MEWINA

مشروع التقييم والمتابعة لقطاع المياه بدول شمال أفريقيا

Monitoring and Evaluation for Water In North Africa

CEDARE

African Water Facility
Facilité africaine de l'eau

Mobilising Resources for Water in Africa

Tunisia 2012 State of the Water Report

Tunisia 2012 State of the Water Report

MEWINA
مشروع التقييم والمتابعة لقطاع المياه بدول شمال أفريقيا
Monitoring and Evaluation for Water In North Africa

CEDARE
سيدارى

N-AMCOW

African Water Facility
Facilité africaine de l'eau
Mobilising Resources for Water in Africa

Donor: African Water Facility/African Development Bank
Grant Recipient: CEDARE
AWF Grant Agreement No.: 5600155002351
Project ID No.: P-Z1-EAZ-027
Document Name: Tunisia 2012 State of the Water Report
Document Type: National Report
Version: English, Final Version (V2)
Countries: Tunisia
Region: North Africa
Main Author: Mekki Hamza, Ph.D., Tunisia National Project Management Unit (NPMU)
Contributors: Moncef Rekaya, Habib Chaieb, Lotfi Nacef, National Task Force, Tunisia NPMU
Supervision & Review: Khaled AbuZeid, Ph.D., P.E.; Mohamed Elrawady, M.Sc., CEDARE
Design & Layout: Eng. Tamer El-Hakim
Document Date: November, 2014

For reference purposes, this publication should be referred to as:
Tunisia MAWRF, CEDARE, Hamza, M. (2014), "Tunisia 2012 State of the Water Report", Monitoring & Evaluation for Water In North Africa (MEWINA) Project, Ministry of Agriculture, Water Resources & Fisheries (MAWRF) - Tunisia, Water Resources Management Program - CEDARE.

National Task Force

Abderrahman Ouasli	Office of Planning and Hydraulic Equilibriums (BPEH)/ Agriculture
Samy Sellami	National Water Distribution Utility (SONEDE)/ Agriculture
Fahmi Ben Abdeljaoued	Directorate of Urban Hydraulic (DHU)/ Processing
Habib Omrane	National Sanitation Utility (ONAS)/ Environment
Jamel Chellouf	Directorate of Milieu Hygiene and Environmental Protection (DHMPE)/ Health
Karim Salah	National Institute of Statistics (INS)/ Development
Mohamed Nouira	General Authority of the State Budget Disposal (CGABE)/ Financial
Hatem Baccour	National Institute of Meteorology (INM)/ Transportation
Abdelghani Darghouthi	Tunisian Company of Electricity and Gas (STEG)/ Industry and Energy
Hichem Khelfa	General Directorate of Foreign Trade (DGCE)/ Trade and Handicrafts
Henda Mnacer Ben Hassine	General Directorate of Water Resources (DGRE)/ Agriculture

Contents

List of Tables

List of Figures

Photos

List of Abbreviations and Acronyms

AfDB:	African Development Bank
AMCOW:	African Ministers' Council On Water
ANGED:	Agence Nationale de Gestion des Déchets
ANPE:	Agence Nationale de Protection de l'Environnement
AUE:	Association d'Usagers de l'Eau
AWC:	Arab Water Council
BAD:	Banque Africaine de Développement
BCM:	Billion Cubic Meters
BIRD:	Banque Internationale de Reconstruction et de Développement
BIRH:	Bureau de l'Inventaire et des Recherches Hydrauliques
BPEH:	Bureau de Planification et des Equilibres Hydrauliques
CEDARE:	Center for Environment & Development for the Arab Region & Europe
CGABE:	Comité Général de l'Administration du Budget de l'Etat
CITET:	Centre International des Technologies de l'Environnement
CM:	Cubic Meters
COPEAU:	Contrôle de la Pollution des Eaux
CRDA:	Commissariat Régional au Développement Agricole
DGACTA:	Direction Générale d'Aménagement et de Conservation des Terres Agricoles
DGBGTH:	Direction Générale des Barrages et des Grands Travaux Hydrauliques
DGCE:	Direction Générale du Commerce Extérieur
DGDD:	Direction Générale du Développement Durable
DGEDA:	Direction Générale des Etudes et du Développement Agricole
DGEQV:	Direction Générale de l'Environnement et de la Qualité de la Vie
DGGREE:	Direction Générale du Génie Rural et de l'Exploitation des Eaux
DGRE:	Direction Générale des Ressources en Eau
DHMPE:	Direction de l'Hygiène du Milieu et de la Protection de l'Environnement
DHU:	Direction de l'Hydraulique Urbaine
EMWIS:	Euro-Mediterranean Water Information System

EUT:	Eaux Usées Traitées
FAE:	Facilité Africaine de l'Eau
FAO:	Food and Agriculture Organization of the United Nations
GDA:	Groupement de Développement Agricole
GIS:	Geographic Information System
GR:	Génie rural
GWh:	Gigawatts/hour
GWP:	Global Water Partnership
INM:	Institut National de la Météorologie
INRGREF:	Institut National de Recherche en Génie Rural, Eaux et Forêts
INS:	Institut National de la Statistique
IWRM:	Integrated Water Resources Management
JMP:	Joint Monitoring Program for water supply and sanitation, dirigé par OMS/UNICEF
MCM:	Million Cubic Meters
M&E:	Monitoring and Evaluation
M&E&R:	Monitoring , Evaluation and Reporting
MARH:	Ministère de l'Agriculture et des Ressources Hydrauliques
MDGs:	Millennium Development Goals
MEWINA:	Monitoring & Evaluation for Water In North Africa
Mm3/Year:	Million cubic meters per year
MW:	Megawatt
NA:	Not Available
N-AMCOW:	Northern Region of the African Ministerial Council on Water
NT:	Norme Tunisienne
NWSAS:	North Western Sahara Aquifer System
OMD:	Objectifs du Millénaire pour le Développement
OMS:	Organisation Mondiale de la Santé
ONAS:	Office National de l'Assainissement
ONG:	Organisation non gouvernementale

OSS: Observatoire du Sahara et du Sahel

OTEDD: Observatoire Tunisien de l'Environnement et du Développement Durable

OTH: Office du Thermalisme et d'Hydrothérapie

PIB: Produit Intérieur Brut

PISEAU: Projet d'Investissement dans le Secteur de l'Eau

PNEE: Programme National d'Economie d'Eau

PNUD: Programme des Nations Unies pour le Développement

RAR: Rapid Assessment Report

RWSS: Rural Water Supply and Sanitation

SAEP: Système d'Alimentation en Eau Potable

SASS: Système Aquifère du Sahara Septentrional

SECADENORD: Société d'Exploitation du Canal et des Adductions des Eaux du Nord.

SEMIDE: Système Euro-méditerranéen d'Information de l'Eau

SINEAU: Système d'information National sur l'Eau

SISOLS: Système d'Information sur les Sols

SONEDE: Société Nationale d'Exploitation et de Distribution des Eaux

SOW: State Of the Water

STEG: Société Tunisienne d'Electricité et du gaz

SYCOHTRAC: Système de Collecte des Mesures Hydrologiques en Temps Réels et Annonce des Crues

SYGREAU: Système de Gestion des Ressources en Eau

TDN: Tunisian Dinar

UNESCO: United Nations Education, Science and Culture Organization

UWSS: Urban Water Supply and Sanitation

WSS: Water Supply and Sanitation

WWTP: Waste Water Treatment Plant

1. Introduction

This report is conducted in the framework of MEWINA project in execution of the component relating to the standardization and harmonization of national systems with those of N-AMCOW and the development of a sustainable mechanism for monitoring, evaluation and reporting.

After the development of a minimum set of indicators, standards and criteria; of a framework and operational guidelines of the state of the national water monitoring and evaluation, and after the compilation of existing data and information on the monitoring and evaluation of the water sector and sanitation; it is important to continue the process and prepare the National Baseline Report State of the water for the country. This methodological guideline will not only monitor progress and performances achieved in the country to meet the objectives of national, regional and global targets in the water and sanitation sector, but also will prepare Baseline State of the Water Report in the N- AMCOW region.

Although efforts have been made in the country for the reporting of monitoring and evaluation of water sector, this National Baseline State of the Water Report proposes to bring together existing indicators, process, and integrate the most useful and the most relevant of them with the SOW indicators harmonized regionally by the MEWINA project, to stop a new set of indicators to be regularly monitored and evaluated in the country in harmony with the SOW indicators in N-AMCOW region.

The first part focused on nationally set water related targets in Tunisia, as well as continental and global targets that have been adopted. The current standings towards achieving all targets were mentioned. In addition, values were assigned for the target indicators presented.

The second part presents the full list of indicators used in the report and all indicators belong to one of the agreed indicator categories, during the MEWINA Water M&E Rapid Assessment Regional Validation Workshop held in Cairo on October 27th-29th 2013. Definitions, methodologies of calculation and reporting, institutions in charge of measuring and/or estimating indicator, and source of data were outlined in this section as well.

The following section consists of a data sheet indicating the values assigned to each indicator, for the year 2012, along with the units of measurement, the measurement year, the source, and any remarks.

Then, an overall analysis of the national state of the water is provided and an inventory of available historical data for some indicators and observed trends is given.

Finally the last part recommends policy reforms to enhance the state of the water Reporting process in general.

Figure 1. Tunisia Location Map

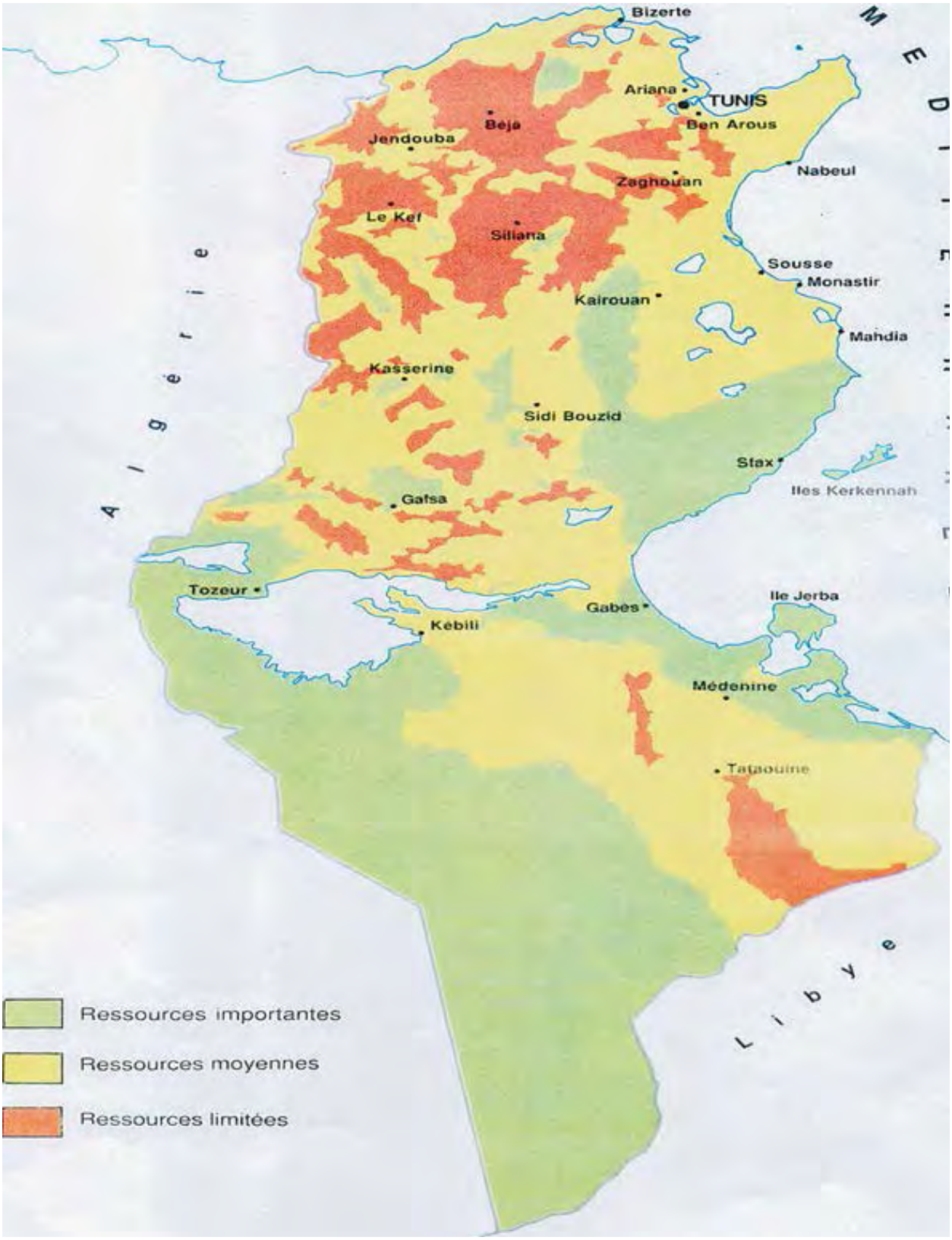


Figure 2. Tunisia Water Resources Map

2. National, Continental, and Global Targets

2.1. Tunisia National Water Targets

Table 1. Summary table of water program (Budget Management by Objective BMO), with its objectives, indicators and targets for 2016

Objective	Indicator	Target	Definition	Methodology of Calculation
Mobilization of water resources	1-Storage capacity of large dams	1-Achieve a capacity of 2438 Mm^3/year in 2016 (Start date: 2010, Start volume: 2077 Mm^3)	Total storage volume of fresh water natural lakes and reservoirs created by large dams	Technical design data drawings for manmade reservoirs; hydrographic surveys and bathymetric maps in case of natural lakes
	2-Capacity North Water Transfer	2- Achieve transferred volumes of 800 Mm^3/year in 2016 (Start date:2010, Start volume: 700 Mm^3)	Total transfer capacity of North water network	Technical design data drawings for pumping stations, manmade reservoirs; hydrographic surveys and networks.
	3- Mobilization of Surface Water	3- Achieve mobilized volumes of 2355 Mm^3/year in 2016 (Start date: 2010, Start volume:2144 Mm^3)	Total annual volumes mobilized by all dams relative to the potential of surface water that can be technically mobilized	Total annual volumes mobilized by all dams / Potential of surface water that can be technically mobilized that is 2,5 billions m^3 /year
	4- Exploitation of groundwater	4- Achieve exploited volumes of 2262 Mm^3/year in 2016 (Start date: 2010, Start volume:2121 Mm^3)	Total annual volumes abstracted from groundwater sources and wells including non renewable resources per year	Total annual volumes abstracted from groundwater sources and wells including non renewable resources per year. Field surveys or estimation using well licenses and irrigation permissions.
Saving water and reducing losses	5-Equipment of irrigable areas by water saving equipment	5- Achieve an equipment rate of 93 % in 2016 (Start date: 2010, Start rate: 86 %)	Total area equipped with sprinklers, drip irrigation, localized irrigation concreted seguias/ Total irrigable area.	Total area equipped with sprinklers, drip irrigation, localized irrigation concreted seguias (ha)/ Total irrigable area (ha).
	6- Coverage of operating and maintenance costs of irrigation systems and rural drinking water supply	6- Achieve a coverage rate of 90 % for rural drinking water supply and 83% for irrigation systems in 2016 (Start date: 2010, Start rate: 83 % for DWS) (Start date: 2010, Start rate: 60 % for IS)	Operating and maintenance costs paid by users/Actual operating and maintenance costs	Operating and maintenance costs paid by users/Actual operating and maintenance costs for rural drinking water supply (TDN) Operating and maintenance costs paid by users/Actual operating and maintenance costs for irrigation systems (TDN)

	7- Renovation of networks, rehabilitation and development of irrigation	7- Development and operation input of 11 000 ha obsolete irrigated area in 2016 (Start date: 2013, Start OIA: 4000 ha)	Modernization of irrigation networks, and rehabilitation & development of irrigated land	Surface of obsolete irrigated area, modernized, rehabilitated and back in operation (ha)
	8- Improving the efficiency of irrigation systems on farms	8- Achieve efficiency rate of 78% in 2016 (Start date: 2010, Start rate: 76 %)	Amounts of water distributed in head parcel of the farm, less losses in the farm network in comparison to total amounts of water distributed in head parcel.	(Amounts of water distributed in head parcel - losses in the farm network)/ Total amounts of water distributed in head parcel of the farm.
Rural water supply	9- Drinking water supply in rural areas	9- Achieve coverage rate of 98% in 2016 (Start date: 2010, Start rate: 93,5%)	Percentage of population provided with piped or improved drinking- water source in rural areas	Population provided with piped or improved drinking- water source in rural areas / Total population in rural areas.
Preservation and sustainable water resources management	10- Annual rate of aquifers artificial recharge	10- Achieve an injection volume of 27,2 Mm^3 per year in 2016 (Start date: 2012, Start rate: 16,8 %)	Volume of injected water actually reaching the saturated zone/Total volume of water from different sources, injected into overexploited aquifers, accusing a piezometric decline.	Volume of injected water actually reaching the saturated zone/Total volume of water injected into overexploited aquifers.
	11- Quantities of treated wastewater reused in agricultural irrigation	11- Achieve a volume of 22 Mm^3/ year 2016 (Start date: 2010, Start volume:16 Mm^3)	Quantity of treated wastewater from WWTP that is reused in a given year in agricultural irrigation	Quantity of treated wastewater from WWTP that is reused in a given year in agricultural irrigation

The table above presents the state of water target indicators program of the Ministry of Agriculture (in charge of water) with the objectives, targets, definitions and methods of calculation. This program includes 11 target indicators, among which 9 indicators have been incorporated and retained in the **New National SOW set of indicators.** The remaining target indicators are not relevant and scalable and have not been selected with the SOW indicators. The retained target indicators are presented in the following table:

Table 2. Target indicators, value, state, and possible reasons for deterioration or improvement

Indicator Category	Indicator	Target	Value for target indicator			State of the indicator	Possible reasons for deterioration or improvement
			2010	2011	2012		
Water & Availability (Blue Water)	3-Mobilization of Surface Water	Achieve mobilized volumes of 2355 Mm^3/year in 2016	2144	2144	2188	Improvement	Achievement of new dams
Water & Availability (Non Conventional Water)	11-Treated wastewater reused in agricultural irrigation	Achieve a volume of 22 Mm^3/year 2016	16	17	17	Stable	Farmers unwillingness

Water & Consumption	4-Withdrawals from Blue Groundwater	Achieve exploited volumes of 2262 Mm^3/year in 2016	2121	2147	2172	Slight improvement	-New permits -New shallow and deep wells
	8-Improving the efficiency of irrigation systems on farms	Achieve efficiency rate of 78% in 2016	76	76	77	Slight improvement	-
	5-Equipment of irrigable areas by water saving equipment	Achieve an equipment rate of 93 % in 2016	86	86	88	Slight increase	-
Water & Finance	6- Coverage of operating and maintenance costs of irrigation systems and rural drinking water supply	Achieve a coverage rate of 90 % for rural drinking water supply in 2016	83	83	66	Deterioration	Revolution
		Achieve a coverage rate of 83% for irrigation systems in 2016	60	60	64	Slight increase	-
Water & services (Water Coverage and Accessibility)	9-Rural Water Supply Coverage	Achieve a coverage rate of 98% in 2016	93.5	95.4	96.2	Improvement	Achievement of new rural drinking water supply systems (RDWSS)
Water & services (Water Infrastructure)	1-Dams capacity	Achieve a capacity of 2438 Mm^3/year in 2016	2077	2077	2152	Improvement	Achievement of new dams
	2-Transfer Capacity of Water resources (Northern waters)	Achieve transferred volumes of 800 Mm^3/year in 2016	700	700	700	Stable	-

2.2. African Water & Sanitation Targets

African Ministers' council on water (AMCOW): the pan African Water and Sanitation Monitoring, Evaluation and Reporting Format: (7 themes, 25 Performance Categories, and about 15 Indicators for preparing the 2013 report to African Union Assembly on implementing Water and Sanitation Goals in Africa).

Table 3. African Water and Sanitation M&E, & Reporting: indicator, target, value, state and possible reasons for deterioration or improvement

Themes	Performance Category	Indicator	Performance Target	Value for target indicator (2013)	State of the indicator	Possible reasons for deterioration or improvement
1.Water Infrastructure for Economic Growth	1. Water for Energy	Hydropower utilization	Increase by 10% between 2000 and 2015	Rate of increase : ٪٠ in 2013	Stable Target will not be achieved in 2015	The economically feasible hydropower potential and the installed hydroelectric capacity have not changed since several years.

	2. Water for Agriculture	Water productivity	Increase WP by 30% from 2000 to 2015	Rate of increase: +71.3% in 2013	Improvement Target will be achieved in 2015	-Improving water management and mastering modern techniques of irrigation and water saving.
		Rain fed Agriculture & Irrigation	Increase IA by 50% from 2000 to 2015	+59.1 % in 2013	Target will be achieved in 2015	-Improving water management and mastering modern techniques of irrigation and water saving.
	3. Water for Multiple Uses	Water Demand Satisfaction Index	Increase by 10% from 2000 to 2015	+18.2 % in 2013	Fluctuation from year to year	Target is met but is highly controlled by the fluctuation in green water
2.Management and Protection of Water Resources	4. Transboundary basins and Water Resources Management	Existence of a Management Plan for Effective Water or IWRM Plan	Existence of a Management Plan for Effective Water or IWRM Plan by 2015	There is no stated plan for IWRM, however the main institutions in charge of water work separately for the promotion of IWRM.	Slight improvement	-
	7. Rainwater	Share of rainwater use in total municipal water consumption	Increase up to 10% by 2015	+1.6 % in 2013	Weak or absent performance	Institutional gap
3.Achieving the Water and Sanitation MDGs	8. Urban Water Supply	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 100 % in 2013	Improvement Target achieved	-
	9. Urban Sanitation	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 83.3 % in 2013	Improvement Target will be achieved in 2015	-
	10. Rural Water Supply	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 90.0 % in 2013	Improvement Target will be achieved in 2015	-
	11. Rural Sanitation and Hygiene	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 71.9% in 2013	Improvement	Institutional gap
4.Global Changes and Risks Management	12. Adaptation to Climate Change	Existence Climate Change Adaptation Strategy	Develop and implement , at least 1 CC Adaptation Strategy per country by 2015	1 CC Adaptation Strategy in 2013	Improvement	Strategy adopted
	13. Water-related Hazards	Existence of Early warning System for disaster prevention	Establish at least 1 EW System at national level by 2015	Under preparation	-	-

5. Governance and Management	14. Institutional arrangements	Reform response to good governance principles	Updated Reform available and implemented by 2015	Specific actions taken so far	Improvement	-Restructuring of BPHE, Revision of the Water Code, Establishment of the National Water Council, etc.
	17. Right to water	Reform response to criteria for human right to water and sanitation	Updated Reform available and implemented by 2015	Updated Reform available in 2014	Improvement	Water Rights in the new constitution (Article 44) (2014)
6. Financing	19. Financing water and Sanitation	% of GDP to hygiene and sanitation (resp.% of national budget to watsan)	Allocate at least 0.5 % of GDP to hygiene and sanitation (resp. 5% of national budget for watsan)	Allocate 0.13 % of GDP to hygiene and sanitation in 2013 (resp.1.8 % of national budget for watsan)	Weak or absent performance	Need to bring the percentage to 0.5 % of GDP on hygiene and sanitation and to 5 % the percentage of national budget for water and sanitation
7. Education	23. Information	Existence of M&E Systems in line with the pan African M&E System	-	-	Not yet	-

(Full template show in annex)

Source: AMCOW pan African Water and Sanitation Monitoring, Evaluation and Reporting Format: Tunisia Background Information Sheet, Tunisia Water and Sanitation Performances Evaluation Sheet. N-MEWINA project. Mekki HAMZA. June 2014.

Among these 7 themes, 15 Performance Categories, and 16 target indicators enable monitoring and evaluation of performances to achieve the 2015 targets. Most of these target indicators were included in the New National SOW set of indicators for Tunisia.

