93.22	11.33	353.59	14.03	521.95	389.36	585.73	142.53	10,314.00	10.31
Fruits	455	1,967.02	9.91	-	5,841.74	120.00	625.03	227.77	17.11	353.55	183.16	11.14	1,771.22	196.67	49.46	12.85	762.07	101.61	1,294.46	1,475.56	651.00	427.33	16,098.67	16.10
Dates	2,277	2,255.10	34.16		3,836.56		1,507.37	45.86	84.20	-		42.94	245.03	784.88	8.20	62.85		-	1,002.70	9.20	507.77	123.41	10,550.23	10.55
Fibers	1300	-	-		249.33		23.40	-	-	-		-	2.16	-	-	-		2.59	210.60	871.00	-	23.56	1,382.63	1.38
Tobacco	9,000	79.20	-	-	-	2.43	18.09	16.29	-	94.59	-	-	18.09	-	12.78	-	-	-	-	139.50	11.16	207.81	599.94	0.60
Red Meat	10,440	2,680.99	171.22	119.12	8,325.80	70.37	2,465.20	223.52	473.87	1,451.37	1,714.67	2,430.95	4,041.74	245.24	99.70	142.40	1,364.93	2,107.63	10,178.90	2,616.47	1,227.74	1,036.90	43,188.71	43.19
Poultry Meat	2046	1,047.96	13.40	-	2,698.67	102.30	151.40	562.65	94.50	206.24	245.52	9.53	1,248.06	134.01	116.62	17.39	1,178.50	7.37	112.53	204.60	449.51	270.07	8,870.84	8.87
Milk	3,600	14,022.00	37.44	-	20,154.53	553.36	1,137.02	940.39	204.16	967.97	835.56	1,422.00	8,676.00	286.06	784.48	419.18	6,200.71	3,794.04	22,726.30	8,828.10	4,489.20	1,080.00	97,558.49	97.56
Eggs	2700	904.50	8.10	-	789.97	119.61	91.45	116.64	116.10	63.86	162.00	15.69	750.60	38.48	94.50	9.15	607.50	6.62	140.40	302.40	316.98	181.71	4,836.24	4.84
Green Fodders	1,910	769.65	1.10	-	1,549.38	9.27	202.17	52.34	7.51	6.07	168.14	-	840.71	63.55	29.04	13.35	254.01	-	206.69	166.14	109.69	318.27	4,767.08	4.77
Total	Total in MCM	36,336.35	277.52	124.38	91,421.22	1,058.41	20,974.55	3,860.46	1,133.43	4,215.75	4,661.01	4,682.05	41,679.17	1,881.84	1,738.74	691.33	#######	6,885.90	47,065.14	#######	14,840.95	5,448.64	324,480.99	**324**
Total in BCM	Total in BCM	36.34	0.28	0.12	91.42	1.06	20.97	3.86	1.13	4.22	4.66	4.68	41.68	1.88	1.74	0.69	12.51	6.89	47.07	22.99	14.84	5.45	324	

* AOAD (2016) / CEDARE

Table 26. Calculation of Average Vegetable Oil Virtual Water

	Soybean Oil	Cotton Seed Oil	Groundnut Oil	Olive Oil	Sesame Oil	Maize Oil	Linseed Oil	Sunflower Oil	Margarine
Average Crop Yield of Oil Source (Kg/Ha)	2262	1360	1885	2413	1387	3661	1200	1365	
Oil Yield (Litre/Ha)	446	325	1059	1212	696	172	478	952	
Oil Density (Ton/Liter) or (gm/cm3)	0.92	0.92	0.93	0.93	0.92	0.91	0.90	0.90	
Virtual Water of Oil Source Crop/Seeds (m3/ton)	2400	2400	2782	3015	2400	909	2406	2407	5550
1/Oil Yield (Litre/Ha) * Average Yield of Crop (Kg/Ha)/1000*1/Density (gm/cm3) *1000*Virtual Water of Oil Source Crop (m3/ton)	13272	10952	5323	6456	5198	21260	6711	3834	5550
Average Virtual Water (m3/ton)									8,728