2.3. Global Water Targets

Achievement of MDGs:

Goal 7: Ensure Sustainable Development

TARGET 7C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and to basic sanitation services

Monitoring Indicators of Achieved Progress:

Indicator 1: Proportion of population using an improved drinking water source

Indicator 2: Proportion of population using improved sanitation facilities

Table 4. Millennium Development Goals: indicator, target, value, state and possible reasons for deterioration or improvement

Themes	Performance Category	Indicator	Performance Target	Value for target indicator	State of the indicator	Possible reasons for deterioration or improvement
Achieving the Water and Sanitation MDGs	8. Urban Water Supply	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 100 % in 2013	Improvement Target achieved	-
	9. Urban Sanitation	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 83.3 % in 2013	Improvement Target achieved	-
	10. Rural Water Supply	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 90.0 % in 2013	Improvement Target achieved	-
	11. Rural Sanitation and Hygiene	% of people without access	Reduce by 50% from 1990 to 2015	Reduce by 71.9% in 2013	Improvement Target achieved	Institutional gap

These target indicators are monitored and evaluated to measure simultaneously the achieved progress to reach both continental and global targets.

2.4. Summary of National, Pan African and Global Indicators Monitored and Evaluated in Tunisia

Table 5. Summary of national, pan African and global indicators monitored and evaluated in Tunisia

Indicator Category / Performance Category	Indicator	Definition/ Explanation	Type of target
Water & Availability (Blue Water)	1-Mobilization of Surface Water	Total annual volumes mobilized by all dams relative to the potential of surface water that can be technically mobilized	National Water Targets (9 indicators)
Water & Availability (Non Conventional Water)	2-Treated wastewater reused in agricultural irrigation	Quantity of treated wastewater from WWTP that is reused in a given year in agricultural irrigation	
Water & Consumption	3-Withdrawals from Blue Groundwater	Total annual volumes abstracted from groundwater sources and wells including non renewable resources per year	
	4-Improving the efficiency of irrigation systems on farms	Amounts of water distributed in head parcel of the farm, less losses in the farm network in comparison to total amounts of water distributed in head parcel.	
	5-Equipment of irrigable areas by water saving equipment	Total area equipped with sprinklers, drip irrigation, localized irrigation concreted seguias/ Total irrigable area.	
Water & Finance	6- Coverage of operating and maintenance costs of irrigation systems and rural drinking water supply	Operating and maintenance costs paid by users/Actual operating and maintenance costs	
Water & services (Water Coverage and Accessibility)	7-Rural Water Supply Coverage	Percentage of population provided with piped or improved drinking- water source in rural areas	

Water & services (Water and Infrastructure)	8-Dams capacity	Total storage volume of fresh water natural lakes and reservoirs created by large dams	
	9-Transfer Capacity of Water resources (Northern waters)	Total transfer capacity of North water network	
1. Water for Energy	1-Hydropower utilization -Rate of increase in hydropower utilisation Index (RiHpul).	The hydropower utilisation Index (**Hpul**) is the fraction of economically feasible hydropower potential that can be genererated by the installed Hydropower Plants. The Index can be improved when the country increases the capacity or the number of its hydropower plants. For a given year, the Rate of increase in hydropower utilisation Index is the change (in %) in its value of the year 2000.	African Water & Sanitation Targets (16 indicators)
2. Water for Agriculture	2-Water productivity - Rate of increase in Water productivity (RiWp).	The Water productivity (**Wp**) measures the contribution of water to the economy (i.e. the US $ produced per a cubic meter of water used in crop production). The rate of increase in water productivity (**RiWP**) is the change (in %) in its value of the year 2000.	
	3--Rain fed Agriculture & Irrigation -Rate of increase of irrigated areas (**RiIA**).	The Irrigated areas (**IA**) is the total area equiped for irrigation. The rate of increase of irrigated areas (**RiIA**) is the change (%) in its value in 2000.	
3. Water for Multiple Uses	4-Water Demand Satisfaction Index -Rate of increase of Water Demand Satisfaction Index (**RiWDSI**)	The Water Demand Satisfaction Index (**WDSI**) is the level at which the total country water demand is satisfied. For a given year, the Rate of increase the Water Demand Satisfaction Index (**RiWDSI**) is (in %) the incremental value of the WDSI from its 2000 value. This incremental value reflects country efforts to mobilize conventional and nonconventional water resources to satisfy demand in all sectors.	
4. Transboundary basins and Water Resources Management	5-Existence of a Management Plan for Effective Water or IWRM Plan - Water efficiency Plan	A national strategy that identifies the priority steps that must be taken to reform the water management system to meet IWRM principles. It may suggest changes to national policy, the legislative framework, financing structure, organizational framework, and a range of management tools. It should set out a sequence of actions over a specific time frame to transform existing practices to more sustainable ones *(GWP definition).* This strategy might also be called IWRM Plan or any other name, and must provide clear overview of *: (i) the Policy and legal environment, (ii) the institutional arrangements, (iii) the financing structure, and (iv) the Management tools* , of the national water resources management.	

7. Rainwater	6-Share of rainwater use in total municipal water consumption - Percentage of rainwater use in total municipal water consumption (**pRu**).	Roof-collected rainwater can be used for a range of purposes to complement the municipal water supplies. The uses include personal washing, toilet flushing, laundry, use, surface and equipment washing, topping up spas and pools, garden irrigation, cooling and heating, and many industrial processes. It is not recommended that rainwater is used for drinking or food preparation in areas where a reticulated drinking water supply is provided, as the quality of rainwater is not as reliable as urban drinking water supplies. The total amount of rainwater used in the country by businesses, community groups, sporting clubs and residential developments, to supplement their water supply, constitutes with the total municipal water supply and other uses, the total municipal water consumption by the country.	
8. Urban Water Supply	7-% of people without access - Rate of Water Inacessibilty reduction (**IRwat**)	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the urban population without improved drinking water source.	
9. Urban Sanitation	8-% of people without access - Rate of Sanitation and Hygiene Inacessibilty reduction (**IRsan**)	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the urban population without improved sanitation facility.	
10. Rural Water Supply	9-% of people without access -Rate of Water Inacessibilty reduction (**IRwat**)	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the rural population without improved drinking water source.	
11. Rural Sanitation and Hygiene	10-% of people without access - Rate of Sanitation and Hygiene Inacessibilty reduction (**IRsan**)	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the rural population without improved sanitation facility.	
12. Adaptation to Climate Change	11-Existence Climate Change Adaptation Strategy - Climate Change Adaptation Strategy.	The Strategy is an official policy document developed by the country for climate change resilience.	
13. Water- related Hazards	12-Existence of Early warning System for disaster prevention - Early warning system for disaster prevention at national level.	The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss. Warning systems need to span all steps from hazard detection through to community response. *(Definition of the United Nations International strategy for disaster reduction, UNISDR)*	

14. Institutional arrangements	13-Reform response to good governance principles - Water sector policy that reflects good governance principles.	The range of political, social, economic, and administrative systems that are in place to regulate the development and management of water resources and provision of water services at different levels of society *(Definition of UNESCO/UNDESA)*	
17. Right to water	14-Reform response to criteria for human right to water and sanitation	Need to improve water sector policy & reform that promotes human rights to water and sanitation	
19. Financing water and Sanitation	15-% of GDP to hygiene and sanitation (resp.% of national budget to watsan)	-	
	- Percentage of GDP to Sanitation and Hygiene (gdpSH).	Share of the national GDP allocated to sanitation and hygiene.	
	- Percentage of national Budget to Water and Sanitation (BdgWS).	Share of the national Budget allocated to Water and Sanitation.	
23. Information	16-Existence of M&E Systems in line with the pan African M&E System - Enhanced Water and Sanitation M&E System in line with the pan African M&E.	The on-going pan African M&E process that aims at establishing data management system (DMS) at AMCOW/AUC to track progress on the implementation of the Sharm El-Sheikh Commitments on Water and Sanitation, requires alignement of existing data management systems at country level, as well as RLBOs and RECs levels. Under this framework countries' water and sanitation M&E systems will be enhanced to be aligned with DMS at sub-regional and continental levels.	
8. Urban Water Supply	1-% of people without access - Rate of Water Inacessibilty reduction	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the urban population without improved drinking water source.	Global Water Targets (4 indicators)
9. Urban Sanitation	2-% of people without access - Rate of Sanitation and Hygiene Inacessibilty reduction	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the urban population without improved sanitation facility.	
10. Rural Water Supply	3-% of people without access - Rate of Water Inacessibilty reduction	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the rural population without improved drinking water source.	
11. Rural Sanitation and Hygiene	4-% of people without access - Rate of Sanitation and Hygiene Inacessibilty reduction	It is the rate by which the country has reduced, so far (from 1990 to date), the proportion of the rural population without improved sanitation facility.	
TOTAL	29 indicators	-	

4 indicators relating to Water Supply and Sanitation being counted twice, the selected indicators become

then 25 indicators.

All these indicators of national interest will be found in the list of SOW indicators harmonized regionally by the MEWINA project and/or in the additional specific indicators list of the country.

3. National State of the Water (SOW) Indicators

This section presents the full list of indicators used in the report with their definition, the methodology and the institutions in charge of measuring and/or estimating the indicator.

3.1. National & Country Specific SOW Indicators

Table 6. A set of National SOW indicators for Tunisia: Definition, Methodology, Institution and Source of data

Indicator Category	Indicator	Definition	Methodology to measure, estimate, and report value	Institution in charge	Source of data
4.1.1 Water & Availability	i-Annual Average Precipitation Depth	Average precipitation is the long-term average in depth (over space and time) of annual precipitation in the country (mm)	$R_A = \sum_{i=1}^{i=n} w_i R_i$ Thiessens Polygon method: $R_A = \frac{1}{A} \sum_{i=1}^{i=n} a_i R_i$	DGRE, INM	DGRE, INM
	ii-Annual Average Precipitation Volume	The long term average in volume (over space and time) of annual precipitation, it is the product of the annual Average Precipitation Depth and the Effective Rainfall area	Annual Average Precipitation Volume (depth* actual rainfall area) (BCM): it is the product of the Annual Average Precipitation Depth and the Effective Rainfall area (Not necessarily the area of the countries)	DGRE	DGRE
i)Blue Water	a)-Internal Renewable Surface Water (IRSW)	**IRSW:** is the amount of precipitation that is neither beneficially abstracted from the atmosphere, nor infiltrated in the ground, but flows overland and routed through channels or joins bigger water bodies.	Measured in gauging stations implemented across main rivers, watersheds and their tributaries.	DGRE, DGBGTH, CRDA	CRDA, DGRE, BPEH, DGACTA, DGBGTH
	b)-Internal Renewable Groundwater (IRG)	**IRG:** Groundwater Recharge is the total volume of water entering underground sources of water (typically aquifers) within a country's borders from endogenous (internal) precipitation and surface water flow (FAO)	If not measured, IRG can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation. Groundwater recharge from Surface water flows can either be estimated from observation wells or modeled through Surface-Groundwater Coupled models.	DGRE, CRDA	CRDA, DGRE

	c)-Total Internal Renewable Blue Water Resources (TIRBWR=IRSW+IRG)	**TIRBWR= (IRSW+IRG):** Long-term average 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)	(TIRBWR=IRSW+IRG)	DGRE, DGBGTH, CRDA	CRDA, DGRE, BPEH, DGACTA, DGBGTH
	d)- External Surface Water Inflow (ESWI)	**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), it also takes into account the quantity of flow protected by formal agreements or treaties, and therefore, it may vary with time. (Modified from FAO)	ESWI is measured in gauging stations located at the entrance of rivers across borders; it concerns surface inflows from upstream neighboring country.	DGRE, DGBGTH	CRDA, DGRE, BPEH, DGBGTH
	e)-External Surface Water Outflow (ESWO)	Long-term average annual quantity of surface water leaving the country	**External Surface Water Outflow (ESWO):** Long-term average annual quantity of Surface water leaving the country. No ESWO towards neighboring countries, but towards the sea in case of floods	DGRE, DGBGTH, CRDA	CRDA, DGRE, BPEH, DGBGTH
	f)-External Groundwater Inflow (EGI)	Long-term average annual quantity of groundwater annually entering the country, taking into consideration treaties (FAO)	**External Groundwater Inflow (EGI):** Long-term average annual quantity of groundwater annually entering the country, taking into consideration treaties (FAO). Estimated from piezometric maps, observation wells or modeled through Groundwater models.	DGRE, CRDA	CRDA, DGRE
	g)-External Groundwater Outflow (EGO)	Long-term average annual quantity of groundwater leaving the country (FAO)	**External Groundwater outflow (EGO) :** Long-term average annual quantity of groundwater leaving the country (FAO) Estimated from piezometric maps, observation wells or modeled through Groundwater models. No EGO towards neighboring countries, but towards the sea in case of coastal aquifers.	DGRE, CRDA	CRDA, DGRE
	h)-Total External Renewable Blue Water Resources Inflow (TERBWR)=(ESWI+EGI)	The portion of the country's renewable water resources which is not generated within the country (FAO)	(TERBWR)=(ESWI+EGI)	DGRE, DGBGTH, CRDA	CRDA, DGRE, DGBGTH, BPEH

	i)-Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESW I)-(ESWO)	Is the resultant of the internal produced surface water and the transboundary inflows and outflows of surface water	(TRBSW)=(IRSW)+(ESW I)-(ESWO)	DGRE, DGBGTH, CRDA	CRDA, DGRE, DGBGTH, DGACTA, BPEH
	j)- Total Renewable Blue Groundwater (TRBG)=(IRG)+(EG I)-(EGO)	Is the resultant of the internal produced groundwater and the transboundary inflows and outflows of groundwater	(TRBG)=(IRG)+(EG I)-(EGO)	DGRE, CRDA	CRDA, DGRE
	k)-Overlap between surface water and groundwater (OSWGW)	Part of the renewable freshwater resources that is common to both surface and groundwater. It is equal to groundwater drainage into rivers (typically base flow of rivers) minus seepage from rivers into aquifers. (FAO)	OSW= base flow of rivers minus seepage from rivers into aquifers. It is measured by gauging rivers that feed or drain aquifers.	DGRE, CRDA	CRDA, DGRE
	l)-Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWGW)	Is the sum of total renewable blue surface and groundwater excluding the overlap between them	(TRBWR)=(TRBSW)+(TRBG)-(OSW)	DGRE, DGBGTH, CRDA	CRDA, DGRE, DGBGTH, DGACTA, BPEH
	m)-Total Exploitable Non-Renewable Ground Water (TENRG)	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).	TNRGWR can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation, Satellite imagery. Groundwater recharge from Surface water flows can either be estimated from observation wells or modeled through Surface-Groundwater Coupled models. The TNRGWR extractable annually, according to a pre specified safe yield, is dictated by a pre specified sustainability period (x number of years).	DGRE, CRDA	CRDA, DGRE
	n) Total Blue Water Resources (TBWR)	Is the sum of Total Renewable Blue Water Resources (TRBWR) and Total Exploitable Non-Renewable Ground Water (TNRG)	TBWR=TRBWR+TNRGW	DGRE, CRDA	CRDA, DGRE
	o)-Mobilization of Surface Water (specific indicator)	Total annual volumes mobilized by all dams relative to the potential of surface water that can be technically mobilized	Total annual volumes mobilized by all dams / Potential of surface water that can be technically mobilized that is 2, 5 BCM /year.	DGBGTH, DGRE	DGBGTH

ii)Green Water	a)-Water for Rain-fed Agricultural Consumptions	The total amount of precipitation directly consumed by rain fed agriculture	-The Reference value is calculated as the ratio between irrigation abstractions and the area for the corresponding land use (R). -Alpha is a function of the prevailing aridity and the plant cover (an average value of 0.7 may be assumed for crops in temperate to arid regions) -The rainy period for the Natural vegetation land use is then identified (say 3 months, i.e. (0.25) year) -Average Vegetation abstractions = Area of Vegetation * (R) * (0.7) * (0.25) -Satellite imagery is currently more efficient	DGRE, DGGREE	CRDA, DGGREE, DGPA, DGE-DA, DGRE
	b)-Water for Rain-fed Pasture Consumptions	The total amount of precipitation directly consumed by pasture areas	-Average Vegetation abstractions = Area of Vegetation * (R) * (0.7) * (0.25) -Satellite imagery is currently more efficient	DGRE, DGGREE	CRDA, DGPA,OEP, DGEDA, DGGREE, DGRE
	c)-Water for Rain-fed Forest Consumptions	The total amount of precipitation directly consumed by forests	-Average Vegetation abstractions = Area of Vegetation * (R) * (0.7) * (0.25) -Satellite imagery is currently more efficient	DGRE, DGGREE	CRDA, DGPA, DGF, DGGREE, DGEDA, DGRE
	d)-Total Renewable Green Water Resources TRGWR = a+ b+ c	The total amount of precipitation directly consumed by rain fed agriculture, pasture and forests areas	TRGWR = a+ b+ c	DGRE, DGGREE	CRDA, DGPA, DGEDA, DG-GREE, OEP, DGF, DGRE
	e)- 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.	(TRWR)=(TRBWR+TRGWR)	DGRE, DGGREE	CRDA, DGPA, DGEDA, DG-GREE, OEP, DGF, DGRE
	f)- Total Conventional Water Resources (TCWR) = TRWR+TNRG = TBWR+TRGWR	Is the sum of Total Renewable Water Resources and Total Non Renewable Water Resources. Also it is the sum of Total Blue Water Resources and Total Renewable Green Water Resources.	(TCWR) = TRWR+TNRG = TBWR+TRGWR	DGRE, DGGREE	CRDA, DGPA, DGEDA, DG-GREE, OEP, DGF, DGRE
iii)Non-Conventional Water	a)-Produced Municipal and Industrial Wastewater (PMW)	Annual quantity of wastewater generated in the country, in other words, the quantity of water that has been polluted by adding waste	Non measured Estimated from municipal and industrial withdrawals	ONAS	ONAS
	b)- 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)	Measured quantity of generated municipal and industrial wastewater that is treated in a given year and discharged from treatment plants	ONAS	ONAS
	c)- Reused Treated Municipal and Industrial Wastewater	Quantity of treated wastewater that is reused in a given year	Measured quantity of treated wastewater that is reused in a given year	ONAS, DGGREE	ONAS, DGGREE, CRDA

	c bis)- Treated wastewater reused in agricultural irrigation	Total amount of treated wastewater from WWTP that is reused in a given year in agricultural irrigation	-Total volume of treated wastewater reused in a given year in agricultural irrigation (MCM/year) -% of the total amount of TWW produced by WWTP	DGGREE, ONAS	DGGREE, ONAS
	d)- Produced Agricultural Drainage (PAD)	Total volume of the water withdrawn for agriculture but not consumed and flows out of the system	Not measured regularly	DGGREE, DGRE	CRDA, DGGREE, DGRE
	e)- Reused Agricultural Drainage	The total volume of agricultural drainage that is returned back to the system through reuse	Not measured regularly	DGGREE, DGRE	CRDA, DGGREE, DGRE
	f)- Produced Desalinated Water (PDW)	Water produced annually by desalination of brackish or salt water	Measured regularly by SONEDE Non measured regularly concerning private producers	SONEDE, DGRE	CRDA, SONEDE, DGRE
	g)- Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PAD)+(PDW)	Total Non-Conventional Water Resources	(TNCWR)= (PMW)+(PAD)+(PDW)	ONAS, SONEDE, DGGREE, DGRE	CRDA, ONAS, SONEDE, DGGREE, DGRE
	a) h)- **T** h)- Total Non-Renewable Gro Groundwater (TNRGR)	The annual extractable amount of non-renewable groundwater according to a pre specified safe yield that is dictated by a specific sustainability period (x number of years)	TNRGWR can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation, Satellite imagery. Groundwater recharge from Surface water flows can either be estimated from observation wells or modeled through Surface-Groundwater Coupled models. The TNRGWR extractable annually, according to a pre specified safe yield, is dictated by a pre specified sustainability period (x number of years).	DGRE,	CRDA, DGRE
	i)-Total Conventional Water Resources (TCWR)= (TRWR)+(TNRGR)	TCWR	(TCWR)= (TRWR)+(TNRGR)	DGRE, DGBGTH, DGGREE	CRDA, DGBGTH, BPEH, DGGREE, DGRE
	j)-Total Available Water Resources (TAWR)= (TCWR)+(TNCWR)	TAWR is the sum of total annual renewable and non-renewable water resources (approximated) and total annual non-conventional water resources	(TAWR)= (TCWR)+(TNCWR)	DGRE, DGBGTH, DGGREE, ONAS, SONEDE	CRDA, DGBGTH, BPEH, DGGREE, DGRE, ONAS, SONEDE
4.1.2 Water & Uses	a) Annual Total water withdrawal	The gross amount of water extracted from all sources, either permanently or temporarily, for all uses. It includes consumptive use, conveyance losses, and return flow	Water extracted annually from all sources for all uses. It includes consumptive use, conveyance losses, and return flow	BPEH, DGBGTH, DGGREE, SONEDE, DGRE	CRDA, BPEH, DGBGTH, DGGREE, SONEDE, ONAS, BIRH, DGRE
	b)Withdrawal for Domestic Water use	Total annual volume of water withdrawals used for domestic purposes	Total annual volume of water withdrawals used for domestic purposes	SONEDE, DGGREE, BIRH, DGRE	CRDAs, SONEDE, DGGREE,BIRH, DGRE

	c)Withdrawal for Industrial Water use	Total annual volume of water withdrawals used for industrial purposes	Total annual volume of water withdrawals used for industrial purposes	SONEDE, MIN IND, DGGREE, BIRH, DGRE	CRDA, STEG, SONEDE, DGGREE, BIRH, DGRE
	d)Withdrawal for Agricultural Water use	Total annual volume of blue water withdrawals used for agricultural purposes	Total annual volume of blue water withdrawals used for agricultural purposes TABWW	DGPA, DGEDA,DGGREE,BIRH, BPEH, DGRE	CRDAs, DGPA, DGEDA, DGGREE, BIRH, BPEH, DGRE
	e) Green Water Consumptions for Agriculture Water use	The total volume of green water annually consumed by rain fed agriculture	The total volume of green water annually consumed by rain fed agriculture TAGWW	DGRE, DGGREE, BPEH	CRDAs, DGPA, DGEDA, DGGREE, OEP, DGF, BIRH, BPEH, DGRE
	f)Total Agricultural Water uses	The total annual volume consumed by both rain fed and irrigated agriculture	TABWW+TAGWW	DGRE, DGGREE, BPEH	CRDA, DGPA, DGEDA, DGGREE, BIRH, BPEH, DGRE
	g)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)	Annual gross amount of water extracted from rivers, lakes, dams and reservoirs. It includes -withdrawal of primary renewable surface water resources -and secondary freshwater sources (water previously withdrawn and returned)	DGRE, DGBGTH, SONEDE	CRDAs, BIRH,BPEH, SONEDE, DGBGTH, DGACTA , DGRE
	h) Withdrawals from Blue Renewable Groundwater	Total abstractions from renewable groundwater sources, per year	Total annual abstractions from groundwater sources, including non renewable sources (Flow measurement, satellite imagery)	DGRE, BIRH, CRDA	CRDA, BIRH, SONEDE, DGGREE, DGRE
	i)Withdrawals from Blue Non-Renewable Groundwater	Total annual volumes abstracted from non-renewable resources, namely, fossil groundwater.	Total annual volumes abstracted from non-renewable resources, namely, fossil groundwater. (Flow measurement, satellite imagery)	DGRE	CRDA, DGRE
	ibis) Total withdrawals from Blue Water	Is the sum of withdrawals from Blue Surface Water, Blue Renewable Groundwater and Blue Non Renewable Groundwater	TWBW=WBSW+BRG+BNRG	DGRE	CRDA, DGRE
	i ter) Green water Consumption for Livestock Fodder Water Use (Additional)	Total withdrawals from Green Water for Livestock Fodder Water Use	Total withdrawals from Green Water for Livestock Fodder Water Use	DGGREE, OEP, DGPA, DGEDA	CRDA, DGGREE, OEP, DGPA, DGEDA
	I quat) Bottled Water Production (Additional)	Bottled Water Production (BCM/Year)	Bottled Water Production (BCM/Year)	BIRH, OFFICE DE THERMALISME	BIRH, OFFICE DE THERMALISME
	j)Withdrawals from non-conventional resources	Total volumes abstracted annually from water resources other than surface and groundwater, namely, treated wastewater and desalinated sea water	Total volumes abstracted annually from treated wastewater and desalinated sea water	ONAS, SONEDE, DGGREE, DGRE	CRDA, ONAS, SONEDE, DGGREE, DGRE

	k)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 withdrawal from Original Sources expressed as a percentage.	OWUE=100*((Withdrawals from Original sources-Wastewater and Drainage outflows)/Withdrawals from Original sources)	SONEDE, ONAS,DGGREE, BPEH, DGRE	CRDA, SONEDE, ONAS, DGGREE, BPEH, DGRE
	l)Water Sustainability Index	The ratio of the total withdrawals from Original sources including green water consumptions by rain fed agriculture to the Total Renewable Water resources (Blue and Green Water)	TW including green water consumptions by rain fed agriculture/TRWR (Blue and Green Water)	BPEH, DGBGTH,DGGREE, SONEDE, DGRE	CRDA, BPEH, DGBGTH, DGGREE, SONEDE, ONAS, BIRH, DGRE
	m)Wastewater and Drainage Outflows	Wastewater and Agricultural Drainage flowing out of the system	PMIW+ PAD (out of the system)	ONAS, DGGREE, DGRE	CRDA, ONAS, DGPA, DGGREE, DGRE, BPEH
	n)Transboundary Wastewater and Drainage Outflows	Wastewater and Agricultural Drainage flowing out of the country's borders	PMIW+ PAD (out of the country's borders)	ONAS, DGGREE, DGRE	CRDA, ONAS, DGGREE, DGRE, BPEH
	o)Mineral water consumption	Total volume of mineral water consumed per year and per capita	Total volume of mineral water consumed per year and per capita (l/c/y)	Ministry of Trade (DC), Ministry of Health (Hydrotherapy office)	Ministry of Trade (DC), Ministry of Health (Hydrotherapy office)
	p)Non Conventional Water Resources used in water supply	Annual volumes of Non Conventional Water Resources used in water supply -Desalinated water -Treated water	Annual volumes of Non Conventional Water Resources used in water supply -Desalinated water -Treated water	SONEDE, DGRE	SONEDE, DGRE
	q)Withdrawals by different ecosystems	-Total annual volume dedicated to meet the water needs of different ecosystems (wetlands areas, lakes, sebkhas)	-Total annual volume dedicated to meet the water needs of different ecosystems (wetlands areas, lakes, sebkhas)	ANPE, DGRE	ANPE, DGRE
4.1.3 Water & Land-Use Changes	a)Total irrigated Agricultural Land	Total water managed agricultural area	Area (ha)	DGGREE	DGGREE, DGEDA, CRDAs, CNT
	b)Total Rain fed Agricultural Land	Total rain fed agricultural area	Area (ha)	DGPA	DGPA, DGGREE , DGEDA, CRDAs, CNT
	c) Total Pasture Land	Total rain fed pastoral area	Area (ha)	DGF, OEP	DGF, OEP, DGPA, DGEDA, CRDAs, CNT
	d)Total Forests land	Total rain fed forest area	Area (ha)	DGF	DGF, DGEDA, CRDAs, CNT

	e)Urban Encroachment on Agricultural Land	Is the loss of agricultural land caused by urbanization, and is expressed by agricultural area lost/ year.	The recommended approach depends on the presence of high resolution Landsat Satellite images for different years for the area or country of interest. These images are simply overlaid and the difference in area between them is studied by Geographical Information System (GIS) software.	DGGREE, DGPA, DGACTA, OTEDD	DGGREE, DGPA, DGEDA, CRDAs, OTEDD, CNT
4.1.4 Water & Services					
i)Water Coverage and Accessibility	a)Improved Urban Water Supply Coverage	Percentage of population provided with piped drinking water in urban areas	% of population provided with piped drinking water in urban areas (sector ministry)	SONEDE	SONEDE, INS
	b)Improved Rural Water Supply Coverage	Percentage of population provided with piped drinking water in rural areas	% of population provided with piped drinking water in rural areas (sector ministry)	DGGRRE, SONEDE	DGGREE, GDA, SONEDE, INS, Governorate Council
	c)Improved Urban Sanitation Coverage	Percentage of population covered with sanitation in urban areas	% of population covered with sanitation in urban areas (sector ministry)	ONAS	ONAS, INS
	d)Improved Rural Sanitation Coverage	Percentage of population covered with sanitation in rural areas	% of population covered with sanitation in rural areas (sector ministry)	ONAS? DGGREE?	DGGREE, ONAS, INS
	e)Percentage of population with improved water supply	An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination	% of population with improved drinking water source (JMP)	SONEDE, DGGREE	SONEDE, DGGREE, INS, JMP
	f)Percentage of population with improved sanitation	Defined at looking at the following facilities as indicators: Flush or pour-flush (piped sewer system, septic tank, pit latrine), Ventilated Improved Pit latrine, pit latrine with slab, composting toilet	% of population with improved sanitation facilities (JMP)	ONAS, DGGREE	ONAS, DGGREE, INS, JMP
	F1)Rural drinking water supply systems (RDWSS)	Number of rural drinking water supply systems (RDWSS)	Number of rural drinking water supply systems (RDWSS)	DGGREE, SONEDE	SONEDE, DGGREE, CRDA
	F2)Agricultural Develop-ment Groups (ADG)	Number of Agricultural Development Groups (ADG) -Water supply ADG -Irrigation ADG -Joint ADG	Number of Agricultural Development Groups (ADG) -Water supply ADG -Irrigation ADG -Joint ADG	DGGREE, CRDA	DGGREE, CRDA
	F3)Drinking water & Quality standards	Part of the drinking water supplied, not conform to quality standards -Rural area -Urban area	Part of the drinking water supplied, not conform to quality standards -Rural area -Urban area	SONEDE, DGGREE, DHME	SONEDE, DGGREE, DHMPE

	F4)Drinking water with TDS <1, 5 g/ l	-Distribution rate of drinking water TDS <1, 5 g / l	-Volume of drinking water distributed with TDS <1, 5 g / l/Total drinking water distributed volume -Rural area -Urban area	SONEDE, DGGREE	SONEDE, DGGREE
	F5)Utilization of brackish water TDS> 5 g / l in irrigated sector	Utilization rate of brackish water with TDS> 5 g / l in irrigated sector	Volume utilized of brackish water with TDS> 5 g / l in irrigated sector/Total volume of water used	DGGREE, DGPA, DGACTA, INRGREF	DGGREE, DGPA, DGACTA, INRGREF
	F6)Treated wastewater & Quality standards	Part of treated wastewater produced, not conform to quality standards (treatment stage1, treatment stage2, treatment stage3)	Part of treated wastewater produced, not conform to quality standards (treatment stage1, treatment stage2, treatment stage3)	ONAS, DGGREE	ONAS, DGGREE
ii)Water Infrastructure:	g) Lengths of Networks (Water Supply, Sewage, Irrigation, and Drainage).	Lengths of Networks (Water Supply, Sewage, Irrigation, and Drainage).	Lengths of Networks (Water Supply, Sewage, Irrigation, and Drainage) in km.	DGGREE, SONEDE, ONAS	DGGREE, SONEDE, ONAS, DGBGTH, SECADENORD, CRDA
	h)Dam Storage Capacity	The total capacity of all water regulating structures installed.	Total capacity of all water regulating structures installed (BCM/y).	DGBGTH, SONEDE, SECADENORD, DGACTA	DGBGTH, SONEDE, SECADENORD, DGACTA
	i)Water Supply 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	-Total Drinking Water Treatment Capacity (MCM/y), -Summation of the potential capacities of all drinking water plants (MCM/y)	SONEDE, DGGREE	SONEDE, DGGREE, CRDAs
	j)Desalination capacity	The total capacity of all desalination plants	Total capacity of all desalination plants (MCM/y)	SONEDE, DGRE	SONEDE, CRDA, Private users,
	k)Number of water supply meters installed	Number of water supply meters installed	Number of water supply meters installed	SONEDE, DGGREE,	SONEDE, DGGREE, CRDA, DGBGTH, DGACTA, SECADENORD
	l) Municipal Wastewater Treatment Capacity	Total capacity of all Municipal Wastewater Treatment Plants (MCM/ Year)	Total capacity of all Municipal Wastewater Treatment Plants (MCM/Year)	ONAS	ONAS
	m) Industrial Wastewater Treatment Capacity	Total capacity of all Industrial Wastewater Treatment Plants (MCM/ Year)	Total capacity of all Industrial Wastewater Treatment Plants (MCM/Year)	ONAS	ONAS
	n) Wastewater Collection Capacity (Additional)	Is the sum of Municipal and Industrial Wastewater Treatment Capacity	Is the sum of Municipal and Industrial Wastewater Treatment Capacity	ONAS	ONAS
	o)Transfer capacity of Water resources (mainly Northern Waters)	Total transfer capacity of Northern waters network in a given year	Technical design data drawings for pumping stations, manmade reservoirs; hydrographic surveys and networks.	SECADENORD, SONEDE, DGBGTH	SECADENORD, SONEDE, DGBGTH

4.1.5 Water & Energy	a)Electricity generated using Hydropower (GWh/ Year)	Electricity generated using Hydropower (GWh/Year). Hydropower production as percent of total electricity production (Word Bank).	Hydropower production as percent of total electricity production (World Bank). -For all Hydropower generation plants , the following two parameters should be known: (i) Head (h): The Vertical distance between the water intake and the Turbine (ii) Flow (q): Inside the Turbine -$P_{th} = \square\ q\ g\ h$ *-Some of the power generated is lost due to friction inside the Turbine, therefore the theorettical Power is corrected by multiplying it by a factor.*	Ministry of Industry, STEG	STEG, INS
	b)Installed Hydropower capacity (MW)	Sum of all generator nameplate power ratings(in GW) from the installed Hydropower Plants (AMCOW,2012)	Sum of all generator nameplate power ratings (in GW) from the installed Hydropower Plants (AMCOW, 2012) or the maximum runoff of a hydroelectric facility that can be constantly maintained and utilized by equipment	Ministry of Industry, STEG	STEG, INS
	b bus)Water Used to generate Electricity (MCM/ Year) (Additional)	Water Used to generate Electricity (MCM/Year)	Water Used to generate Electricity (MCM/Year)	Ministry of Industry, STEG, DGBGTH	STEG, DGBGTH
4.1.6 Water & Population	c)Internal Renewable Water Resources per capita	The maximum theoretical amount of water produced internally and actually available, on a per person basis	IRWR / Total population in m^3 /y/c.	DGRE, INS	DGRE, DGBGTH, BPEH, INS
	d) Total Renewable Blue Water Resources per capita	The maximum theoretical amount of water actually available, on a per person basis	TRBWR/Total population in m^3 /y/c.	DGRE, INS	DGRE, DGBGTH, BPEH, INS
	e)Total Population	Total population	Total population	INS	INS
	f)Internal Renewable water resources per capita	Long-term average annual flow of rivers and recharge of aquifers generated from endogenous precipitation, on a per person basis	IRWR/Total population in m^3 /y/c.	DGRE, INS	DGRE, BPEH, INS
	g)Total Surface 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.	TSRBWR/Total population in m^3 /y/c.	DGRE, INS	DGRE, DGBGTH, BPEH, INS
	h)Total Renewable Water Resources per capita	Is the sum of total renewable blue and green water resources, on a per person basis	(TRBWR+TRGWR)/Total population in m^3 /y/c.	DGRE, INS	DGRE, DGBGTH, BPEH, INS

	i)Blue water Withdrawals 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.	Total annual abstractions/ Total population in m^3 /y/c.	DGRE, DGGREE, INS	DGRE, DGBGTH, DGGREE, BPEH, INS
	j) Green Water Consumptions per capita	The total amount of precipitation directly consumed by pasture areas, rain fed areas, and forest areas, on a per person basis.	Total amount of precipitation directly consumed by pasture areas, rain fed areas, and forest areas / Total population in m^3 /y/c.	DGRE, INS	DGRE, DGEDA, DGPA, BPEH, INS
	k)Total Available Water Resources per capita	The sum of renewable, non renewable and non conventional Water Resources on a per person basis.	(RWR+NRWR+NCWR)/ Total population in m^3 /y/c.	DGRE, INS	DGRE, DGEDA, SONEDE, ONAS, BPEH, INS
	l) Total Water Consumption per capita	The gross amount of water extracted by all sectors from all sources, either permanently or temporarily, on a per person basis	Water extracted by all sectors from all sources/ Total population in m^3 /y/c.	DGRE, DGGREE, INS	DGRE, DGGREE, SONEDE, BPEH, INS
	m) Agricultural Water Withdrawals per capita	The sum of total agricultural abstractions from blue water, and direct beneficial abstractions from precipitation in rain fed areas, on a per person basis	Agricultural abstractions from blue water, and direct beneficial abstractions from precipitation in rain fed areas/ Total population in m^3 /y/c.	DGRE, DGGREE, DGEDA,DGPA, BPEH, INS	DGRE, DGGREE, DGEDA,DGPA, BPEH, INS
	n)Industrial Water Withdrawals per capita	Total annual volume of water withdrawals used for industrial purposes on a per person basis	Total annual volume of water withdrawals used for industrial purposes/Total population in m^3 /y/c.	DGRE, DGGREE, BPEH, INS	DGRE, DGGREE, DGEDA, BPEH, INS
	o) Domestic Water Withdrawals per capita	Total annual volume of water withdrawals used for domestic purposes on a per person basis	Total annual volume of water withdrawals used for domestic purposes/ Total population in m^3 /y/c.	DGRE, DGGREE, INS	DGRE, DGGREE, SONEDE, BPEH, INS
	p)Population without Improved Water Supply	The total population without improved Water Supply	Total population without improved Water Supply	DGGREE, SONEDE, INS	DGGREE, SONEDE, INS
	q) Population without Adequate Sanitation	The total population without improved Sanitation	Total population without improved Sanitation	DGGREE, ONAS,INS	DGGREE, ONAS, INS
4.1.7 Water & Health	a)Diarrhea prevalence	% of children under five suffering from Diarrhea	% of mortality of children under five suffering from Diarrhea	Ministry of Health, DHMPE	Ministry of Health, DHMPE, INS
	b)Dracunculiasis reported cases	Number of annual incidents of the disease	Number of annual incidents of the disease	Ministry of Health, DHMPE	Ministry of Health, DHMPE, INS (disease not currently monitored)
	c)Cholera reported cases	Number of annual incidents of the disease	Number of annual incidents of the disease	Ministry of Health, DHMPE	Ministry of Health, DHMPE, INS
	d)Open Defecation practice	Number of people who continue to practice open defecation	Number of people who continue to practice open defecation	Ministry of Health, DHMPE Ministry of Environment, ONAS, INS	Ministry of Health, DHMPE, INS Ministry of Environment, ONAS

	e)Percentage of open defecation	% of population practicing open defecation	% of population practicing open defecation	Ministry of Health, DHMPE Ministry of Environment, ONAS, INS	Ministry of Health, DHMPE, INS Ministry of Environment, ONAS
	f)Hepatitis A reported cases	-Number of annual incidents of the disease	-Number of annual incidents of the disease	DHMPE	DHMPE
	g) Typhoid fever reported cases	-Number of annual incidents of the disease	-Number of annual incidents of the disease	DHMPE	DHMPE
	h) Cholera reported cases (Additional)	-Number of annual incidents of the disease	-Number of annual incidents of the disease	DHMPE	DHMPE
4.1.8 Water & Quality					
The Water Quality Index WQI		WQI measures dissolved oxygen, pH, conductivity, total nitrogen, and total phosphorus. It is an indicator of eutrophication, nutrient pollution, acidification, and salinization.	WQI measures dissolved oxygen, pH, conductivity, total nitrogen, and total phosphorus. $WQI=100-((F1^2+F2^2+F3^2)^{1/2})/1.732$ F1:% of failed variables (scope) F2: % of failed tests (frequency) F3: Amount by which failed tests exceed guidelines (magnitude) WQI between 80-94: Good WQI between 65-79: Fair		
	a)Dissolved oxygen (D0)	Dissolved oxygen is a measure of free (i.e., not chemically combined) oxygen dissolved in water	It can be measured with a dissolved oxygen probe such as an oxygen sensor or an optode in liquid media, usually water. The standard unit is milligrams per liter (mg/l) or parts per million (ppm)	DGRE, DHMPE SONEDE ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE ANPE, ONAS
	b)pH	Is a measure of the acidity or alkalinity of a water body	pH is the measure of acidity or basicity of solutions. Mathematically, pH is the negative logarithm of the activity of the hydronium ion, more often expressed as the measure of the hydronium ion concentration. The pH of pure water is about 7 at 25 °C; this value varies with temperature.	DGRE, DHMPE SONEDE ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE ANPE, ONAS
	c) Electric Conductivity (EC)	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	-In many cases, conductivity is linked directly to the Total Dissolved Solids (T.D.S.). High quality deionized water has a conductivity of about 5.5 µS/m, typical drinking water in the range of 5-50 mS/m, while sea water about 5 S/m (i.e., sea water's conductivity is one million times higher than that of deionized water). -It is measured with a conductivity meter	DGRE, DGACTA DHMPE SONEDE, SECADENORD ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE, SECADENORD ANPE, ONAS CRDA

	d)Nitrogen and phosphorus	Are naturally occurring elements essential for all living organisms. Increases in N and P in natural waters, largely as a result of human activities in the drainage basin can overestimate plant growth and choke off oxygen supplies	-The cheapest and simplest method to analyze water samples for phosphate and nitrate concentration is the use of chemical tests. -The Photometer will allow precise interpretation of colors into mg/l.	DGRE, DHMPE SONEDE ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE ANPE, ONAS
	e)Total Dissolved Solids TDS (ppm)	Total Dissolved Solids TDS (ppm)	Oven drying water samples Chemical tests	DGRE, DHMPE SONEDE ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE ANPE, ONAS
	f)Fecal Choliform (Colonies/100 ml) (Additional)	Fecal Choliform (Colonies/100 ml)	Fecal Choliform	DGRE, DHMPE SONEDE ANPE, ONAS	DGRE, DGACTA DHMPE SONEDE ANPE, ONAS
4.1.9 Water & Ecosystems	a)Number of wetlands sites acknowledged by RAMSAR	Number of wetlands sites acknowledged by RAMSAR	Number of wetlands sites	Ministry of Environment, ANPE Ministry of Agriculture, DGRE, DGF INS	Ministry of Environment, ANPE DGRE, DGF, INS
	b)Total Wetlands areas (to be calculated by earth observation tools)	Total Wetlands areas	Total Wetlands areas (to be calculated by earth observation tools) in ha.	Ministry of Environment, ANPE Ministry of Agriculture, DGRE, DGF INS	Ministry of Environment, ANPE DGRE, DGF, INS
	c)Total Freshwater Species Count	Total Freshwater Species Count	Number	DGF, WWF Med, ANPE	DGF, WWF Med, ANPE
	d)Number of Endangered Species (Additional)	Number of Endangered Species	Number	DGF, WWF Med, ANPE	DGF, WWF Med, ANPE
	e)Number of Invasive Species (Additional)	Number of Invasive Species	Number	DGF, WWF Med, ANPE	DGF, WWF Med, ANPE
4.1.10 Water & Climate					
i)Extreme Weather Events	f)Flood events in the last two decades	A flood is defined as an overflow of a large amount of water beyond its normal limits, especially over what is normally dry land.	-Cost of Annual damage induced by floods -Human Losses	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, BPEH, DGRE, CRDA, CNT, Civil protection

	g)Flash-flood events in the last two decades	A flash flood is defined as an overflow of a large amount of water over what is normally dry land, due to heavy rain.	-Cost of Annual damage induced by flash floods -Human Losses	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, DGRE, CRDA, CNT Civil protection
	h)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)	Number	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, DGRE, CRDA, CNT Civil protection
	i) 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 at 1-2 decades and affecting a large geographic region (> 5000 sq. km) (Dartmouth, 2013)	Number	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, DGRE, CRDA, CNT Civil protection
	j)Number of Class 2 Flood Events	Class 2 flood events are extreme events with an estimated recurrence interval greater than 100 years (Dartmouth, 2013)	Number	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, DGRE, CRDA, CNT Civil protection
	k)Drought events in the last two decades	A drought event is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.	-Cost of Annual damage induced by droughts -Human Losses	DGRE, INM, Ministry of Interior, Civil Protection	Ministry of Agriculture, DGRE, CRDA, CNT
	l)Unusual Weather Events (Snow, hail, etc.) (Additional)	Unusual Weather Events (Snow, hail, etc.)	Number/Type	INM, DGRE	INM, DGRE, DGPA, CRDA, Civil Protection
	m)Existence of Early Warning Disaster prevention System and Year of establishment	Existence of Early Warning Disaster prevention System and Year of establishment	Existence of Early Warning Disaster prevention System and Year of establishment (Yes/No)	DGRE , INM, Ministry of Interior, Civil Protection	Ministry of Agriculture DGRE, CNT
	n)Climate Change Adaptation: National Adaptation Plan (Yes/No)	National Adaptation Plan (Yes/No)	National Adaptation Plan (Yes/No)	DGRE, DGEQV, OTEDD	Ministry of Agriculture, DGRE, Ministry of Environment, ANPE, OTEDD
4.1.11 Water & Socio-Economics					
i)Water productivity	a)Industrial water productivity	Industrial GDP/(Industrial water withdrawal), Economic value added (in US$) per cubic meter of water withdrawn by industry; the gross industrial revenue divided by the total industrial water consumption	-Industrial GDP/(Industrial water withdrawal), - The gross industrial revenue divided by the total industrial water consumption -Value in US$	DGRE, DGGREE, BPEH, INS, Ministry of Industry	Ministry of Industry Ministry of Agriculture, DGRE, DGGREE, BPEH INS

	b) Agricultural water productivity "Crop per Drop"	Economic value added in (US$) per cubic meter of water withdrawn by agriculture: In other words, it is the gross agricultural revenue divided by the total agricultural water consumption (including irrigation withdrawals and rain fed agriculture green water consumption).	-The gross agricultural revenue divided by the total agricultural water consumption (including irrigation withdrawals and rain fed agriculture green water consumption). -Value in US$	DGRE, DGGREE, BPEH, INS, DGEDA, Ministry of Agriculture	Ministry of Agriculture, DGRE, DGGREE, BPEH, CRDA INS
	c)Employment in Agriculture "Job per Drop"	The ratio of total labor employed in Agriculture to the total withdrawals (including irrigation withdrawals and rain fed agriculture green water consumption)	-Total labor employed in Agriculture /Total withdrawals (including irrigation withdrawals and rain fed agriculture green water consumption)	DGRE, DGGREE, BPEH, INS, DGEDA, Ministry of Agriculture	Ministry of Agriculture, DGRE, DGGREE, BPEH, DGEDA CRDA, INS
	d) Employment in Industry "Job per Drop"	The ratio of total labor employed in industry to the total industrial withdrawals	-Total labor employed in industry /Total industrial withdrawals	DGRE, DGGREE, BPEH, INS, Ministry of Industry	Ministry of Industry Ministry of Agriculture, DGRE, DGGREE, BPEH, DGEDA, CRDA, INS
ii) Tariffs and Affordability	a)Water and Sanitation charges as % of average household income:	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.	-GNI per capita (formerly GNP per capita) is the gross national income, converted to US$ using the Word Bank Atlas method, divided by the midyear population. GNI is the sum of values 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 - Monthly charge for 10 cubic meters of water/ Monthly household income.	SONEDE, DGGREE ONAS, INS	Ministry of Agriculture: SONEDE, DGGREE Ministry of Environment: ONAS Ministry of Finance Ministry of Development and Planning: INS
	b)Subsidy (Domestic-Industrial-Agricultural)	% of subsidy applied for different sectors.	-% of subsidy applied to Domestic sector+ % of subsidy applied to Industrial sector+ % of subsidy applied to Agricultural sector.	SONEDE, DGGREE, DGEDA, DGFIOP, ONAS, INS	Ministry of Agriculture: SONEDE, DGGREE Ministry of Environment: ONAS Ministry of Industry Ministry of Finance Ministry of Development and Planning: INS
4.1.12 Water & Finance	a)Public expenditure on Water related projects	It is defined as government spending in water resources infrastructure development, planning& management, as well as drinking water supply and sanitation treatment and reuse.	Investment in water and sanitation projects with private participation covers infrastructure projects in water and sanitation that have reached financial closure and directly or indirectly serve the public.	Ministry of Finance Ministry of Agriculture ONAS, SONEDE	-Ministry of Agriculture: DGFIOP, DGRE,DGGREE, DGBGTH, DGACTA, CRDA, SONEDE, SECADENORD, -Ministry of Environment: ANPE, OTEDD, ONAS -Ministry of Regional Development and Planning: INS -Ministry of Finance