* Hoekstra, A.Y. (2010), AOAD (2016)

Table 27. Calculation of Water Users Associations Agricultural Land Coverage Indicator

Coutries	Withdrawals for Industrial Water Use		Total Agricultural Water Use		Industrial Water Productivity		Agricultural Water Productivity "Crop per Drop"		Physical Domestic Water Losses	
Units	BCM/Year		BCM/Year		$/CM		$/CM		BCM/Year	
	2012	2015	2012	2015	2012	2015	2012	2015	2012	2015
Algeria	0.65	0.65	21.00	21.93	153.92	91.23	0.87	0.90	0.77	0.77
Bahrain	0.02	0.03	0.16	0.15	720.24	384.75	0.53	0.63	0.05	0.05
Comoros	0.001	0.001	0.05	0.05	228.02	223.37	6.24	6.03	0.002	0.002
Djibouti	0.001	0.001	0.003	0.01	235.42	274.18	12.00	4.22	0.01	0.01
Egypt	4.00	5.40	59.41	61.51	21.06	22.57	0.49	0.59	2.30	1.90
Emirates	2.33	1.78	73.78	34.70	56.75	41.92	0.12	0.27	0.82	0.81
Iraq	0.03	0.04	0.54	0.80	241.04	258.59	1.56	1.73	0.08	0.10
Jordan	0.02	0.02	0.19	0.14	5739.12	2824.23	1.69	4.52	0.12	0.04
Kuwait	0.16	0.18	3.80	3.80	41.24	42.30	0.42	0.50	0.001	0.001
Lebanon	0.07	0.25	6.15	6.14	369.48	91.95	0.12	0.14	0.20	0.11
Libya	0.03	0.05	1.54	2.26	74.44	25.10	0.37	0.53	0.03	0.03
Mauritania	0.47	0.50	22.55	29.12	55.33	52.80	0.53	0.51	0.29	0.25
Morocco	0.04	0.04	1.38	1.58	1401.56	836.20	0.37	0.37	0.06	0.07
Oman	0.03	0.03	1.33	1.40	82.35	76.75	0.39	0.30	0.09	0.08
Palastine	0.01	0.01	0.26	0.28	17156.25	8864.95	0.67	0.94	0.04	0.04
Qatar	0.70	0.98	20.81	21.20	661.73	303.49	0.736	0.68	0.64	0.64
Saudi Arabia	0.003	0.003	5.26	31.14	508.46	481.94	0.16	0.03	0.01	0.01
Somalia	0.11	0.13	44.60	74.84	19.87	15.49	0.51	0.34	0.09	0.06
Sudan	0.75	0.72	28.88	30.89	24.08	35.22	0.42	0.40	0.63	0.52
Syria	0.09	0.17	7.67	8.87	148.35	65.24	0.51	0.34	0.09	0.09
Tunisia	0.14	0.12	6.99	4.02	1504.66	1355.63	0.37	0.67	0.30	0.27
Yamen	0.08	0.08	4.75	5.80	212.10	205.72	1.00	0.88	0.06	0.06

*Industrial GDP, (World Bank Database) and Agricultural GDP, (AOAD (2016))

Table 28. Number of Riparians Sharing all Shared Water Bodies in Western Asia

Coutries	Number of Riparians Sharing all Shared Water Bodies	Notes
Bahrain	2	(2) Qatar, Saudi Arabia
Iraq	19	(6), Jordan (2), Syria (4), Saudi Arabia (5), Turkey (3), Iran (3), Kuwait (2)
Jordan	16	(7), Lebanon (1), Syria (6), Saudi Arabia (3), Turkey (1), Palestine (1), Iraq (2), Israel (1)
Kuwait	4	(2), Iraq (2), Saudi Arabia (2)
Lebanon	9	(5), Palestine (1), Syria (4), Jordan (1), Turkey (1), Israel (2)
Oman	3	(3), Saudi Arabia (1), United Arab Emirates (1), Yemen (1)
Palestine	10	(5), Lebanon (1), Jordan (1), Syria (1), Egypt (2), Israel (5)
Qatar	2	(2), Bahrain (1), Saudi Arabia (1)
Saudi Arabia	17	(9), Iraq (4), Jordan (3), Yemen (3), Kuwait (2), Qatar (1), Bahrain (1), Oman (1), United Arab Emirates (1), Syria (1)
Syria	24	(8), Jordan (6), Turkey (5), Iraq (4), Lebanon (4), Sauid Arabia (2), Iran (1), Israel (1), Palestine (1)
UAE	3	(3), Saudi Arabia (1), Oman (1), Yemen (1)
Yemen	5	(3), Saudi Arabia (3), United Arab Emirates (1), Oman (1)