	b)Foreign Aid for Water	The sectorial distribution of bilateral Official Development Assistance commitments refers to the economic sector of destination.	The sectorial distribution of bilateral Official Development Assistance commitments refers to the economic sector of destination, 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 sectorial distribution of technical co-operation, and on actual disbursements of food and emergency aid.	Ministry of Finance Ministry of Agriculture ONAS, SONEDE	-Ministry of Agriculture: DGFIOP, DGRE, DGGREE,DGBGTH, DGACTA, CRDA, SONEDE, SECADENORD, -Ministry of Environment: ANPE, OTEDD, ONAS -Ministry of Regional Development and Planning: INS -Ministry of Finance
	c)Percentage of national Budget directed to the water sector (AMCOW)	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 Water supply and sanitation.	% of national budget directed to all water related projects, labor, and services. It includes all water use sector.	Ministry of Finance Ministry of Agriculture ONAS, SONEDE	-Ministry of Agriculture: DGFIOP, DGRE, DGGREE, DGBGTH, DGACTA, CRDA, SONEDE, SECADENORD, -Ministry of Environment: ANPE, OTEDD, ONAS -Ministry of Regional Development and Planning: INS -Ministry of Finance
	d)Percentage of national Budget directed to Water and Sanitation Sector	It is the percentage of national budget directed to Water and Sanitation Sector projects, labor, and services.	%	Ministry of Finance Ministry of Agriculture ONAS, SONEDE	Ministry of Finance Ministry of Agriculture ONAS, SONEDE, DGFIOP Ministry of Environment, Ministry of Regional Development and Planning
	e)Operation & Maintenance Cost Recovery for Water Supply and Sanitation	Is the sum of all tariffs collected from all subscribers to Water supply and Sanitation services in one year divided by the total operational cost of water supply and sanitation for the same year	-Sum of all tariffs collected from all subscribers to Water supply and Sanitation services in one year /Total operational cost of water supply and sanitation for the same year.	SONEDE, DGGREE ONAS	SONEDE, DGGREE, GDA, ONAS
	f)Percent of GDP directed to Sanitation & Hygiene	Is the percent of GDP directed to Sanitation & Hygiene	%	Ministry of Finance, Ministry of Health, ONAS, DHMPE	Ministry of Finance, Ministry of Health, Ministry of Environment, Ministry of Regional Development and Planning, ONAS, DHMPE

	g) Operation & Maintenance Cost Recovery for Irrigation	Is the sum of all tariffs collected from all farmers in one year divided by the total operational cost of irrigation for the same year	-Sum of all tariffs collected from all farmers in one year /Total operational cost of irrigation for the same year.	DGGREE	DGGREE, CRDA, GDA
	h)) Operation & Maintenance Cost Recovery for Industry	Is the sum of all tariffs collected from all industrials in one year divided by the total operational cost of industry for the same year	Is the sum of all tariffs collected from all industrials in one year divided by the total operational cost of industry for the same year	Ministry of industry, Ministry of Finance	Ministry of industry, Ministry of Finance
	i)Private sector investment in the water sector and sanitation	-Private sector investment in the water sector -Private sector investment in the sanitation sector	-Private sector investment in the water sector -Private sector investment in the sanitation sector	Ministry of Agriculture (APIA, DGFIOP, CRDA), Ministry of Environment,	Ministry of Finance, Ministry of Agriculture, Ministry of Environment
	j)Cost of water degradation	Cost of water degradation (pollution, overexploitation, depletion, marine and salt water intrusion, water salinization.	Cost of water degradation (pollution, overexploitation, depletion, marine and salt water intrusion, water salinization	Ministry of Finance, Ministry of Agriculture, Ministry of Environment	DGRE,BIRH, DGGREE, CRDA, SONEDE, SECADENORD, Ministry of Interior, Ministry of Justice
4.1.13 Water & Trade	a)Virtual-water flows related to trade in crop, animal, and industrial products, per country. Will be limited to: -Agricultural Virtual Water Export (BCM/Year) - Agricultural Virtual Water Import (BCM/Year)	Total inflow and 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)	Hoekstra and Chapagain (2001) provided reference tables that provide the approximate volume of water needed to produce one kilogram 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 t estimate the amount of water embedded in imported and exported products	Ministry of Trade (DGCE), Ministry of Agriculture, DGPA, DGEDA, DGGREE, INRGREF, IRESA, DGRE.	Ministry of Trade Ministry of Agriculture: DGGREE, DGRE, GDGPA, DGEDA, IRESA, INRGREF
4.1.14 Water & Governance	a)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	-IWRM plan in place (Yes/No)	DGRE, BPEH	Ministry of Agriculture: DGRE, DGGREE,DGBGTH, SECADENORD, SONEDE, BPEH Ministry of Environment: ANPE, OTEDD, ONAS
	b)Existence of National Water and Sanitation M&E,& R System (AMCOW)	Existence of National Water and Sanitation M&E,& R System (AMCOW)	-National Water and Sanitation M&E,& R System (AMCOW) in place (Yes/No)	DGRE, BPEH	All stakeholders All users (no national system)
	c) Surface Water Permits Issued to Date	Surface Water Permits Issued to Date	Number	DGRE, BIRH, CRDA	DGRE, BIRH, CRDA
	d) Total Volumetric Rights Assosciated with surface Water Permits	d) Total Volumetric Rights Associated with surface Water Permits	MCM/Year	DGRE, BIRH, CRDA	DGRE, BIRH, CRDA

	e) Volume associated with surface Water permits as a Percent of Annual Blue Surface Water Withdrawals	e) Volume associated with surface Water permits as a Percent of Annual Blue Surface Water Withdrawals	%	DGRE, BIRH, CRDA	DGRE, BIRH, CRDA
	f)Water Rights/Year	Number of officially authorized water rights permits for beneficial usage by individuals or entities, and equivalent % of total annual volume distributed.	Number of officially authorized water rights for beneficial usage by individuals or entities.	DGRE (BIRH), BPEH	Ministry of Agriculture: DGRE , BIRH, DGGREE, CRDA
	d)Groundwater well permits issued to date (Number)	Number of officially authorized registered shallow or deep wells for beneficial usage by individuals or entities.	-Number of officially authorized shallow or deep wells for beneficial usage by individuals or entities.	DGRE (BIRH), CRDA	Ministry of Agriculture: DGRE , BIRH, CRDA
	e)Total Volumetric Water Rights Associated with Well Permits	Total Volumetric Water Rights Associated with Well Permits	MCM/Year	DGRE (BIRH), CRDA	Ministry of Agriculture: DGRE , BIRH, CRDA
	f)Total Volume associated with well permits as a percent of Annual Blue Groundwater Abstractions	Total Volume associated with well permits as a percent of Annual Blue Groundwater Abstractions	MCM/Year	DGRE (BIRH), CRDA	Ministry of Agriculture: DGRE , BIRH, CRDA
	g)Number of unlicensed wells	Number of unlicensed wells	Number	DGRE (BIRH),CRDA	Ministry of Agriculture: DGRE , BIRH, CRDA
	h)Irrigation and drainage related Complaints as a percentage of irrigation Water Users	Annual number of complaints that relate directly to irrigation issues Number/Year	-Annual number of complaints that relate directly to irrigation issues -Number of resolved Irrigation complaints	DGGREE, CRDA	Ministry of Agriculture: DGGREE , CRDA
	i)Water supply and Sanitation related Complaints as a percentage of Serviced Households	Annual number of complaints that relate directly to water supply and sanitation services. Number/Year	-Annual number of complaints that relate directly to water supply and sanitation services -Number of resolved Water Supply and Sanitation complaints	SONEDE, DGGREE, CRDA ONAS	Ministry of Agriculture: DGGREE, SONEDE, DGRE, CRDA Ministry of Environment: ONAS, ANPE
	j)Number of Water Supply Meters Installed as a Percent of Total Number of Covered Households	Number of Water Supply Meters Installed as a Percent of Total Number of Covered Households	%	DGGREE, SONEDE	DGGREE,SONEDE
	k)Number of Groundwater Meters Installed as a percent of Serviced Households	Number of Groundwater Meters Installed as a percent of Serviced Households	%	DGGREE, SONEDE, DGRE	DGGREE, SONEDE, DGRE
	l)Number of Surface Irrigation Meters Installed as a % of Surface Irrigation Water Permits	Number of Surface Irrigation Meters Installed as a % of Surface Irrigation Water Permits	%	DGGREE, DGRE, BIRH	DGGREE, DGRE, BIRH

	m)Physical Domestic Water Losses	Physical Domestic Water Losses	%	SONEDE, DGGREE	SONEDE, DGGREE
	M1)Corruption in the water sector	Corruption in the water sector: -Annual number of illegal drilling, illegal tapping water, water theft.	Corruption in the water sector: -Annual number of illegal drilling works, illegal tapping water, water theft.	DGRE, DGGREE, BPEH	DGRE,BIRH, DGGREE, CRDA, SONEDE, SECADENORD, Ministry of Interior, Ministry of Justice
	M2)National strategy of Groundwater Preservation	National strategy of Groundwater Preservation in place (yes/no): a national plan dedicated entirely to groundwater resources, with more than 3 entities involved, and with all groundwater use sectors addressed could qualify as a national strategy of GWP.	National strategy of Groundwater Preservation in place (yes/no): a national plan dedicated entirely to groundwater resources, with more than 3 entities involved, and with all groundwater use sectors addressed could qualify as a national strategy of GWP. (Artificial recharge, water code, Participatory water management, etc.)	DGRE, BIRH, DGGREE, BPEH	DGRE, BIRH, BPEH
	M 3)Database natural disasters	National database natural disasters in place (Yes or no)	National database natural disasters in place (Yes or no)	INM, DGACTA, DGRE, Civil Protection, Ministry of Interior, Ministry of Agriculture, Ministry of Environment, Ministry of Equipment	INM, DGACTA, DGRE, Civil Protection, Ministry of Interior, Ministry of Agriculture, Ministry of Environment, Ministry of Equipment
	M 4)Monitoring and prevention system of risks related to water	-Monitoring system of risks related to water -Prevention system of risks related to water	-Monitoring system of risks related to water -Prevention system of risks related to water	DGACTA, DGRE, INM, Civil Protection, Ministry of Interior, Ministry of Agriculture, Ministry of Environment, Ministry of Equipment	DGACTA,DGRE, INM, Civil Protection, Ministry of Interior, Ministry of Agriculture, Ministry of Environment, Ministry of Equipment
	M 5)National strategy for the conservation of soil and water in place: (Yes or No)	% of developed area against erosion, compared to the total agricultural land (%)	(All managed actions/Total agricultural area)	DGACTA	DGACTA
		Rate of areas which were the subject of preservation and consolidation, with respect to all developed area against erosion (%)	(All consolidation and preservation actions/Total developed area against erosion)	DGACTA	DGACTA
		Reduction of water losses runoff (%) in the development area against erosion	Reduction of water losses runoff (%) in the developed area against erosion	DGACTA , DGRE, BPEH	DGACTA, DGRE

	M 6)National expertise in the field of water and sanitation	Evaluation of National expertise in the field of water and sanitation in a given year (experts, consulting firms, companies, corporations, etc.)	Evaluation of national expertise in the field of water and sanitation in a given year (experts, consulting firms, companies, corporations, etc.)	BPEH, DGRE	BPEH, DGRE
	n) 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.	100*((Withdrawals from original Sources-Wastewater and Drainage outflows)/Withdrawals from Original Sources)	DGRE, DGGREE, ONAS	DGRE, DGGREE, ONAS, CRDA
	o)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 (Blue and Green Water).	%	DGRE, DGGREE, SONEDE	DGRE, DGGREE, SONEDE, CRDA
	p)Wastewater and Drainage Outflows	Wastewater and Agricultural Drainage flowing out of the system.	BCM/Year	DGGREE, ONAS, DGRE	DGGREE, ONAS, DGRE, CRDA
	q)Transboundary Wastewater and Drainage Outflows	Wastewater and Agricultural Drainage flowing out of the country's borders.	BCM/Year	DGGREE, ONAS, DGRE	DGGREE, ONAS, DGRE, CRDA
	r)Commercial Water Losses	Commercial Water Losses	BCM/Year	SONEDE, DGGREE, DGBGTH, SECADENORD	SONEDE, DGGREE, DGBGTH, SECADENORD
	s)Physical Irrigation Water Losses	Physical Irrigation Water Losses	BCM/Year	DGGREE	DGGREE, CRDA
	t)Number of Water related citations (Water Laws Enforcement)	Number of Water related citations (Water Laws Enforcement)	Number	DGAJ, DGRE, BIRH, DGGREE, SONEDE, ANPE, ONAS	DGAJ, DGRE, BIRH, DGGREE, SONEDE, ANPE, ONAS
	u)Number of Water Users Associations	Number of Water Users Associations	Number	DGGREE	DGGREE, CRDA
	v)Water Users Associations Agricultural Land Coverage	Water Users Associations Agricultural Land Coverage	% of Agricultural Land	DGGREE	DGGREE, CRDA
4.1.15 Water & Inernational Relations	a)Transboundary water bodies' dependency Ratio	The percent of annual volumes abstracted from transboundary water bodies to total annual available water resources.	-Annual volumes abstracted from transboundary water bodies /Total annual available water resources.	DGRE, DGBGTH, BPEH	DGRE, DGBGTH, CRDA

	b)Shared Waters related Bilateral/Multilateral Agreements and /or MoU and Cooperation Mechanisms.	The number of Bilateral/Multilateral Agreements and/or MoU and Cooperation Mechanisms a particular country is involved in. These agreements should be solely intended to transboundary water	-Number of Multilateral/ Bilateral Agreements	Ministry of Agriculture: DCI, DGRE, DGBGTH Ministry of Foreign Affairs	Ministry of Agriculture: DCI, DGRE, DGBGTH Ministry of Foreign Affairs.
	c)Number of riparians sharing all shared water bodies	Number of riparian's sharing all shared water bodies	Number of riparian's in each water body	Ministry of Agriculture: DGRE, BIRH, INS	Ministry of Agriculture: DGRE, BIRH, INS
	d) Number of Shared Water Resources	Number of Shared Water Resources	Number of Shared Water Resources	DGRE	DGRE

Number of National SOW indicators: 148 (in black color in Table 6)

Number of Additional Specific indicators: 31 (in red color in table 6)

Total Number of National SOW indicators: 179 indicators

Selected National & Country Specific SOW Indicators:

The review and analysis of all the listed indicators enable the selection of the following set:

(Definitions, Methodology, Institutions in charge of measuring and/or estimating the indicator and Source of data are given in table 6.

Table 7. A new selected set of National SOW indicators for Tunisia

No.	Code	Water Related Indicators	Units
*	1	**Water & Availability**	
1	1-1	Annual Spatially Averaged Precipitation Depth	MM/Year
2	1-2	Annual Precipitation Volume	BCM/Year
*	*	**Blue Water**	
3	1-3	Internal Renewable Surface Water (IRSW)	BCM/Year
4	1-4	Internal Renewable Groundwater (IRG)	BCM/Year
5	1-5	Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)	BCM/Year
6	1-6	External Surface Water Inflow (ESWI)	BCM/Year
7	1-7	External Surface Water Outflow (ESWO)	BCM/Year
8	1-8	External Groundwater Inflow (EGI)	BCM/Year
9	1-9	External Groundwater outflow (EGO)	BCM/Year
10	1-10	Total External Renewable Blue Water Resources Inflow(TERBWR)=(ESWI+EGI)	BCM/Year
11	1-11	Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)	BCM/Year
12	1-12	Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)	BCM/Year
13	1-13	Overlap between Surface Water and Groundwater (OSWG)	BCM/Year
14	1-14	Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSWG)	BCM/Year
15	1-15	Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year
16	1-16	Total Blue Water Resources (TBWR)	BCM/Year
*	*	**Green Water**	
17	1-17	Water for Rain-fed Agricultural Consumption	BCM/Year
18	1-18	Water for Rain-fed Pasture Consumption	BCM/Year
19	1-19	Water for Rain-fed Forest Consumption	BCM/Year
20	1-20	Total Renewable Green Water Resources (TRGWR)	BCM/Year
21	1-21	**Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)**	BCM/Year
22	1-22	**Total Conventional Water Resources (TCWR)= TRWR+TNRG = TBWR+TRGWR**	BCM/Year
*	*	**Non-Conventional Water**	
23	1-23	Produced Municipal Wastewater (PMW)	BCM/Year
24	1-24	Produced Industrial Wastewater (PIW)	BCM/Year
25	1-25	Produced Agricultural Drainage (PAD)	BCM/Year

26	1-26	Produced Desalinated Water (PDW)	BCM/Year
27	1-27	Total Non-Conventional Water Resources (TNCWR)= (PMW)+(PIW)+(PAD)+(PDW)	BCM/Year
28	1-28	**Total Available Water Resources (TAWR) = TCWR+TNCWR**	BCM/Year
*	2	**Water & Uses**	
29	2-1	Withdrawals for Domestic Water Use	BCM/Year
30	2-2	Withdrawals for Industrial Water Use	BCM/Year
31	2-3	Withdrawals for Agricultural Water Use	BCM/Year
32	2-4	Annual Total Water Withdrawals	BCM/Year
33	2-5	Green Water Consumption for Agriculture Water Use	BCM/Year
34	2-6	Total Agricultural Water Uses	BCM/Year
35	2-7	Withdrawals from Blue Surface Water	BCM/Year
36	2-8	Withdrawals from Blue Renewable Groundwater	BCM/Year
37	2-9	Withdrawals from Blue Non-Renewable Groundwater	BCM/Year
38	2-10	Total Withdrawals from Blue Water	BCM/Year
39	2-11	Agricultural Drainage Water Reuse	BCM/Year
41	2-13	Total Withdrawals from Non-Conventional Water Resources	BCM/Year
43	2-15	Greenwater Consumption for Livestock Fodder Water Use	BCM/Year
47	2-19	Bottled Water Production	BCM/Year
*	3	**Water & Land Use Changes**	
50	3-1	Total Irrigated Agricultural Land	ha
51	3-2	Total Rain-fed Agricultural Land	ha
52	3-3	Total Pasture Land	ha
53	3-4	Total Forests Land	ha
54	3-5	Urban Encroachment on Green Cover	ha lost/Year
*	*	**Impact of Urban Encroachment on water Resources (Indicators listed below)**	
55	3-6	Decrease in Groundwater Recharge	BCM/Year
56	3-7	Decrease in Water Consumptions of Green Cover	BCM/Year
57	3-8	Increase in Surface Runoff	BCM/Year
58	3-9	Increase in Domestic Water Withdrawals	BCM/Year
*	4	**Water & Services**	
*	*	**Water Coverage and Accessibility**	
59	4-1	Improved Urban Water Supply Coverage	%
60	4-2	Improved Rural Water Supply Coverage	%
61	4-3	Improved Urban Sanitation Coverage	%
62	4-4	Improved Rural Sanitation Coverage	%
63	4-5	Improved Water Supply Coverage	%
64	4-6	Improved Sanitation Coverage	%
*	*	**Water Infrastructure**	
65	4-7	Length of Water Supply Networks	km
66	4-8	Length of Sewage Networks	km

67	4-9	Length of Irrigation Networks	km
68	4-10	Length of Drainage Networks	km
69	4-11	Dam Storage Capacity	BCM
70	4-12	Water Supply Capacity	BCM/Year
71	4-13	Desalination Capacity	BCM/Year
72	4-14	Municipal Wastewater Treatment Capacity	BCM/Year
73	4-15	Industrial Wastewater Treatment Capacity	BCM/Year
74	4-16	Wastewater Collection Capacity	BCM/Year
*	5	**Water & Energy**	
76	5-1	Electricity Generated Using Hydropower	GWh/Year
77	5-2	Hydropower as % of Total Generated Electricity	%
78	5-3	Installed Hydropower Capacity	MW
79	5-4	Water Used to Generate Electricity	BCM/Year
*	6	**Water & Population**	
80	6-1	Total Population	1000 inhabitants
81	6-2	Internal Renewable Water Resources Per Capita	CM/capita/Year
82	6-3	Total Renewable Blue Water Resources Per Capita	CM/capita/Year
83	6-4	Total Renewable Water Resources Per Capita	CM/capita/Year
84	6-5	Total Available Water Resources Per Capita	CM/capita/Year
85	6-6	Blue Water Withdrawal Per Capita	CM/capita/Year
86	6-7	Green Water Use Per Capita	CM/capita/Year
87	6-8	Total Water Consumption Per Capita	CM/capita/Year
88	6-9	Agricultural Water Withdrawal Per Capita	CM/capita/Year
89	6-10	Industrial Water Withdrawal Per Capita	CM/capita/Year
90	6-11	Domestic Water Withdrawal Per Capita	CM/capita/Year
91	6-12	Population Without Improved Water Supply	1000 inhabitants
92	6-13	Population Without Improved Sanitation	1000 inhabitants
*	7	**Water & Health**	
93	7-1	Diarrhea Prevalence	%
94	7-2	Dracunculiasis Reported Cases	%
95	7-3	Open Defecation Practice	Number
96	7-4	Percentage of Open Defecation	%
97	7-5	Cholera Reported Cases	Number/Year
98	7-6	Typhoid Reported Cases	Number/Year
99	7-7	Hepatitis A Reported Cases	Number/Year
*	8	**Water & Quality**	
100	8-1	Dissolved Oxygen (DO)	PPM
101	8-2	pH	Dimensionless
102	8-3	Electric Conductivity (EC)	1/OHM (S/M)
103	8-4	Nitrogen Concentration	PPM
104	8-5	Phosphorous Concentration	PPM
105	8-6	Total Dissolved Solids	PPM
106	8-7	Fecal Choliform	Colonies/100ML

*	9	**Water & Ecosystems**	
111	9-1	Number of Wetlands Sites Acknowledged by RAMSAR	Number
112	9-2	Total Wetlands Areas	ha
113	9-3	Total Freshwater Species Count	Number
114	9-4	Number of Endangered Species	Number
115	9-5	Number of Invasive Species	Number
*	10	**Water & Climate**	
*	*	**Extreme Weather Events**	
116	10-1	Number of Class 1 Flood Events	Number
117	10-2	Number of Class 1.5 Flood Events	Number
118	10-3	Number of Class 2 Flood Events	Number
120	10-5	Drought Events	Number
121	10-6	Cost of Annual Damage Caused by Floods	$ - % of GDP
122	10-7	Cost of Annual Damage Caused by Droughts	$ - % of GDP
123	10-8	Annual Human Losses Related to Floods	Number
124	10-9	Annual Human Losses Related to Droughts	Number
125	10-10	Unusual Weather Events (Snow, Hail,……)	Number/Type
126	10-11	National Climate Change Adaptation Plan	Yes/No
*	11	**Water & Socio-Economics**	
*	*	**Water Productivity**	
127	11-1	Industrial Water Productivity	$/CM
128	11-2	Agricultural Water Productivity “Crop Per Drop”	$/CM
129	11-3	Employment in Agriculture “Job Per Drop”	Jobs/MCM
129	11-4	Employment in Industry “Job Per Drop”	Jobs/MCM
*	*	**Tariffs and Affordability**	
131	11-5	Water and Sanitation Charges as % of Average Household Income	%
*	12	**Water & Finance**	
132	12-1	Percentage of National Budget Directed to Water & Sanitation Sector	%
133	12-2	Operation & Maintenance Cost Recovery for Water Supply and Sanitation	%
134	12-3	Percent of GDP Directed to Sanitation & Hygiene	%
135	12-4	Foreign Aid for Water & Sanitation	Million US$
136	12-5	Operation& Maintenance Cost Recovery for Irrigation	%
*	13	**Water & Trade**	
140	13-1	Agricultural Virtual Water Export	BCM/Year
141	13-2	Agricultural Virtual Water Import	BCM/Year

*	14	Water & Governance	
142	14-1	IWRM Plan	Yes/No
143	14-2	National Water and Sanitation M&E & R System	Yes/No
144	14-3	Surface Water Permits Issued to Date	Number
145	14-4	Total Volumetric Rights Assosciated with surface Water Permits	BCM/Year
146	14-5	Volume associated with surface Water permits as a Percent of Annual Blue Surface Water Withdrawals	%
147	14-6	Groundwater Well Permits Issued to Date	Number
148	14-7	Total Volumetric Water Rights Associated with Well Permits	BCM/Year
149	14-8	Total Volume associated with well permits as a percent of Annual Blue Groundwater Abstractions	%
150	14-9	Number of unlicensed wells	Number
151	14-10	Irrigation & Drainage Related Complaints as a percentage of Irrigation Water Users	Number/Year
152	14-11	Water supply and Sanitation Related Complaints as a percentage of Serviced Households	Number/Year
153	14-12	Number of Water Supply Meters Installed as a Percent of Total Number of Covered Households	%
154	14-13	Number of Groundwater Meters Installed as a percent of Serviced Households	Number
155	14-14	Number of Surface Irrigation Meters Installed as a % of Surface Irrigation Water Permits	%
156	14-15	Physical Domestic Water Losses	BCM/Year
157	14-16	Overall Water Use Efficiency	%
158	14-17	Water Sustainability/ Depletion Index	%
159	14-18	Wastewater and Drainage Outflows	BCM/Year
160	14-19	Transboundary Wastewater and Drainage Outflows	BCM/Year
161	14-20	Commercial Water Losses	BCM/Year
162	14-21	Physical Irrigation Water Losses	BCM/Year
163	14-22	Number of Water related citations (Water Laws Enforcement)	Number
164	14-23	Number of Water Users Associations	Number
165	14-24	Water Users Associations Agricultural Land Coverage	% of Ag. Land
*	15	Water & International Relations	
166	15-1	Transboundary Water Dependency Ratio	%
167	15-2	Shared Waters related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms	Number
168	15-4	Number of Riparians sharing all shared water bodies	Number
169	15-6	Number of Shared Water Resources	Number

This selected new set of National & Country Specific SOW Indicators includes: 98 Primary indicators, 32 Secondary Derived Indicators, and 22 Specific Indicators.

We will develop in the following pages, these National & Country Specific SOW Indicators, with their 2012 values and their corresponding historical data.

3.2. Shared Aquifer SOW Indicators

The North Western Sahara Aquifer System (NWSAS) is shared by Algeria, Libya and Tunisia.

This section presents the full list of indicators used, with their definition, the methodology to measure, estimate and report value, and the institutions in charge of measuring and/or estimating the indicator.

Table 8. A selected set of NWSAS SOW indicators

Whole Aquifer Indicators	Units	Definition	Methodology to measure, estimate and report value	Institution in charge	Source of data
Water & Availability					
Internal Renewable Groundwater (IRG)	BCM/Year	**IRG:** Groundwater Recharge is the total volume of water entering underground sources of water (typically aquifers) within a country's borders from endogenous (internal) precipitation and surface water flow (FAO)	If not measured, IRG can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation. Groundwater recharge from Surface water flows can either be estimated from observation wells or modeled through Surface-Groundwater Coupled models.	DGRE, CM	CRDA, DGRE, OSS
Total Exploitable Non-Renewable Ground Water Resources	BCM/Year	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).	TENRGWR can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation, Satellite imagery. Groundwater recharge from Surface water flows can either be estimated from observation wells or modeled through Surface-Groundwater Coupled models. The TENRGWR extractable annually, according to a pre specified safe yield, is dictated by a pre specified sustainability period (x number of years).	DGRE, CM	CRDA, DGRE, OSS
Country's Area Inside The Aquifer	km2 (Mapped)	Country's Area inside the Shared Aquifer	Mapped	DGRE, CM	CRDA, DGRE , OSS
Potential Volume for Each Country	BCM	Country's Potential Groundwater Volume inside the Shared Aquifer	Can be estimated by hydrological modeling (Physically-Based Distributed Models): P records, Soil type maps, Land use maps, Irrigation and drainage maps, ETP inputs, Surface runoff and catchment outlets, Recharge of groundwater aquifers by precipitation, Satellite imagery.	DGRE, CM	CRDA, DGRE, OSS
Inflow to Each Country	BCM/Year	Long-term average annual quantity of groundwater annually entering the country, taking into consideration treaties (FAO)	**External Groundwater Inflow (EGI):** Long-term average annual quantity of groundwater annually entering the country, taking into consideration treaties (FAO). Estimated from piezometric maps, observation wells or modeled through Groundwater models.	DGRE, CM	CRDA, DGRE, OSS

Whole Aquifer Indicators	Units	Definition	Methodology to measure, estimate and report value	Institution in charge	Source of data
Outflow from Each Country	BCM/Year	Long-term average annual quantity of groundwater leaving the country (FAO)	**External Groundwater outflow (EGO) :** Long-term average annual quantity of groundwater leaving the country (FAO) Estimated from piezometric maps, observation wells or modeled through Groundwater models. No EGO towards neighboring countries, but towards the sea in case of coastal aquifers.	DGRE, CM	CRDA, DGRE, OSS
Pieozometric Water Heads	Meters (Mapped)	Pieozometric Water Heads	Mapped	DGRE, CM	CRDA, DGRE, OSS
Depth from water to Basement/ Confining Layer (Unconfined Aquifer)	Meters (Mapped)	Depth from water to Basement/ Confining Layer (Unconfined Aquifer)	Mapped	DGRE, CM	CRDA, DGRE, OSS
Depth to Water Table (Unconfined Aquifer)	Meters (Mapped)	The vertical distance from the ground surface to the water Table in case of unconfined aquifers	Mapped	DGRE, CM	CRDA, DGRE, OSS
Depth to Piezometric Surface (Confined Aquifer)	Meters (Mapped)	The vertical distance from the ground level to the piezometric level	Mapped	DGRE, CM	CRDA, DGRE, OSS
Depth from Piezometric surface to Basement/ Bottom of confined aquifer	Meters (Mapped)	The vertical distance from the ground surface to the bottom of the confined water bearing formation	Mapped	DGRE, CM	CRDA, DGRE, OSS
Water & Uses					
Withdrawals from Blue Groundwater	BCM/Year	Total abstractions from groundwater sources, including non renewable sources per year	Total annual abstractions from groundwater sources, including non renewable sources (Flow measurement, satellite imagery)	DGRE,BIRH,CRDA, CM	CRDA, BIRH, SONEDE, DGGREE, DGRE, OSS
Withdrawals from Exploitable Non-Renewable Groundwater	BCM/Year	Total annual volumes abstracted from exploitable non-renewable resources, namely, fossil groundwater.	Total annual volumes abstracted from exploitable non-renewable resources, namely, fossil groundwater. (Flow measurement, satellite imagery)	DGRE, CM	CRDA, DGRE, OSS
Extraction Zones of the Aquifer	Numbers/ Mapped	Extraction zones of the aquifer, without any risk	Numbers/ Mapped	DGRE , CM	CRDA,DGRE, OSS
Annually Observed Drawdown (Average & Mapped)	Meters	Annually Observed Drawdown	(Average & Mapped)	DGRE , CM	CRDA,DGRE, OSS

Whole Aquifer Indicators	Units	Definition	Methodology to measure, estimate and report value	Institution in charge	Source of data
Water & Land Use Change					
Total Irrigated Agricultural Land	ha	Total water managed agricultural area	Area (ha)	DGGREE, CM	DGGREE, DGEDA, CRDAs, CNT, OSS
Total Rainfed Agricultural Land	ha	Total rain fed agricultural area	Area (ha)	DGPA, CM	DGPA, DGGREE, DGEDA, CRDAs, CNT, OSS
Total Pasture Area	ha	Total Pasture Area	Area (ha)	DGF, OEP, CM	DGF, OEP, DGPA, DGEDA, CRDA
Total Forests Area	ha	Total Forests Area	Area (ha)	DGF, CM	DGF, DGEDA, CRDA
Urban Encroachment on Agricultural Land	ha/Year	Is the loss of agricultural land caused by urbanization, and is expressed by agricultural area lost/ year.	The recommended approach depends on the presence of high resolution Landsat Satellite images for different years for the area or country of interest. These images are simply overlaid and the difference in area between them is studied by Geographical Information System (GIS) software.	DGGREE, DGPA, DGACTA, CM	DGGREE, DGPA, DGEDA, CRDAs, CNT, OSS
The Decrease in Groundwater Recharge caused by Urban Encroachment	BCM/Year	The Decrease in Groundwater Recharge caused by Urban Encroachment	Mapped	DGRE, OSS	DGRE,OSS,OTEDD, CNT
Water & Population					
Total Aquifer bound and dependent population	Number	Total Aquifer bound and dependent population	Total Aquifer bound and dependent population	DGRE, BIRH, CM	DGRE, BIRH, OSS
Internal Renewable Water Resources Per Capita	CM/Capita	The maximum theoretical amount of water produced internally and actually available, on a per person basis	IRWR / Total population in m^3 /y/c.	DGRE, INS,CM	DGRE, DGBGTH, BPEH, INS, OSS
Groundwater Withdrawal Per Capita	CM/Capita	Total annual abstractions from groundwater sources including non-renewable groundwater and secondary freshwater sources (water previously withdrawn and returned), on a per person basis.	Total annual abstractions/ Total population in m^3 /y/c.	DGRE, DGGREE, INS, CM	DGRE, DGBGTH, DGGREE, BPEH, INS, OSS
Water & Quality					
Concentration of Chloride in The Aquifers Domain	PPM/ Mapped	Concentration of Chloride in the Aquifers Domain	Mapped	DGRE, BIRH, CM	DGRE, BIRH, OSS

Whole Aquifer Indicators	Units	Definition	Methodology to measure, estimate and report value	Institution in charge	Source of data
Nitrate Concentration	PPM/ Mapped	Nitrate Concentration	Mapped	DGRE, BIRH, CM	DGRE, BIRH, OSS
Electric Conductivity	1/OHM (S/M)	Electric Conductivity	Mapped	DGRE, BIRH, CM	DGRE, BIRH, OSS
Total Dissolved Solids	PPM/ Mapped	Total Dissolved Solids	Mapped	DGRE, BIRH, CM	DGRE, BIRH, OSS
Fluoride Concentration	PPM/ Mapped	Fluoride Concentration	Mapped	DGRE, BIRH, CM	DGRE, BIRH, OSS
Water & Ecosystems					
Number of Groundwater Based Ecosystems	Number	Number of Groundwater Based Ecosystems	Number	DGF, WWF, MC	DGF, WWF, OSS
Number of RAMSAR Wetlands in The Aquifer Domain	Number	Number of RAMSAR Wetlands in The Aquifer Domain	Number	DGF, WWF, MC	DGF, WWF, OSS
Number of Endangered Species	Number	Number of Endangered Species	Number	DGF, WWF, MC	DGF, WWF, OSS
Number of Invasive Species	Number	Number of Invasive Species	Number	DGF, WWF, MC	DGF, WWF, OSS
Water & Governance					
IWRM Plan (Yes/No)	Yes/No	IWRM Plan (Yes/No)	IWRM Plan (Yes/No)	DGRE, BIRH , MC	DGRE,BIRH, CRDA , OSS
Well Permits to date	Number	Well Permits to date	Well Permits to date	DGRE, BIRH, MC	DGRE,BIRH, CRDA , OSS
Volumetric Groundwater Rights	BCM/Year	Volumetric Groundwater Rights	Volumetric Groundwater Rights	DGRE, BIRH, MC	DGRE,BIRH, CRDA , OSS
Unlicensed Groundwater Abstractions	BCM/Year	Unlicensed Groundwater Abstractions	Unlicensed Groundwater Abstractions	DGRE, BIRH, MC	DGRE,BIRH, CRDA ,OSS
Water & International Relations					

Whole Aquifer Indicators	Units	Definition	Methodology to measure, estimate and report value	Institution in charge	Source of data
Dependency Ratio of Each Riparian Country	%	The percent of annual volumes abstracted from transboundary water bodies to total annual renewable water resources.	-Annual volumes abstracted from transboundary water bodies /Total annual renewable water resources.	DGRE, DGBGTH, BPEH, MC	DGRE,DGBGTH, CRDA, OSS
Bilateral / Multilateral Agreements & Cooperation Protocol or MOUs Between Riparians	Number	The number of Bilateral and/ or Multilateral agreements & Cooperation Protocol or MOUs between Riparians, a particular country is involved in. These agreements should be solely intended to transboundary water	-Multilateral/ Bilateral Agreements & Cooperation Protocol or MOUs between Riparians -Number of Riparians in each water body	Ministry of Agriculture: DCI, DGRE, DGBGTH, MC Ministry of Foreign Affairs	Ministry of Agriculture: DCI, DGRE, DGBGTH, OSS Ministry of Foreign Affairs.
Presence of Other Transboudray Bodies in Riparian Countries	Number	Other Transboudray Bodies in Riparian Countries	Other Transboudray Bodies in Riparian Countries	DGRE, BIRH, MC	DGRE, BIRH, OSS

Total: 40 indicators

4. Indicators Values

This section consists of a data sheet indicating the values assigned to each indicator, along with the units of measurement, the measurement year, the source of data, and any remarks. All reported values are for the year 2012.In the unlikely case where values are only available for a year prior to 2012 an extrapolation method is used to estimate the 2012 value.

4.1. The National SOW Data

Table 9. National SOW data sheet indicating the values assigned to each indicator, unit, measurement year, and source

Indicator	Units	Values	Source	Remarks	Values 2012	Source (V 2012)	Remarks
Water & Availability							
Annual Spacially Averaged Precipitation Depth	MM/Year	230.00	FAO AQUASTAT	Annual Average	153.0	DGRE Rainfall Directory	Annual Average Hydrological Year 2012-13 (Deficit Year in rain)
Annual Precipitation Volume	BCM/Year	36.00	CEDARE/AWC	AA	23.7	DGRE Rainfall Directory	Annual Average Hydrologic Year 2012-13 (Deficit Year in rain)
Blue Water							
Internal Renewable Surface Water (IRSW)	BCM/Year	2.70	MEWINA RAR	AA	2.700	DGRE	AA
Internal Renewable Groundwater (IRG)	BCM/Year	2.10	MEWINA RAR	AA	1.554	DGRE	AA
Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)-(OSWG)	BCM/Year	4.80	FAO AQUASTAT	AA	3.854	DGRE	AA
External Surface Water Inflow (ESWI)	BCM/Year	0.30	FAO AQUASTAT	AA	0.320	DGRE	AA
External Surface Water Outflow (ESWO)	BCM/Year	0.18	FAO AQUASTAT	AA	0.190	DGRE	AA
External Groundwater Inflow (EGI)	BCM/Year	0.10	FAO AQUASTAT	AA	0.100	DGRE	AA
External Groundwater Outflow (EGO)	BCM/Year	0.00	FAO AQUASTAT	AA	0.000	DGRE	AA
Total External Renewable Blue Water Resources Inflow (TERBWR)=(ESWI+EGI)	BCM/Year	0.40	FAO AQUASTAT	AA	0.420	DGRE	AA

Total Renewable Blue Surface Water (TRBSW)=(IRSW)+(ESWI)-(ESWO)	BCM/Year	2.82	FAO AQUASTAT	AA	2.830	DGRE	AA
Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)	BCM/Year	2.20	FAO AQUASTAT	AA	1.654	DGRE	AA
Overlap Between Surface Water and Groundwater (OSWG)	BCM/Year	0.40	FAO AQUASTAT	AA	0.400	DGRE	AA
Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBGW)-(OSWG)	BCM/Year	4.62	FAO AQUASTAT	AA	4.084	DGRE	AA
Total Exploitable Non-Renewable Groundwater (TNRG)	BCM/Year	-	-	-	0.61 (2012) and 0.72 (2050) as Model projections	DGRE, OSS,CM	AA
Total Blue Water Resources 1-(TBWR)=(TBSW)+(TBGW)-(OSWG) 2-(TBWR)=(TRBWR)+(TNRBWR)	BCM/Year	-	-	-	(1) 4.694 (2) 4.694	DGRE	AA
Mobilization of Surface Water (specific indicator)	BCM/Year	-	-	AA	2.188	DGRE,DGBGTH	AA
Green Water							
Water for Rain-fed Agriculture Consumptions	BCM/Year	5.52	CEDARE/AWC	AA	5.500	DGGREE	AA
Water for Rain-fed Pasture Consumption	BCM/Year	5.95	CEDARE/AWC	AA	6.000	DGGREE	AA
Water for Rain-fed Forest Consumption	BCM/Year	1.33	CEDARE/AWC	AA	1.500	DGGREE	AA
Total Renewable Green Water Resources (TRGWR)	BCM/Year	12.81	CEDARE/AWC	AA	13.000	DGRE	AA
Total Renewable Water Resources (TRWR)=(TRBWR+TRGWR)	BCM/Year	17.41	CEDARE/AWC	AA	17.084	DGRE	AA
Total Conventional Water Resources (TCWR)=(TRWR)+(TNRG)=(TBWR+(TRGWR)	BCM/Year	-	-	-	17.694 17.694	DGRE DGRE	AA AA
Non-Conventional Water							
Produced Municipal and Industrial Wastewater (PMW) +(PIW)	BCM/Year	0.38	CEDARE/AWC	AA	0.276	ONAS	AA PMW= 0.239 PIW = 0.037

Produced Agricultural Drainage (PAD)	BCM/Year	0.10	CEDARE/AWC	-	0.140	DGRE	DGRE 2011
Produced Desalinated Water (PDW)	BCM/Year	0.03	MEWINA RAR	-	0.030	DGRE SONEDE	DGRE, (2011) SONEDE (2012)
Total Non-Conventional Water Resources (TNCWR)=(PMIW)+(PAD)+(PDW)	BCM/Year	0.52	CEDARE/AWC	-	0.446	DGRE	DGRE (2011)
Total Available Water Resources (TAWR)=(TCWR)+(TNCWR)	BCM/Year	5.79	CEDARE/AWC	-	18.140	DGRE	TCWR= 17.694 TNCWR= 0.446 TOT = 18.140
Treated Municipal and Industrial Wastewater	BCM/Year	0.24	MEWINA RAR	-	0.232	O NAS	1990-2012 AA= 0.165 BCM
Reused Treated Municipal and Industrial Wastewater	BCM/Year	0.02	FAO AQUASTAT	-	0.06	ONAS	1990-2012 AA= 0.042 BCM
Treated wastewater reused in agricultural irrigation	BCM/Year	-	-	-	0.025	DGGREE	Counting the amount of water delivered or invoiced to CRDAs
Water & Uses							
Withdrawals for Domestic Water Use	BCM/Year	0.37	FAO AQUASTAT	-	0.495	DGRE	SONEDE= 0.451 DGGREE= 0.044 TOT= 0.495
Withdrawals for Industrial Water Use	BCM/Year	0.11	FAO AQUASTAT	-	0.089	DGRE	Private wells= 0.042, SONEDE= 0.046, MINERAL WATER= 0.001 TOT= 0.089
Withdrawals for Agricultural Water Use (Blue water+ Non-conventional water)	BCM/Year	2.16	FAO AQUASTAT	-	2.165	DGGREE	Counting volume of water charged by GDA 2.140 + 0.025 = 2.165
Annual Total Water Withdrawals	BCM/Year	2.64	FAO AQUASTAT	-	2.749	DGRE	0.495+0.089 + 2.165 = 2.749
Green Water Consumption for Agricultural water use	BCM/Year	5.52	CEDARE/AWC	-	5.500	DGGREE	2012
Total Agricultural Water Uses	BCM/Year	7.69	CEDARE/AWC	-	7.665	DGGREE	
Withdrawals From Blue Surface Water	BCM/Year	1.50	FAO AQUASTAT	-	0.615	DGBGTH, BIRH	2012-13
Withdrawals From Blue Renewable Groundwater	BCM/Year	1.14	FAO AQUASTAT	-	1.511	DGRE	2010,2012 data NA
Withdrawals from Non-Renewable Groundwater	BCM/Year	0.00	CEDARE/AWC	-	0.610	DGRE	2010
Total Withdrawals from Blue Water	BCM/Year	-	-	-	2.736	DGRE	0.615+1.511+ 0.610= 2.736 DGRE 2012-13 &2010

Agricultural Drainage Water Use	BCM/Year	-	-	-	0.020	DGRE	2011
Withdrawals from Desalinated Water	BCM/Year	-	-	-	0.030	SONEDE, DGRE (Private)	2012 2011
Total Withdrawals from Non-Conventional Water Resources	BCM/Year	-	-	-	0.110	DGRE	2012
Green Water Consumption for Livestock Fodder Water Use	BCM/Year	-	-	-	0.760	DGPA, DGEDA, DGSA, OEP	2012
Bottled Water Production	BCM/Year	-	-	-	0.001	Office of Thermalism & Hydrotherapy	2012
Water &Land use Change							
Total Irrigated Agricultural Land	ha	385 000.00	FAO AQUASTAT	-	421, 000.00	DGGREE	DGGREE
Total Rain-Fed Agricultural Land	ha	4 491 000.00	CEDARE/AWC	-	4, 953,550.00	DGPA DGEDA	2012
Total Forest Land	ha	1 085 000.00	World Ressources Institute	-	1, 151,218.00	DGF	DGF
Total Natural Pasture Land	ha	4 840 000.00	CEDARE/AWC	-	4, 895,000.00	DGF, DGEDA	DGF
Urban Encrochment on Green Cover	ha lost/Year	-	-	-	10,000	DGACTA,OTEDD, CNT	DGACTA,OTEDD, CNT
Impact of Urban Encrochment on Water Resources (Indicators listed below)							
Decrease in Groundwater Recharge	BCM/Year	-	-	-	0.00126	DGRE	DGRE
Decrease in Water Consumptions of Green Cover	BCM/Year	-	-	-	0.030	DGEDA, DGPA, DGF	DGEDA, DGPA, DGF
Increase in Surface Runoff	BCM/Year	-	-	-	0.03126	DGRE	DGRE
Increase in Domestic Water Withdrawals	BCM/Year	-	-	-	0.030	DGGREE,SONEDE	DGGREE,SONEDE
Water &Services							
Water Coverage and Accessibilility							
Improved Urban Water Supply Coverage (Sector Ministry)	%	100.00	MEWINA RAR	-	100.00	SONEDE DGGREE	SONEDE