*UN-ESCWA and et al (2013)

Table 29. Number of Shared Water Resources Bodies in Western Asia

Coutries	Number of Shared Water Resources Bodies	Notes
Bahrain	1	Umm er Radhuma-Dammam Aquifer: Gulf (G)
Iraq	9	Euphartes (S), Tigris (S), Shatt al Arab (S), Widyan-Salman (G), Dibdibba (G), Jezira (G), Taurus-Zagros (G), Sakaka-Rutba (G), Ga'ara (G)
Jordan	8	Euphartes (S), Jordan (S), Wadi-Sirhan (G), Central Hammad (G), Azraq-Dhuleil (G), Yarmouk (G), Ga'ara (G), Saq-Ram (G)
Kuwait	2	Widyan-Salman (G), Dibdibba (G)
Lebanon	5	Jordan (S), Orontes (S), Nahr el Kabir (S), Western Galilee (G), Anti-Lebanon (G)
Oman	1	Rub' al Khali (G)
Palestine	5	Jordan (S), Coastal (G), Eastern (G), North-Eastern (G), Western (G)
Qatar	1	Umm er Radhuma-Dammam Aquifer: Gulf
Saudi Arabia	9	Widyan-Salman (G), Umm er Radhuma-Dammam Aquifer: Gulf (G), Rub' al Khali (G), Dibdibba (G), Wadi Sirhan (G), Sakaka-Rutba (G), Tawila-Mahra (G), Saq-Ram (G), Wajid (G)
Syria	13	Euphrates (S), Tigirs (S), Jordan (S), Orontes (S), Nahr el Kabir (S), Qweik (S), Jezira (G), Central Hammad (G), Azraq-Dhuleil (G), Yarmouk (G), Jezira Tertiary Limestone (G), Anit-Lebanon (G), Ga'ara (G)
UAE	1	Rub' al Khali (G)
Yemen	3	Rub' al Khali (G), Tawila-Mahra (G), Wajid (G)

*UN-ESCWA and et al (2013)

Table 30. Shared Waters Related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms in Western Asia

Coutries	Shared Waters Related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms	Notes
Bahrain	0	
Iraq	5 (S)	2 Agreements over the Euphartes - 3 Agreements over the Tigris
Jordan	5, 1 (G), 4 (S)	Agreement wit Syria over the Yarmouk Basin (1987) -3 Agreements over the Jordan River - 1 Agreement on the Yarmouk River
Kuwait	0	
Lebanon	3 (S)	1 Agreements over the Jordan River - 1 Bilateral Agreements on the Orontes River Basin - 1 Treaty over Nahr el Kabir river with Syria in 1992
Oman	0	
Palestine	2, 1 (G), 1 (S)	1 Bilateral Agreements with Israel over the Western Aquifer Basin - 1 Agreements over the Jordan River
Qatar	0	
Saudi Arabia	1 (G)	Bilateral Agreement with Jordan over the Saq-Ram Basin (2007)
Syria	9 (S)	2 Agreements over the Euphartes- 2 Agreements over the Tigris - 1 Agreements over the Jordan River - 2 Bilateral Agreements on the Orontes River Basin - 1 Treaty over Nahr el Kabir river with Lebanon in 1992 - 1 Agreement with Turkey in 1921 (under the French mandate) over the Qweik river basin
UAE	0	
Yemen	0	

*UN-ESCWA and et al (2013)

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