Improved Rural Water Supply Coverage (Sector Ministry)	%	94.00	MEWINA RAR	-	93.4	SONEDE DGGREE	SONEDE (49.7%) + DGGREE (43.7%)
Improved Urban Sanitation Coverage (Sector Ministry)	%	84.70	MEWINA RAR	- 98.94	85.4	ONAS	1994-2012, AA= 74,5 %
					INS	INS 2009 2012 NA	
Improved Rural Sanitation Coverage (Sector Ministry)	%	5.50	MEWINA RAR	- 83.95	5.1	0NAS	-
					INS	INS 2009 2012 NA	
Improved Water Supply Coverage (Sector Ministry)	%	98.00	MEWINA RAR	-	97.8	SONEDE DGGREE	Urban + Rural
Improved Sanitation Coverage (Sector Ministry)	%	57.00	MEWINA RAR	- 94.44	58.4	ONAS	-
					INS	INS 2009 2012 NA	
Water Infrastructure							
Length of Water Supply Networks	Km	47,544.00 (without DGGREE)	MEWINA RAR	-	SONEDE: 48,459.00 km DGGREE: 78,100.5km TOTAL:126,559.5 km	SONEDE DGGREE	-SONEDE, 1983 -2012 AA= 31,563.5 km; -DGGREE, 1965-2012 AA= 29,643.95 km
Length of Seewage Networks	Km	-	-	-	15,364	ONAS	2012
Length of Irrigation Networks	Km	-	-	-	NA	DGGREE	-
Length of Drainage Networks	Km	-	-	-	NA	DGGREE	-
Dam Storage Capacity (Installed)	BCM	2.66	FAO AQUASTAT	-	2.152	DGBGTH	2012
Water Supply Capacity	BCM/Year	-	-	-	0.755	SONEDE	2012
Desalination Capacity	BCM/Year	-	Sector Ministry	-	-0.025 (SONEDE), not included drinking water treatment and deferrization plants capacity -0.010 (Private stations) TOT: 0.035	SONEDE	0.025 BCM/Year by SONEDE & 0.010 BCM/Year by private stations
Municipal Wastewater Treatment Capacity	BCM/Year	-	-	-	0.2983	ONAS	-
Industrial Wastewater Treatment Capacity	BCM/Year	-	-	-	0.0193	ONAS	-

Wastewater Collection Capacity	BCM/Year	-	-	-	0.234	ONAS	-
Water & Energy							
Electricity Generated Using Hydropower	GWh/Year	160	IHA	2008	110.56	STEG	2012
Hydropower as % of Total Generated Electricity	%	-	-	-	1	STEG	2012
Installed Hydropower Capacity	MW	70.00	IHA	2008	66.00	STEG	2012
Water Used to Generate Electricity	BCM/Year	-	-	-	0.830 848	STEG	2012
Water & Population							
Total Population	1000 inhabitants	10365.00	Index Mundi	-	10,776. 400	INS	July 2012 (INS)
Internal Renewable Water Resources Per Capita	CM/capita/Year	463.10	CEDARE/AWC	-	1,564	DGRE	2012
Total Renewable Blue Water Resources Per Capita	CM/capita/Year	446.02	CEDARE/AWC	-	378.9	DGRE	2012
Total Renewable Water Resources Per Capita	CM/capita/Year	1679.40	CEDARE/AWC	-	1,585.3	DGRE	2012
Total Available Water Resources Per Capita	CM/capita/Year	-	-	-	1,683.0	DGRE	2012
Blue Water Withdrawal Per Capita	CM/capita/Year	254.69	CEDARE/AWC	-	254.00	DGRE DGBGTH	2010
Green Water Use Per Capita	CM/capita/Year	1236.08	CEDARE/AWC	-	1,206.00	DGGREE	AA
Total Water Consumption Per Capita	CM/capita/Year	1490.77	CEDARE/AWC	-	1,460.00	DGRE	AA
Agricultural Water Withdrawal Per Capita	CM/capita/Year	208.86	CEDARE/AWC	-	201.00	DGGREE	AA
Industrial Water Withdrawal Per Capita	CM/capita/Year	10.61	CEDARE/AWC	-	8.25	DGRE	AA
Domestic Water Withdrawal Per Capita	CM/capita/Year	35.21	CEDARE/AWC	-	46.0	SO NEDE, DGGREE	AA
Population Without Improved Water Supply	1000 inhabitants	103.65	CEDARE/AWC	-	-240 (SONEDE), -239.9 (INS)	SO NEDE, INS, DGGREE	1993-2013 (INS) *(INS 2009)
Population Without Improved Sanitation	1000 inhabitants	414.60	CEDARE/AWC	-	579.700 (INS)	INS	1966-2009 (INS) (INS 2009)
Water & Quality							
Dissolved Oxygen (DO)	ppm	-	-	-	V1 : 7.7-8.5 V2 : 5.4-6.4 V3 : NA V4 : NA	In hot spots of ANPE Control Network of Water Pollution 2010-2012. COPEAU AQUAPOLE	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater

pH	Dimensionless	-	-	-	V1 : 7.8-11.2 V2 : 8.0-8.4 V3 : 7.7-8.8 V4 : 8.4-8.7	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon, Ghar El Melh lagoon) COPEAU AQUAPOLE	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Electric Conductivity (EC)	(m S/cm)	-	-	-	V1 : 1.5-2.5 V2 : 0.2-0.5 V3 : 1.7-46.8 V4 : 2.0-7.0	In hot spots of ANPE Control Network of Water Pollution 2010-2012 COPEAU AQUAPOLE	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Nitrogen Concentration (NO_3)	ppm	-	-	-	V1 : NA V2 : NA V3 : 2.0-128.2 V4 : NA	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon Ghar El Melh lagoon) COPEAU	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Phosphorous Concentration (PO_4)	ppm	-	-	-	V1 : 1.3-33.0 V2 : 0.4-9.7 V3 : 0.1-71.8 V4 : 0.1-0.7	In hot spots of ANPE Control Network of Water Pollution 2006-2012 C0PEAU	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Total Dissolved Solids (TDS)	ppm	-	-	-	V1 : 730-1480 V2 : 110-220 V3 : 950-37800 V4 : 1200-5500	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon, Ghar El Melh lagoon) COPEAU	V1 : Medjerda V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Bacteriological Analysis	-Number of Samples -Unsuitable Cases (UC)	-	-	-	-48,251 samples -UC : 1.5%	SONEDE	1.5% <NT 09-14 limit and < WHO threshold
Fecal Choliform	Colonies/100 ml	-	-	-	1-3	SONEDE	Complies with the standards

Water & Health							
Diarrhea Prevalence	% of children under 5 years old	5.80	WHO	-	6.48	DHMPE	AA=5.80 (2000-2013)
Dracunculiasis Reported Cases	%	0.00	WHO	-	0.00	DHMPE	DHMPE, 2013
Open Defecation Practice	Number	-	-	-	348,540	INS	RGPH 2009
Percentage of Open Defecation	%	-	-	-	3.2	INS	RGPH 2009
Cholera Reported Cases	Number/Year	-	-	-	0.0	DHMPE	AA=0.00 (2000-2013)
Hepatitis A Reported Cases	Number/year	-	-	-	412	DHMPE	412 new reported cases in 2012
	Incidence rate (Cases number /100 000 inhabitants)	-	-	-	3.82	DHMPE	AA=7.33 (2000-2013)
Typhoid fever Reported Cases	Number/year	-	-	-	28	DHMPE	28 new reported cases in 2012
	Incidence rate (Cases number /100 000 inhabitants)	-	-	-	0.26	DHMPE	AA=0.55 (2000-2013)
Water & Ecosystems							
Number of Wetlands Sites Acknowledged by RAMSAR	Number	-	-	-	35	DG Forêts, RAMSAR, WWF, MAVA	40 in 2013
Total Wetlands areas	ha	-	-	-	877,467	DG Forêts, RAMSAR, WWF, MAVA	1,608,024 ha in 2013
Total Freshwater Species Count	Number	-	-	-	260 terrestrial plant species, 50 aquatic plant species, 140 bird species (most of which are migratory). 7 species of freshwater fish in dams.	DG Forêts, RAMSAR, WWF, MAVA	-
Number of Endangered Species	Number	-	-	-	Several species (>10)	DG Forêts, RAMSAR, WWF, MAVA	-

Number of Invasive Species	Number	-	-	-	>500,000 birds in winter from Asia and Europe (ducks, coots and flamingos	DG Forêts, RAMSAR, WWF, MAVA	-
Water & Climate							
Extreme Weather Events							
Number of Class 1 Flood Events	Number	-	-	-	0	DGRE	-
Number of Class 1.5 Flood Events	Number	-	-	-	1	DGRE	in fact two successive floods (February-March 2012)
Number of Class 2 Flood Events	Number	-	-	-	0	DGRE	-
Drought Events	Number	-	-	-	0	DGRE	-
Cost of Annual Damage Caused by Floods	$- % GDP	-	-	-	14,000 ha of cereals land lost	Civil Protection	NA
Cost of Annual Damage Caused by Droughts	$-% GDP	-	-	-	0	DGRE	-
Annual Human Losses Related to Floods	Number	-	-	-	Several deaths recorded Evacuation of several villages	Civil Protection	NA
Annual Human Losses Related to Droughts	Number	-	-	-	0	DGRE	-
Unusual Weather Events (Snow, Hail,…)	Number/Type	-	-	-	Snow:13 Events in 2012 Hail: 16 Events in 2012	INM	-
National Climate Change Adaptation Plan	Yes/No	-	-	-	Yes	OTEDD, DGRE	Ministry of Environment, Ministry of Agriculture
Water &Socio-Economics							
Water & Productivity							
Industrial Water Productivity (GDP/Water Use)	$/CM	138.83	CEDARE/AWC	-	145.33	INS, DGRE	GDP=12.93475 B$ WU=0.089 BCM/Year
Agricultural Water Productivity (GDP/Water Use)	$/CM	0.41	CEDARE/AWC	-	0.51	INS, DGRE DGGREE	GDP=3.89392 B$ WU=7.665 BCM/Year
Employment in Agriculture " Job Per Drop"	Jobs/MCM	97.46	CEDARE/AWC	-	71.75	INS, DGRE DGGREE	WU=7.665 BCM/Year Number of employed persons in agriculture :550,012
Employment in Industry " Job Per Drop"	Jobs/MCM	-	-	-	11, 993.67	INS, DGRE	WU=0.089 BCM/Year Number of employed persons in industry: 1,067,437

Water & Affordability							
Water and Sanitation Charges as % of Average Household Income	%	0.01 1 (INS)	Calculated/ MEWINA RAR	2011	1.26	INS (2010)	1980-2010 (INS) The survey is quinquennial (2010), last survey 2010
Water & Finance							
Percentage of National Budget directed to Water & Sanitation Sector	%	-	-	-	1.9	INS, Ministry of Finance, Ministry of Agriculture, ONAS, DHMPE	1.8 in 2013
Operation & Maintenance Cost Recovery for Water Supply and Sanitation	%	-	-	- 70	80.7	SONEDE	Urban Water Supply
					DGGREE	Rural Water Supply	
Percent of GDP directed to Sanitation and Hygiene	%	-	-	-	0.13	INS, ONAS, DHMPE	0.13 in 2013
Foreign Aid for Water and Sanitation	Million US$	106.31	CEDARE/AWC	-	-14.2 SONEDE -53.22 ONAS TOT : 67.42	DGFIOP, DGCI, Ministry of Finance, Ministry of Plan& International Coop, SONEDE, ONAS.	DGFIOP,DGCI, Ministry of Finance, Ministry of Plan& International Cooperation, SONEDE,ONAS
Operation & Maintenance Cost Recovery for Irrigation	%	-	-	-	64 (Irrigated areas)	DGGREE	DGGREE
Water & Trade							
Virtual Water Imports related to Trade in the Agricultural Sector	BCM/Year	13.01	CEDARE/AWC	-	10.22	DGCE	-
Virtual Water Exports related to Trade in the Agricultural Sector	BCM/Year	-4.78	CEDARE/AWC	-	-6.03	DGCE	-
Virtual-Water net Flow Related to Trade in the Agricultural Sector	BCM/Year	8.23	CEDARE/AWC	-	4.19	DGCE	-
Water & Governance							
IWRM Plan	Yes/No	-	-	-	Yes	DGRE, BPEH	-

National Water and Sanitation M&E & R System	Yes/No	-	-	-	No	DGRE, BPEH	-
Surface Water Permits Issued to Date	Number	-	-	-	170 in 2012	BIRH	162 in 2013 BIRH, DGRE, CRDA
Total Volumetric Rights Associated with surface Water Permits	BCM/Year	-	-	-	0.00544 in 2012	DGRE, BIRH, CRDA	DGRE, BIRH, CRDA
Volume associated with surface Water permits as a Percent of Annual Blue Surface Water Withdrawals	%	-	-	-	0.9	DGBGTH, BIRH, DGRE	Annual Blue Surface Water Withrawals = 0.615 BCM/Year.
Groundwater Well Permits Issued to Date	Number	-	-	-	1,232 in 2012	BIRH	1786 in 2013 BIRH, DGRE, CRDA
Total Volumetric Water Rights Associated with Well Permits	BCM/Year	-	-	-	0.05174 in 2012	DGRE, BIRH, CRDA	0.08394 in 2013 DGRE, BIRH, CRDA
Total Volume associated with well permits as a percent of Annual Blue Groundwater Abstractions	BCM/Year	-	-	-	2.99% in 2010 2.28% in 2012	DGRE, BIRH, CRDA	Annual Blue Groundwater Abstractions = 2.175 BCM in 2010 and 2.269 BCM in 2013
Number of unlicensed wells	Number/Year	-	-	-	1,636 in 2010	DGRE, BIRH, CRDA	DGRE, BIRH, CRDA
Irrigation & Drainage Related Complaints as a percentage of Irrigation Water Users	Number/Year	-	-	-	NA	DGGREE	DGGREE, CRDA
Water supply and Sanitation Related Complaints as a percentage of Serviced Households.	%	-	-	-	2.83	SONEDE, DGGREE	-300,000 complaints in 2012, -Serviced population: 10,593,500 inhabitants in 2012 by SONEDE and DGGREE.
Number of Water Supply Meters Installed as a Percent of Total Number of Covered Households	%	-	-	-	Urban: 99.4% Rural: 45.5% TOTAL : 83.0%	SONEDE	Statistical Directory 2012
Number of Groundwater Meters Installed as a percent of Licensed Wells	Number	-	-	-	NA	DGGREE	DGGREE, CRDA
Number of Surface Irrigation Meters Installed as a % of Surface Irrigation Water Permits	%	-	-	-	NA	DGGREE	DGGREE, CRDA
Physical Domestic Water Losses	MCM (%)	-	-	-	126.8 (78.7 %)	SONEDE	SONEDE
Overall Water Use Efficiency	%	-	-	-	89.5	DGBGTH, DGRE, SONEDE	DGBGTH, DGRE, SONEDE
Water Sustainability/ Depletion Index	%	-	-	-	48.4	DGBGTH, DGRE, DGGREE, SONEDE, ONAS	DGBGTH, DGRE, DGGREE, SONEDE, ONAS
Wastewater and Drainage Outflows	BCM/Year	-	-	-	0.292	ONAS, DGGREE, DGRE	ONAS, DGGREE, DGRE
Transboundary Wastewater and Drainage Outflows	BCM/Year	-	-	-	0.00	ONAS, DGGREE, DGRE	ONAS, DGGREE, DGRE

Commercial Domestic Water Losses	BCM/Year (%)	-	-	-	0.0343 (21.3 %)	SONEDE	SONEDE
Physical Irrigation Water Losses	BCM/Year	-	-	-	38% (Estimated) BCM/Year NA	DGGREE	Efficiency rate in irrigated plots=77% in 2012
Number of Water related citations (Water Laws Enforcement)	Number	-	-	-	188	BIRH, DGRE	267 in 2013 BIRH, DGRE, CRDA
Number of Water Users Associations	Number	-	-	-	2,580	DGGREE	1,327 WUA (GAD) Water Supply + 1,253 WUA (GAD) Irrigation
Water Users Associations Agricultural Land Coverage	% of Ag. Land	-	-	-	47,5% of Irrigated areas, 1.0 % of Agricultural land	DGGREE	200,000 ha covered in 2012
Water & International Relations							
Transboundary Water Bodies Dependency Ratio	%	8.00	CEDARE/AWC	-	6.5	DGRE	((320+100 + +149 +610)/ (18,140))*100
Shared Waters related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms	Number	-	-	-	1	OSS,DGRE, ANRH, GWA	Consultation Mechanism
Number of Riparians sharing all shared water bodies	Number	-	-	-	1,700,000 inhabitants	OSS,DGRE, INS	Estimated from 2014 INS census.
Number of Shared Water Resources	Number	-	-	-	2 Shared aquifers + 1 Shared river	OSS,DGRE, ANRH, GWA	2 Shared aquifers:NWSAS & Djeffara plain,&1 Shared river: Medjerda

Total: 155 indicators including 22 additional specific indicators

COMMENTS ON THE 2012 INDICATORS VALUES:

Definitions, Methodology of calculation and institutions in charge of measuring and/or estimating the indicators are given in Table 5.

1. Water & Availability:

Annual Spacially Averaged Precipitation Depth 153.0 mm in 2012/13 measured on 690 stations (Deficit year in rain)

Annual Average Precipitation Volume: 153.0 mm*154 922 km2 = 23.7 BCM/Year

Blue Water:

- Internal Renewable Groundwater (IRGW): (IRGW)= (TIGW)-(INRGW) = (2.164)-(0.610) = 1.554 BCM/Year
- Total Internal Renewable Blue Water Resources (TIRBWR)= (IRSW)+(IRGW) –(OSWGW)= (2.7)+(1.554)- (0.400)= 3.854 BCM/Year
- External Surface Water Inflow (ESWI) = 0.320 BCM/Year
- External Surface Water Outflow (ESWO) = 0.190 BCM/Year as follows.

Table 10. External surface water inflow and External Surface Water outflow in Tunisia

Basin	Wadi	Area in Tunisia (km²)	Area in Algeria (km²)	Algerians basins input at the boundary (MCM)	Tunisians basins input at the boundary (MCM)
Extreme North West	Zarga		21.25	**9**	
	Mellila	104			51
	Barbra	200	17.5	8	91
	Upstream Bougouss	23	8	4	11
	Melkeir Edir	65	16	7	30
Subtotal 1				**28**	**183**
Mejrda	Ennemra		44	8	
	Mejrda	32.2	1430	145	4
Mellegue	Mellegue, Horihie, Ezzarga, Sammaa	17.2	6405	120	2
Subtotal 2				**273**	6
Extreme South West	Safsaf		1218	12	
	Kébir		805	4	
	Horchane		504	1	
	Laouej		256	0.5	
Subtotal 3				**17.5**	
Total		**441**	**10725**	**318.5≈320**	**189≈190**

- Total External Renewable Blue Water Resources Inflow (TERBWR)=(ESWI+(EGI)= 0.320 + 0.100 = 0.420 BCM/Year
- Total Renewable Blue Surface Water (TRBSW)= (IRSW)+(ESWI)-(ESWO)= (2.700) + (0.320) – (0.190) = 2.830 BCM/Year
- Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO) = (1.554)+ (0.100) – (0.00)= 1.654 BCM/Year
- Overlap between Surface Water and Groundwater (OSWG)= 0.400 BCM/Year, corresponding to the low water flows of wadi during dry seasons
- Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSW)= (2.830) + (1.654) - (0.400) = 4.084 BCM/Year
- Total Exploitable Non-Renewable Groundwater (TNRG) TENRGW= 0.610 BCM/ Year in 2012 (Source: GW Abstraction Directory), TENRGW= 0.720 BCM/Year in 2050 (Source: NWSAS projection of the mathematical model)
- Total Blue Water Resources (TBWR)(TBWR)= (TBSWR)+ (TBGWR)- (OSWGW)=(2.830) +(2.264+0.100)- (0.400)= 4.694 BCM/Year, (TBWR)=(TRBWR)+ (TNRBWR)=(4.084)+ (0.610) = 4.694 BCM/Year

Green Water:

Green Waters cover rainwater intercepted by: (i) rain-fed agriculture (field crops and dry agriculture), (ii) forests and rangelands. The covered areas are:

- Field crops: 1,764,500 ha:
  - Cereals: 1,244,000 ha
  - Fodder: 436,000 ha
  - Leguminous: 84,500 ha
- Dry arboriculture: 1,995,000 ha
  - Olive trees: 1,549,000 ha
  - Olive and almond trees intercropped: 165,000 ha
  - Olive and fruit trees intercropped: 69,500 ha
  - Vineyards: 18,500 ha
  - Almond trees: 193,000 ha
- Forests and Rangelands: 5,505,800 ha
  - Forests: 666,300 ha
  - Rangelands: 4,326,000 ha
  - Alfa and halophyte plants: 513,500 ha

Green water is calculated on the basis of annual plant needs. These needs are generally satisfied when the annual rainfall for the current year is equal to or greater than the average annual rainfall in the country, and well distributed in time and space. The areas indicating field crops and dry arboriculture are derived from the annual survey on monitoring the crop season developed by DGEDA (Agricultural sector indicators, January 2012), while the area covered by forests and Alfa grass are the responsibility of DG Forestry. The assumptions considered in the survey are: (i) the max, min, and average plant needs.

Water for Rain-fed Agriculture Consumptions: 5.500 BCM/Year

Water for Rain-fed Pasture Consumption: 6.000 BCM/Year

Water for Rain-fed Forest Consumption: 1.500 BCM/Year

Total Renewable Green Water Resources (TRGWR): 13.000 BCM/ Year

Total Renewable Water Resources: (TRWR)=(TRBWR+TRGWR)= (4.084) + (13.000) = 17.084 BCM/Year

Total Conventional Water Resources: (TCWR)=(TRWR)+(TNRG)=(17.084) + (0.610) = 17.694 BCM/Year, (TCWR)=(TBWR)+(TRGWR)= (4.694) + (13.000)= 17.694 BCM/Year

Non Conventional Water:

Produced Municipal and Industrial Wastewater (PMIW): (0.239 + 0.037)= (0.276) BCM in 2012 (Source: ONAS Annual Report 2012)

Treated Municipal and Industrial Wastewater (TMIW): 0.232 BCM in 2012 (Source: ONAS Annual Report 2012)

Reused Treated Municipal and Industrial Wastewater: 0.06 BCM in 2012 (Source: ONAS Annual Report 2012)

Treated wastewater reused in agricultural irrigation: 0.025 BCM in 2012 (Source: DGGREE Annual Report 2012)

Produced Agricultural Drainage (PAD): 0.140 BCM in 2012 (DGRE 2011)

Produced Desalinated Water (PDW): 0.030 BCM in 2012 of which 19.7 MCM produced in 2012 by SONEDE, and about 10 MCM by private sector (Source DGRE, 2011)

Total Non-Conventional Water Resources (TNCWR)=(PMIW)+(PAD)+(PDW)=(0.276)+(0.140)+(0.030) = 0.446 BCM

Total Available Water Resources (TAWR)=(TCWR)+(TNCWR)= (17.694)+ (0.446)= 18.140 BCM/Year

2. Water & Uses:

- Withdrawals for Domestic Water Use: (Water Supply by SONEDE) + (Water Supply by DGGREE) = (0.451) + (0.044)= 0.495 BCM/Year (Source: SONEDE 2012 Annual report and DGGREE 2012 Annual report)
- Withdrawals for Industrial Water Use: (Water Supply by SONEDE) + (Own resources: private wells) +(Mineral water plants) = (0.046) +(0.042) + (0.001) = 0.089 BCM/Year
- Withdrawals for Agricultural Water Use (Blue water+ Non-conventional water) = (2.140) + (0.025)= 2.165 BCM in 2012

- Blue Water Withdrawals for Agriculture Use: 2.140 BCM in 2012 (DGGREE 2012 Annual Report)
- Non Conventional Water for Agriculture Use: 0.025 BCM (DGGREE 2012 Annual Report)
- Annual Total Water Withdrawals: (Withdrawals for Domestic Water Use+ Withdrawals for Industrial Water Use + Withdrawals for Agricultural Water Use) = (0.495 + 0.089 + 2.165) = 2.749 BCM
- Green Water Consumption for Agricultural water use= 5.500 BCM in 2012
- Total Agricultural Water Uses= Withdrawals for Agricultural Water Use (Blue water+ Non-conventional water) + Green Water Consumption for Agricultural water use = (2.165)+(5.500) =7.665 BCM in 2012
- Withdrawals from Blue Surface Water = 0.615 BCM in 2012/13 (Source DGBGTH)
- Withdrawals from Blue Renewable Groundwater = 1.511 BCM in 2010 (2012 data non available in DGRE)
- Withdrawals from Blue Non Renewable Groundwater = 0.610 BCM in 2010 (2012 data non available in DGRE)
- Total Withdrawals from Blue Water = (Withdrawals from Blue Surface Water) + (Withdrawals from Blue Renewable Groundwater) + (Withdrawals from Blue Non Renewable Groundwater)
- TWBW = (0.615) + (1.511) + (0.610) = 2.736 BCM in 2012
- Agricultural Drainage Water Use= 0.020 BCM/Year (DGRE 2011)
- Total Withdrawals from Non-Conventional Water Resources= (Withdrawals from treated Municipal and Industrial Water) + (Withdrawals from Drainage Water) + (Withdrawals from Desalinated Water)
- TWNCWR = (0.060) + (0.020) + (0.030) = 0.110 BCM (Source DGRE).
- Green Water Consumption for Livestock Fodder Water Use = 0.760 BCM/Year
- Bottled Water Production= 1.1 MCM in 2012 and 1.1 MCM in 2013 (Source Office of Hydrotherapy)
- Specific Consumption: 106.88 l/capita in 2012 and 107.23 l/capita in 2013.

3. Water & Land Use Changes:

- Total Irrigated Agricultural Land: 421,000 ha (Source DGGREE)
- Total Rain-Fed Agricultural Land: 4,953,550 ha (Source DGEDA 2013)
- Total Forests Land: 1,151,218 ha (Source DGF: Results of the second national forest and pastoral inventory 2010.)
- Total Natural Pasture Land: 4,895,000 ha (Source DGF: Results of the second national forest and pastoral inventory 2010.)
- Urban Encroachment on Green Cover: 10,000 ha lost/Year
- Impact of Urban Encroachment on Water Resources:

  i) Decrease in groundwater recharge:

  - 10,000 ha lost/year, annual average precipitation depth: 253 mm, recharge rate: 5%,
  - Decrease of Groundwater Recharge: 0.253*10,000*104 *0.05 =1.26 MCM/Year

  ii) Decrease in water consumptions of Green Cover:

  - Water Use for Green Cover: 3,000 CM/Year

- Decrease in water consumptions of Green Cover: 3,000* 10,000= 30 MCM/Year

iii) Increase in Surface Runoff: Decrease in groundwater recharge + Decrease in water consumptions of Green Cover = 1, 26 + 30 = 31, 26 MCM/Year

iv) Increase in Domestic Water Withdrawals:

- Between 2011 and 2012 SONEDE recorded an increase of 3% in the subscriber's number and of 7.5% in the volume of water consumed corresponding to 30 MCM more.

4. Water & Services:

Water Coverage and Accessibilility:

- Improved Urban Water Supply Coverage (Sector Ministry) = 100% in 2012 (Source SONEDE 2012 Statistical Report)
- Improved Rural Water Supply Coverage (Sector Ministry) = 93.4 % in 2012 (49.7% by SONEDE and 43.7% by DGGREE), (Source SONEDE 2012 Statistical Report and DGGREE 2012 Annual Report)
- Improved Water Supply Coverage (Sector Ministry) =97.8% in 2012 (Source SONEDE 2012 Statistical Report and DGGREE 2012 Annual Report)
- Improved Water Supply Coverage (JMP): 99%
- Urban Sanitation Coverage (Sector Ministry) = 85.4% in 2012 (Source ONAS 2012 Statistical Report)
- Improved Urban Sanitation Coverage (Sector Ministry) = 98.94% in 2009 (Source INS, 2012 data NA)
- Rural Sanitation Coverage (Sector Ministry) = 5.1% (Source ONAS)
- Improved Rural Sanitation Coverage (Sector Ministry) = 83.95% in 2009 (Source INS, 2012 data NA)
- Improved sanitation means: (i) the connection to the public sewerage network (ONAS and municipalities), (ii) the discharge of wastewater into septic tanks, cesspools or seguia collectors.
- Sanitation Coverage (Sector Ministry) = 58.4% (Source ONAS)
- Improved Sanitation Coverage (Sector Ministry) = 94.44 % in 2009 (Source INS, 2012 data NA)

Water Infrastructure:

- Dam Storage Capacity (Installed): 2.152 BCM/year in 2012, Source: DGBGTH

Dam Storage initial total capacity = 2.622 BCM/year

Dam Storage usable capacity = 2.152 BCM/year in 2012

Dam Storage usable capacity = 2.112 BCM/year in 10/09/2014

Calculated Dam Storage usable capacity = 1.948 BCM/year in 10/09/2014

- SONEDE Water Supply Capacity: is the sum of surface water supply capacity (treated water + desalinated water + deferrizated water) and groundwater supply capacity.

SONEDE WSC = (0.4652 + 0.0254 + 0.0079) + (0.2566) = 0.4984 + 0.2566 = 0.755 BCM in 2012

DGGREE Rural Water Supply Capacity (NA) must be added, such as private desalinated water capacity (10 MCM/Year).

- SONEDE Desalination Capacity: 0.0254 BCM in 2012 (not included drinking water treatment and deferrization plants capacity).

Private Desalination stations must be added (10 MCM/Year).

5. Water & Energy:

- Electricity Generated Using Hydropower: 110.56 GWh/Year by 7 hydropower plants built between 1956 and 2003 (Source: STEG 2012)
- Hydropower as % of Total Generated Electricity: Electricity Generated Using Hydropower (GWh)/ Total Generated Electricity (GWh) = (110.56) / (14 123.2)*100 = (0.7) # 1 % in 2012 (Source: STEG 2012)
- Installed Hydropower Capacity: 66.00 MW in 2012 disaggregated as follows: (1) Nebeur Hydropower plant: 13 MW, (2) El Aroussia : 4.8 MW, (3) Fernana: 9.7 MW, (4) Kasseb: 0.66 MW, (5) Sidi Salem: 36 MW, (6) Bouheurtma: 1.2 MW, (7) and Sejnane: 0.6 MW (Source STEG 2012).
- Water Used to Generate Electricity: 830.8 MCM in 2012 disaggregated as follows: (1) Nebeur Hydropower plant: 44.5 MCM, (2) El Aroussia : 0.0 MCM, (3) Fernana: 37.9 MCM, (4) Kasseb: 32.4 MCM, (5) Sidi Salem: 701.7 MCM, (6) Bouheurtma: 14.3 MCM, (7) and Sejnane: 0.0 MCM (Source STEG 2012).

6. Water & Population:

- Internal Renewable Water Resources Per Capita = (Total Internal Renewable Blue Water Resources (TIRBWR) + Total Renewable Green Water Resources (TRGWR))/ Population = 3.854 BCM/Year + 13.000 BCM/Year)/ 10 776 400 capita = 1,564 CM/Capita/Year.
- Total Renewable Blue Water Resources Per Capita: (TRBWR)=((TRBSW)+(TRBG)-(OSWG))/ Population =((2.830) + (1.654) + (0.400))/10 776 400 = 4.084/ 10 776 400 = 378.9 CM/Capita/ Year
- Total Renewable Water Resources Per Capita: (TRWR) = (TRBWR+TRGWR) Per Capita = (4.084+ 13.000)/ 10 776 400 = 17.084 / 10 776 400 = 1,585.3 CM/Capita/ Year.
- Total Available Water Resources Per Capita: (TAWR) = ((TCWR) + (TNCWR))/ Population) = ((17.694)+ (0.446))/ 10 776 400 = 1,683.0 CM/Capita/Year.
- Blue Water Withdrawal Per Capita: Total Withdrawals from Blue Water = (Withdrawals from Blue Surface Water) + (Withdrawals from Blue Renewable Groundwater) + (Withdrawals from Blue Non Renewable Groundwater)

TWBW = (0.615) + (1.511) + (0.610) = 2.736 BCM in 2012

Blue Water Withdrawal Per Capita: 2.736 BCM /10 766 400 = 254 CM/Capita/Year

- Green Water Use Per Capita: Total Renewable Green Water Resources (TRGWR)/ Population: (13.000 BCM/Year)/ 10 776 400 = 1206 CM/Capita/Year.
- Total Water Consumption Per Capita: (Blue Water Withdrawal + Green Water Use)/ Population = (2.736+ 13.000 BCM/Year)/ 10 776 400 = 15.736 / 10 776 400 = 1460 CM/Capita/Year.
- Agricultural Water Withdrawal Per Capita: (Blue water+ Non-conventional water) = (2.140)+ (0.025)= 2.165 / 10 776 400 = 201 CM /Capita/Year in 2012
- Industrial Water Withdrawal Per Capita: (Water Supply by SONEDE) + (Own resources: private wells) +(Mineral water plants) = (0.046) +(0.042) + (0. 001) = 0.089 BCM/Year

Industrial Water Withdrawal Per Capita: 0.089 /10 776 000 = 8.25 CM /Capita/Year in 2012

- Domestic Water Withdrawal Per Capita: (Water Supply by SONEDE) + (Water Supply by DGGREE)= (0.451) + (0.044)= 0.495 BCM/Year (Source: SONEDE 2012 Annual report and DGGREE 2012 Annual report)

Domestic Water Withdrawal Per Capita = (0.495 BCM/Year)/ 10 776 400 = 46 CM /Capita/Year in 2012

- Population without Improved Water Supply:

240 000 inhabitants in 2012 (Source SONEDE and DGGREE 2012))

239 900 inhabitants in 2012 (Source INS 2012)

- Population without Improved Sanitation: 579 700 inhabitants in 2012 (Source INS)

7. Water & Health:

- Diarrhea Prevalence (% of children under 5 years old) = 6.48% in 2012 (Source DHMPE). The annual Average 2000-2013 is 5.80%.
- Dracunculiasis Reported Cases (%) = 0.00 % in 2012 (Source DHMPE), unsignaled in Tunisia for a long time.
- Open Defecation Practice (Number) = (85 218 households *4.09)= 348 540 inhabitants in 2012 (Source INS, RGPH 2009 edited in 2012)
- Percentage of Open Defecation (%) = (348 540)/ (10 776 400) = 3.2 % (Source INS, RGPH 2009 edited in 2012)
- Cholera Reported Cases (Number per year) = 0.00 % in 2012 (Source DHMPE). The Annual Average 2000-2013 is 0.00 %.
- Hepatitis A Reported Cases = 412 new reported cases in 2012 (Source DHMPE)

Incidence rate (Cases number /100 000 inhabitants) = 3.82 in 2012 (Source DHMPE). The Annual Average 2000-2013 is 7.33 %

- Typhoid fever Reported Cases = 28 new reported cases in 2012 (Source DHMPE)
- Incidence rate (Cases number /100 000 inhabitants) = 0.26 in 2012 (Source DHMPE). The Annual Average 2000-2013 is 0.55 %

8. Water & Quality:

Institutions that ensure monitoring and evaluation of water quality are: (i) DGRE (BIRH) for the quality of natural water through its network (TDS, nitrates), (ii) SONEDE for physico-chemical and bacteriological quality of drinking water (50 000 samples /year), (iii) DHMPE also performs control operations on public wells and water supply networks (residual chlorine and bacteriological analyzes) on drinking water, wastewater, and treated wastewater (total of 50 000 samples / year), (iv) ONAS for water at the entrance and exit of its WWTP, (v) and ANPE for controlling water pollution (COPEAU) in receiving environments.

The 2012 data were drawn from the 2012 annual report of ANPE related to the network of monitoring water quality in Tunisia, being edited.

This network is composed of water sampling stations, installed on: (i) three watersheds (wadi Medjerda, wadi Miliane and wadi El Bey), (ii) three lagoons (Bizerte, Ghar El Melh and Halg El Menjel) (iii) sebkha of Korba, (iv) wadis and dams in the north of Tunisia, (v) and groundwater resources. This network has undergone modifications and extensions in recent years. At least two sampling campaigns are conducted annually and the results are published in the corresponding directory.

Table 11. Water Quality parameters (2012 data)

	Dissolved Oxygen (mg O_2/l)	pH	Electric Conductivity (mS/cm)	Nitrogen Concentration (mg/l) # NO_3	Phosphorus Concentration (mg/l) # PO_4	TDS (mg/l)
Medjerda Watershed main stream, up to down (March-April 2012)	7.7-8.5	7.8-11.2	1.5-2.5	NA	1.3-33	730-1,480
Miliane Watershed main stream, up to down (February-September 2012)	1.6-4.1 <PNT 09.85 (6 mg/l)	8.0-8.3 Conform to PNT 09.85	1.5-13.6	NA	0.7-10.0	1,130-7,900
Wadi El Bey (February-November 2012)	NA	6.16-9.0	1.1-11.41	3.0-150	NA	713-6,112
Bizerte lagoon (January-December 2012)	NA	7.7-8.77	1.73-46.8	2.0-128.2	0.1-71.8	950-37,800
Jendouba dams (April 2012)	4.9-6.4	7.8-8.4	0.13-1.22	NA	1.3-13.8	60-600
Beja dams (April 2012)	5.39-6.45	8.0-8.4	0.22-0.45	NA	0.4-9.7	110-220
Bizerte dams (September 2012)	4.6-6.06	8.41-8.77	0.4-1.06	NA	NA	201-534
Nabeul dams (January 2012)	NA	8.7-8.8	0.25-4.2	NA	0.3-3.7	300-3,000
Nabeul Groundwater (January 2012)	NA	8.4-8.7	2.0-7.0	NA	0.1-0.7	1,200-5,500
Kairouan Groundwater (February 2012)	NA	8.2-8.5	0.5-4.2	2.5-8.5	0.05-1.7	400-3,500
Sfax Groundwater (January 2012)	NA	7.5-8.5	2.2-6.5	NA	NA	1,500-4,300

Source: ANPE, Réseau de surveillance de la qualité de l'eau en Tunisie- Rapport annuel 2012.

Water quality must comply with the NT.09.14 standard, which specifies the values of the following parameters should be as follows: pH between 6-9, Conductivity 180 micro-Siemens / cm, Dissolved Oxygen 6 mg / l, Nitrates between 10-50 mg / l, Phosphorus 0.05-0.2 mg / l, Phosphates 0.1-0.5 mg /

l, and Total Choliform 500-1000 units / 100 ml.

Regarding the bacteriological analysis, SONEDE conducted in 2012 bacteriological analysis of 48,251 samples. Different analyzes have resulted in an average percentage of 98.5% suitable cases.

The table below summarizes the evolution of sampling and bacteriological analysis for the period (1995-2012):

The average percentage of cases unsuitable for all Tunisia, at 1.5% in 2012, is still below the limit required by the NT 09.14 and 5% threshold tolerated by the World Health Organization standard.

Table 12. Bacteriological analysis, historical data (1995-2012)

Analyses Bactériologiques

Désignation	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nombre de prélèvements	33175	38901	45714	48174	49864	51278	51236	49396	51125	53935	52884	51767	47458	47964	47082	47569	49150	48251
Cas propres %	98,2%	98,0%	98,2%	98,1%	97,7%	98,2%	98,6%	98,9%	98,4%	98,5%	98,3%	98,3%	98,8%	98,7%	99,0%	99,1%	99,0%	98,5%
Cas impropres %	1,8%	2,0%	1,8%	1,9%	2,3%	1,8%	1,4%	1,1%	1,6%	1,5%	1,7%	1,7%	1,2%	1,3%	1,0%	0,9%	1,0%	1,5%

Tab1 Tab-Texte AEP

Source: SONEDE

9. Water & Ecosystems:

Wetlands in Tunisia:

Tunisia has:

- 211 natural wetlands, and
- 866 artificial wetlands.

Tunisia has (in 2013), 40 wetlands of international importance, on the list of the RAMSAR Convention, which contributes to the conservation and enhancement of wetlands in the world.

2007 State: 19 wetlands in Tunisia covering an area of 713,903 ha

2012 State: 35 wetlands in Tunisia covering an area of 877,467 ha

2013 State: 40 wetlands in Tunisia covering an area of 1,608,024 ha

Table 13. State of 2013 RAMSAR sites

Name of the Wetland	Registration date on the list of the Ramsar Convention	Governorate	Area (ha)
Sebkhet Sijoumi	07/10/2007	Tunis	2,979
Ghar el Melh Lagoon & Delta of Medjerda	07/10/2007	Bizerte and Ariana	10,168
Ichkeul Lake	24/03/1981	Bizerte	12,600

Name of the Wetland	Registration date on the list of the Ramsar Convention	Governorate	Area (ha)
Lake and bog of Majel Ech Chitan	07/10/2007	Bizerte	7
Lebna Dam	07/10/2007	Nabeul	1,174
Lagoon od Eastern Cap Bon	07/10/2007	Nabeul	504
Sebkhet Soliman	07/10/2007	Nabeul	808
Oued el Hajar Dam	02/02/2012	Nabeul	254
Sidi Abdelmoumen Dam	02/02/2012	Nabeul	31
Sidi el Barrak Dam	02/02/2012	Beja	2,734
Dar Fatma Bogs	07/10/2007	Jendouba	20
Ain Dahab	07/10/2007	Siliana	560
Sabkhet Halk el Menzel & Oued Essed	02/02/2012	Sousse	1,450
Sabkhet el Kelbia	07/10/2007	Sousse	8,732
Sabkhet Sidi el Hani	02/02/2012	Sousse	36,000
Sidi Saad Dam	02/02/2012	Kairouan	8,650
Merguellil Dam	02/02/2012	Kairouan	20,000
Monastir Salines	02/02/2012	Monastir	1,000
Sabkhet Noual	07/10/2007	Sidi Bouzid	17,060
Thyna Saline	07/10/2007	Sfax	3,343
Kerkennah	02/02/2012	Sfax	15,000
Kneiss islands with intertidal zones	07/10/2007	Sfax	22,027
Oued Rmal	02/02/2012	Zaghouan	620
Garaet Douza	02/02/2012	Gafsa	1,400
Gorges of Thelja	02/02/2012	Gafsa	675
Chott el Guettar	02/02/2012	Gafsa	7,400
Chott el Djerid	07/10/2007	Tozeur and Kebili	586,187
Oasis Wetlands of Kebili	07/10/2007	Kebili	2,419
Djerba Ras Rmel	07/10/2007	Mednine	1,856
Djerba Guellala	07/10/2007	Mednine	2,285
Djerba Bin el Ouedian	07/10/2007	Mednine	12,082
Bhiret el Bibane	07/10/2007	Mednine	39,266
Gulf of Boughrara	02/02/2012	Mednine	50,000
Oued Dekouk	02/02/2012	Tataouine	5,750
Garaet Sidi Mansour	07/10/2007	Gafsa	2,426
Tunis Lake	2013	Tunis/Ben Arous	2,243
Ghedir El Goulla and Mornaguia dams	2013	Manouba/Tunis	273
Melaabi Dam	2013	Nabeul	98
Complex Wetlands of Chott El Guettaia & Sebkhet Dreiaa with Akarit, Rekhama et El Maleh wadis	2013	Sfax Gabes	4,845
Complex Wetlands of Sebkhet Oum Ez-Zessar & Sebkhet El Grine	2013	Mednine	9,195
Total : 40			1,608,024

In Tunisia, the wetlands support 260 terrestrial plant species, 50 aquatic plant species and 140 bird species, most of which are migratory. Wetlands host annually in winter, more than 500,000 birds from Asia and Europe. For example, Tunisia is home to an annual average of 250,000 ducks and coots in January, 58% of the Maghrebian population and 25,000 flamingos, one-third of the Mediterranean population.

Water& Ecosystems indicators (2012) are:

- Number of Wetlands Sites Acknowledged by RAMSAR: 35 (2012) then 40 (2013)
- Total Wetlands areas: 877,467 (2012) then 1,608,024 ha (2013)
- Total Freshwater Species Count: 260 terrestrial plant species, 50 aquatic plant species,140 bird species (most of which are migratory)
- Number of Endangered Species: Several species (>10)
- Number of Invasive Species: >500,000 birds in winter from Asia and Europe (ducks, coots and flamingos).

Source:

(i) Les zones humides d'importance internationale en Tunisie, 35 sites RAMSAR ; WWF, MAVA Fondation pour la nature, MA DGF.

(ii) Atlas des aires protégées en Tunisie

10. Water & Socio-Economics:

Water Productivity:

- Industrial Water Productivity: Industrial GDP/(Industrial Water Withdrawal), Economic Value added (in US$) per cubic meter of water withdrawn by industry.

IWP=12.93475 (B$)/0.089 (BCM/Year)= 145.33 $/CM in 2012

Source INS, DGRE.

- Agricultural Water Productivity: Economic Value added (in US$) per cubic meter of water withdrawn by agriculture: it is the gross agricultural revenue divided by the total agricultural water consumption (including irrigation withdrawals and rain fed agriculture green water consumption)

AWP=3.89392 (B$)/7.665 (BCM/Year) = 0.51 $/CM in 2012.

Source: INS, DGRE, DGGREE.

- 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) = 55,012 persons/7.665 BCM/Year= 71.75 Jobs/MCM in 2012.

Source: INS, DGRE, DGGREE.

- Employment in Industry "Job Per Drop": The ratio of total labor employed in Industry to the total

industrial withdrawals= 1,037,437 persons/0.089 BCM/Year= 11, 993.67 Jobs/MCM in 2012.

Source INS, DGRE.

Tariffs & Affordability:

- Water and Sanitation Charges as % Average Household Income: Data are for 2010 because the survey is quinquennial.

Water and Sanitation Charges= 22.996 DT (Invoice) +3.015 DT (Water tanks) +6.645 DT (Mineral water) = 32.656 DT per person in 2010 (Source: INS)

Average Household Income: 4,861.1 DT in 2010 (Source INS).

Water and Sanitation Charges as % Average Household Income= 32.656 DT*100/4,861.1 DT = 0.7% in 2012

11. Water & Finance:

- Percentage of National Budget directed to Water & Sanitation Sector: Water and Sanitation Budget/ Total National Budget

2012 Value: Water & Sanitation Budget = 492.8 MTDN= 308.9856 106 $, Total National Budget =25,551.0 MTDN = 16,020.447 106 $ and % of National Budget directed to Water & Sanitation Sector is 308.9856 106 $/ 16, 020.447 106 $ = 1.9%.

2013 Value: % of National Budget directed to Water & Sanitation Sector is: 1.8%.

Source: INS, Ministry of Finance, Ministry of Agriculture, ONAS, DHMPE.

- Percentage of GDP directed to Sanitation and Hygiene: Sanitation and Hygiene Budget/GDP

2012 Value: Sanitation and Hygiene Budget = 91.5 MTDN = 57.3705 106 $, GDP = 70,584.6 MTDN = 44.256544 109 $ and % of GDP for Sanitation and Hygiene is 57.3705 106 $/44.256544 109 $ = 0.13%.

2013 Value: % of GDP for Sanitation and Hygiene is also: 0.13%

Source: INS, ONAS, DHMPE

- Operation & Maintenance Cost Recovery for Water Supply and Sanitation =80.7% in 2012 (Source SONEDE)
- Operation & Maintenance Cost Recovery for Irrigation =64% in 2012 (Source DGGREE)
- Foreign Aid for Water and Sanitation: Not Available

12. Water & Trade:

Hoekstra and Chapagain (2001) provided reference tables that provide the approximate volume of water needed to produce one kilogram 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

- Virtual Water Imports, Exports and Virtual-Water Net Flow Related to Trade in the Agricultural Sector:

Virtual Water Imports: 10 225.342 MCM in 2012

Virtual Water Exports: 6 032.021 MCM in 2012

Virtual-Water Net Flow: 4 193.321 MCM in 2012

Source: DGCE (Ministry of Trade)

Table 14. Virtual-water net flow: importation/exportation 2012

Item	Virtual Water Imports MCM (1)	Virtual Water Exports MCM (2)	Virtual-Water Net Flow MCM (3) (3)=(1)-(2) expressed in (+x MCM or –x MCM)
Wheat and Flour	2,177.738992	2.674670	2,175.064322
Maize	777.317715	1.363500	775.954215
Rice	40.678996	0	40.678996
Barley	692.821940	0	692.821940
Potatoes	3.120180	1.214565	1.905615
Pulses (total)	22.403842	2.080244	20.323598
Vegetables (total)	7.645755	9.726600	-2.080845
Fruits (total)	5.485025	72.199400	-66.714375
Sugar (Refined)	738.920811	1.361874	737.558937
Fats & Oils (total)	5,479.956000	5,689.260000	-209.304000
Red Meat	153.792228	0.743856	153.048372
Poultry Meat	6.322140	3.431142	2.890998
Eggs	1.198800	0	1.198800
Milk & Dairy products.	117.940000	247.965000	-130.025000
Total	10,225.342 424	6,032.020 851	4,193.321 573

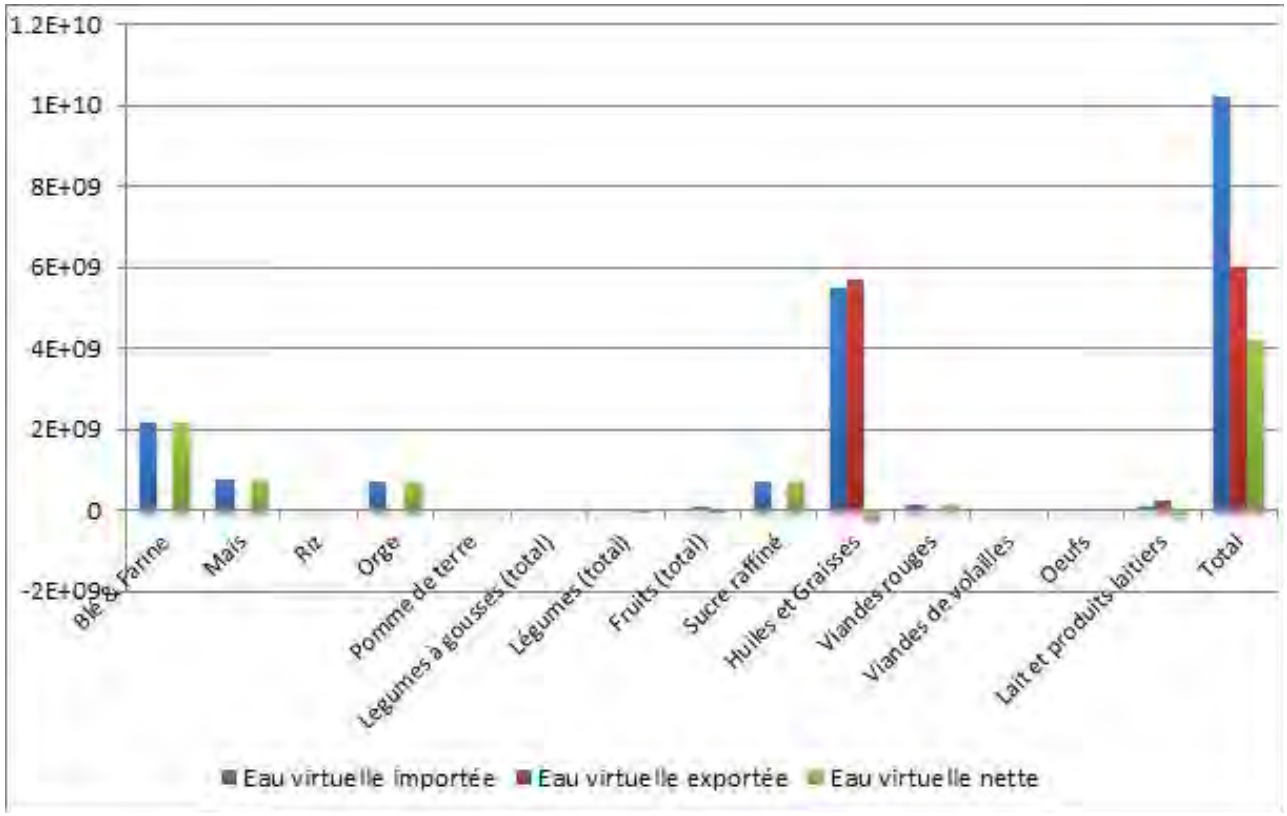


Figure 3. Virtual-water net flow: importation/exportation 2012 (Graph)

13. Water & Governance:

- Physical Domestic Water Losses:

Water losses:

Water losses are either, visible (commercial) losses or actual (physical) losses. It is for this reason that the IWA uses the concept of volume not sold or unbilled water: Non Revenue Water (NRW) in establishing water balance. The concept of Water Not recorded (unaccounted For Water: UFW) is increasingly neglected also because of the confusion it could generate as a result of different interpretations.

Apparent water losses or Commercial losses (CL): is the volume of water consumed but integrated into losses due to measurement errors (imprecision meters) and consumption diverted (fraud).

Actual water losses or Physical losses (PL): is the volume of effective water loss from service to the subscriber meter. They cover all types of leaks (pipes, connections), pipes rupture, overflowing tanks, etc…

The losses distribution on SONEDE water supply networks in 2012 is recorded as follows:

Table 15. Commercial & Physical Water Losses on SONEDE networks (2012)

Losses	Production		Distribution		Total	
	MCM	%	MCM	%	MCM	%
Commercial Water Losses	12.1	7.5	22.2	13.8	34.3	21.3
Physical Domestic Water Losses	39.2	24.3	87.7	54.4	**126.8**	**78.7**
Total	51.3	31.8	109.9	68.2	161.2	100.0

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

Withdrawals from Original Sources= Withdrawals from surface water, renewable and non-renewable groundwater, and desalinated water = 0.615 + 1.511 + 0.610 +0.030 = 2.766 BCM in 2012

Wastewater and Drainage Outflows: Wastewater and Agricultural Drainage flowing out of the system= (0.232- 0.060) + (0.140 – 0.020) = 0.292 BCM in 2012.

Overall Water Use Efficiency: 100*(2.766 – 0.292)/ (2.766) = 89.5 % in 2012.

Source: DGBGTH, DGRE, DGGREE, SONEDE, ONAS

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

TSI = (2.766+ 5.5)/ (4.084+ 13.000) = 48.4 % in 2012.

Source: DGBGTH, DGRE, DGGREE, SONEDE, ONAS.

- Number of Water Users Associations: 2580 Groupings of Agricultural Development, composed of: 1327 WUA (GAD) for Water Supply and 1253 WUA (GAD) for Irrigation
- Water Users Associations Agricultural Land Coverage: 200,000 ha covered by Irrigation WUA, representing 47, 5% of Irrigated areas (421,000 ha), and 1.0 % of Agricultural land (19,759,500 ha) in 2012.

14. Water & International Relations:

- Transboundary Water bodies' dependency Ratio: the percent of annual volumes abstracted from transboundary water bodies to total annual available water resources.

Annual volumes abstracted from transboundary water body = (Total External Renewable Blue Water Resources Inflow) + (Withdrawals from NWSAS Blue Non Renewable Groundwater)+ (Withdrawals from Djeffara plain Groundwater) = (0.320+ 0.100) + (0.610)+ (0.149)= 1.179 BCM/Year

Total Annual Available Water Resources= 18.140 BCM/Year

TWBDR = (1.179)/ (18.140) = 6.5 % in 2012

- Shared Waters related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms: Currently there is only the Concertation mechanism launched in

December 2007.

- Number of Shared Water Resources:

Mainly 2 Shared Aquifers (NWSAS shared by Algeria, Libya, and Tunisia; and Djeffara plain by Libya and Tunisia), then the Transboundary Medjerda watershed shared by Algeria and Tunisia.

- Number of Riparians sharing all shared water bodies: estimated at 1,700,000 riparians, distributed as follows: Shared Medjerda river ((400,000 inhab), Djeffara plain (600,000 inhab), and NWSAS (700,000 Inhab).

4.2. The North Western Sahara Aquifer SOW Data

Table 16. North Western Sahara Aquifer System data sheet indicating the values assigned to each indicator, unit, measurement year, and source

Whole Aquifer Indicators	Units	Whole Aquifer Value (2012)	Algeria (2012)	Libya (2012)	Tunisia (2012)	Notes Source
Water & Availability						
Internal Renewable Groundwater (IRG)	BCM/Year	1.1	0.6	0.27	0.2	Source: OSS
Total Exploitable Non-Renewable Ground Water Resources	BCM/Year	7.745	6.102	0.946	0.697	Source: OSS, NWSAS model Scenario
Country's Area Inside The Aquifer	km2 (Mapped)	1,000,000	670,000	250,000	80,000	Source: 0SS
Potential Volume for Each Country	BCM	30,000	20,388	7,282	2,330	Source: BabaSy, OSS
Inflow to Each Country	BCM/Year	1.1	0.6	0.27	0.2	2012
Outflow from Each Country	BCM/Year	2.823	1.975	0.296	0.551	Outlets
Pieozometric Water Heads	Meters (Mapped)					Mapped
Depth from water to Basement/ Confining Layer (Unconfined Aquifer)	Meters (Mapped)	-	-	-	-	Mapped
Depth to Water Table (Unconfined Aquifer)	Meters (Mapped)	-	-	-	-	Mapped
Depth to Pieozometric Surface (Confined Aquifer)	Meters (Mapped)	-	-	-	-	Mapped
Depth to the bottom of confined layer (Confined aquifer)	Meters (Mapped)	-	-	-	-	Mapped
Water & Uses						
Withdrawals from Blue Groundwater	BCM/Year	2.784	2.006	0.258	0.52	Source: Countries
Withdrawals from Exploitable Non-Renewable Groundwater	BCM/Year	1.684	1.406	0	0.32	2012
Extraction Zones of The Aquifer	Numbers/ Mapped	8	3	3	2	-Algeria: Artesian Basin, Occidental Basin, Mya Wadi -Libya: Ghadames, Jufra, Syrte -Tunisia: Chotts, Tunisian Outlet
Annually Observed Drawdown (Average&Mapped)	Meters	1.41	2.05	1.07	1.12	Source: Countries
Water & Land Use Change						
Total Irrigated Agricultural Land	ha	270,000	202,000	30,000	38,000	OSS 2012

Total Rainfed Agricultural Land	ha	-	-	-	133,300	DGEDA 2012
Total Pasture Area	ha	-	-	-	2,377,150	DGEDA, 2012
Total Forests Area	ha	-	-	-	5,860	DGEDA, 2012
Urban Encroachment on Agricultural Land	ha/Year	-	-	-	Insignificant	-
The Decrease in Groundwater Recharge caused by Urban Encroachment	BCM/Year	-	-	-	Insignificant	-
Water & Population						
Total Aquifer bound and dependent population	Number	4,800,000	3,000,000	1,100,000	700,000	Estimation 2012
Internal Renewable Water Resources Per Capita	CM/Capita	239	200	245	286	-
Groundwater Withdrawal Per Capita	CM/Capita	580	669	234.5	743	2012
Water & Quality						
Concentration of Chloride in The Aquifers Domain	PPM/ Mapped	-	-	-	NA	-
Nitrate Concentration	PPM/ Mapped	-	-	-	NA	-
Electric Conductivity	1/OHM (S/M)	-	-	-	NA	-
Total Dissolved Solids	PPM/ Mapped	144-9722	144-9722	-	1440-5200	OSS (Mapped)
Fluoride Concentration	PPM/ Mapped	-	-	-	NA	-
Water & Ecosystems						
Number of Groundwater Based Ecosystems	Number	-	-	-	6 Ecosystems (Wetlands)	1.Sebkhet Guettar - Gafsa 2.Sebkhat El Hamma - Gabes 3. Chott Fedjej 4.Chott Djerid 5.Chott Gharsa 6. Artificial lakes –Kebili TOTAL AREA: 1,347,600 ha
					3 Ecosystems (National Parks)	1.Jebil-Kebili 2.Dghoumes-Tozeur 3.Sanger Jabbes-Tataouine TOTAL AREA : 445,000 ha
					2 Ecosystems (Wildlife Parks)	1.Thelja-Gafsa 2.Oued Edkouk-Tataouine TOTAL AREA : 8675 ha

Number of RAMSAR Wetlands in The Aquifer Domain	Number	-	-	-	7	1. Garaat Sidi Mansour -Gafsa 2. Chott Djerid 3.Oasis of Kebili 4.Oued Debouk - Tataouine 5.Gorges of Thelja - Gafsa 6.Chott Guettar- Gafsa 7.Chott Guetayate- Gabes TOTAL AREA : 609,702 ha
Number of Endangered Species	Number	-	-	-	NA	-
Number of Invasive Species	Number	-	-	-	NA	-
Water & Governance						
IWRM Plan (Yes/No)	Yes/No	No	-	-	No	-
Well Permits to date	CM/Capita	-	-	-	80	2012
Volumetric Groundwater Rights	BCM/Year	-	-		0.0135	2012
Unlicensed Groundwater Abstractions	BCM/Year	-	-	-	4168 Water points 0.222BCM / Year	2008
Water & International Relations						
Dependency Ratio of Each Riparian Country	%	3	6	1	2.9	520/18,140=2.9
Bilateral / Multilateral Agreements & Cooperation Protocol or MOUs Between Riparians	Number	1	1	1	1	Concertation Mechanism
Presence of Other Transboudray Bodies in Riparian Countries	Number	10	3 (NWSAS+ Taoudeni +Medjerda river)	4(NWSAS + NSAS + Djeffara + Morzouk basin)	3 (NWSAS + Djeffara plain + , Medjerda shared river)	

5. Analysis & Trends

5.1. Analysis of the National State of Water

Table 17. Analysis of the National SOW (Additional specific indicators and Historical Data)

Indicator Category	Data	Source	Additional specific indicators (22)	Historical data
Water& Availability	Available for 2012	DGRE, DGGREE, SONEDE, ONAS	No specific indicators	-Annual Average Precipitation Depth:1983-2013 -Annual Average Precipitation Volume: 1983-2013 -IRSW: 1968-2012 -IRGW: 1968-2012 -TIRBWR: 1968-2012 -TMIW: 1990-2012 -Reused TMIW: 1990-2012
Water& Uses	Available for 2012	DGRE, DGBGTH, DGGREE, SONEDE, ONAS	-Green Water Consumption for Livestock Fodder Water Use -Bottled Water Production	-Withdrawal from Domestic Water Use:2002-2013 -Withdrawal for Industrial Water Use: 2002-2013 -Withdrawal from BSW: 2008-2013 -Withdrawal from BRGW: 2001-2011 --Withdrawal from BNRGW: 2001-2011 -Withdrawal from Desalinated Water: 2007-2012
Water& Land Use Changes	Some data not available for 2012	DGGREE, DGPA, DG FORETS, OEP	No specific indicators	-Total Irrigated Agricultural Land:1970-2012 -Total Forests Land: 1995-2000 -Total Pasture Land: 1995-2000
Water& Services	Available for 2012	DGGREE, SONEDE, ONAS, INS	-Wastewater Collection Capacity	-Improved Urban Water Supply Coverage: 1984-2012 -Improved Rural WSC: 1984-2012 -Improved Urban Sanitation Coverage: 1994-2012 -Improved Water Supply Coverage:1984-2012 -Length of WS networks: 1983-2012 (SONEDE) & 1965-2012 (DGGREE)
Water & Energy	Available for 2012	STEG, DGBGTH	-Water used to generate Electricity	-Electricity Generated using Hydropower: 2000-2012 -Installed Hydropower Capacity: 1965-2012 -Water Used to generate Electricity:2008-2012
Water & Population	Available for 2012	DGRE, DGGREE, SONEDE, INS	No specific indicators	-Total Population: 1921-2013 -Population without improved WS: 1993-2013 -Population without improved Sanitation: 1966-2009

Water & Quality	Available for 2012	ANPE, SONEDE, DHMPE, ONAS	-Fecal Choliform	-Dissolved Oxygen: 2010-2012 (COPEAU Directory) -pH: 2004-2012 (CD) -Electric Conductivity: 2011-2012 (CD) -Nitrogen: 2004-2012 (CD) -Phosphorous: 2006-2012 -TDS: 2004-2006 -Fecal Choliform: 1995-2012
Water& Health	Available for 2012	DHMPE	-Cholera reported cases -Typhoid reported cases -Hepatitis A reported cases	-Diarrhea Prevalence: 2000-2013 -Cholera reported cases: 2000-2013 -Hepatitis A reported cases: 2000-2013 -Typhoid Fever reported cases: 2000-2013
Water & Climate	Available for 2012	DGRE	-Drought events -Cost of annual damage caused by floods - Cost of annual damage caused by droughts -Annual Human Losses related to Floods - Annual Human Losses related to Droughts -Unusual Weather events (Snow, Hail,…) -National CC Adaptation Plan	-Flood-Events: 1969-2012 -Drought Events: 1969-2013 -Drougths-Floods:861-2013 -Unusual Weather: Events:1983-2012
Water & Socio-Economics	Sometimes not available for 2012	DGRE, DGGREE, CGABE, INS	No specific indicators	-Water and Sanitation Charges as % of Average Household Income: 1980-2010
Water & Finance	Sometimes not available for 2012	CGABE, Ministry of cooperation and regional development	No specific indicators	-Percentage of National Budget directed to Water & Sanitation: 2008-2013 -Percent of GDP directed to Sanitation & Hygiene: 2008-2013
Water& Trade	Data available for 2012	Ministry of Trade, DGCE	No specific indicators	--Virtual Water Imports related to trade in the agricultural sector: 1993-2003 - Virtual Water IExports related to trade in the agricultural sector: 1993-2003 - Virtual Water Net Flow related to trade in the agricultural sector: 1993-2003
Water & Governance	Some data not available for 2012	DGRE, BIRH, DGGREE, DGACTA, SONEDE, BPEH	-Commercial Water Losses -Physical Irrigation Water Losses -Number of Water related Citations (Water Laws Enforcement) - Number of Water Users Associations - Water Users Associations Agricultural Land Coverage	--Surface Water Permits issued: 2008-2013 -Total Volumetric Rights associated with Surface Water Permits: 2008-2013 -Groundwater Wells Permits: 2008-2013 - Total Volumetric Water Rights associated with Well Permits: 2008-2013 -Number of Water related Citations (Water Laws Enforcement): 2010-2013
Water & International Relations	Available for 2012	DGRE, BPEH	No specific indicators	No Historical Data

5.2. Inventory of Available Historical Data for Each Indicator

Table 18. Inventory of available historical data, annual average, and 2012 values

Indicator Category	Units	Historical data	Annual Average	Values 2012	Remarks
Water & Availability					
Annual Average Precipitation Depth	MM/Year	1983/84-2012/13 Figure 4	252.9	153.00	Source : DGRE Pluviometric Directories
Annual Average Precipitation Volume	BCM/Year	1983/84-2012/13 Figure 4	39.2	23.7	Source : DGRE Pluviometric Directories
Blue Water					
Internal Renewable Surface Water (IRSW)	BCM/Year	1968-2012 Figure 5	Last estimation 2.700	2.700	Division of the country into seven watersheds Successive estimations
Internal Renewable Groundwater (IRG)	BCM/Year	1968-2012 Figure 5	1.554	1.554	Successive estimations
Total Internal Renewable Blue Water Resources (TIRBWR) =(IRSW+IRG) - (OSWG)	BCM/Year	1968-2012 Figure 5	3.854	3.854	Successive estimations
External Surface Water Inflow (ESWI)	BCM/Year	No Historical Data	0.320	0.320	DGRE
External Surface Water Outflow (ESWO)	BCM/Year	No Historical Data	0.190	0.190	DGRE
External Groundwater Inflow (EGI)	BCM/Year	No Historical Data	0.100	0.100	DGRE
External Groundwater Outflow (EGO)	BCM/Year	No Historical Data	0.000	0.000	DGRE
Total External Renewable Blue Water Resources Inflow (TERBWR) =(ESWI+EGI)	BCM/Year	No Historical Data	0.420	0.420	DGRE
Total Renewable Blue Surface Water (TRBSW) = (IRSW) + (ESWI) -(ESWO)	BCM/Year	No Historical Data	2.830	2.830	2.7 + 0.320 – 0.190 = 2.830
Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO)	BCM/Year	No Historical Data	1.654	1.654	1.554 + 0.100 – 0.000 = 1.654
Overlap between Surface Water and Groundwater (OSW)	BCM/Year	No Historical Data	0.400	0.400	DGRE
Total Renewable Blue Water Resources (TRBWR) = (TRBSW) + (TRBG)- (OSG)	BCM/Year	No Historical Data	4.084	4.084	2.830 +1.654 – 0.400 = 4.084
Total Exploitable Non Renewable Groundwater (TENRG)	BCM/Year	No Historical Data	0.610	0.610 in 2012	DGRE, OSS, CM
Total Blue Water Resources (BWR) = (TRBWR + TENRG)	BCM/Year	No Historical Data	4.694	4.694	DGRE
Mobilization of Surface Water (specific indicator)	BCM/Year	2010-2012	2.159	2.188	DGRE, DGBGTH
Green Water					
Water for Rain-fed Agricultural Consumption	BCM/Year	No Historical Data	5.500	5.500	DGRE, DGPA, DGEDA, DGF
Water for Rain-fed Pasture Consumption	BCM/Year	No Historical Data	6.000	6.000	DGRE, DGPA, DGEDA, DGF
Water for Rain-fed Forest Consumption	BCM/Year	No Historical Data	1.500	1.500	DGRE, DGPA, DGEDA, DGF

Total Renewable Green Water Resources (TRGWR)	BCM/Year	No Historical Data	13.000	13.000	DGRE, DGPA, DGEDA, DGF
Total Renewable Water Resources (TRWR) = (TRBWR + TRGWR)	BCM/Year	No Historical Data	17.084	17.084	DGRE, DGPA, DGEDA, DGF
Total Conventional Water Resources : (TCWR) = TRWR+ TNRG = TBWR + TRGWR	BCM/Year	No Historical Data	17.694 17.694	17.694 17.694	DGRE, DGPA, DGEDA, DGF
Non Conventional Water					
Produced Municipal Wastewater (PMW)	BCM/Year	No Historical Data	-	0.239	ONAS
Produced Industrial Wastewater (PIW)	BCM/Year	No Historical Data	-	0.037	ONAS
Produced Agricultural Drainage (PAD)	BCM/Year	No Historical Data-	-	0.140	DGGREE, DGRE (2011)
Produced Desalinated Water (PDW)	BCM/Year	2007-2012 Figure 11	-	0.030	SONEDE, DGRE (2011)
Total Non-Conventional Water Resources (TNCWR) = (PMW) +(PIW) + (PAD) + (PDW)	BCM/Year	No Historical Data	-	0.446	DGRE, DGGREE, SONEDE, ONAS
Total Available Water Resources (TAWR) = (TCWR) + (TNCWR)	BCM/Year	No Historical Data	-	18.140	DGRE
Treated Municipal and Industrial Wastewater	BCM/Year	1990-2012	0.165	0.232	1990-2012 AA= 0.165 BCM
Reused Treated and Industrial Municipal Wastewater	BCM/Year	1990-2012	0.042	0.06	1990-2012 AA= 0.042 BCM
Treated wastewater reused in agricultural irrigation	BCM/Year	1990-2012	-	0.025	Counting the amount of water delivered or invoiced to CRDAs
Water & Uses					
Withdrawals for Domestic Water Use	BCM/Year	2002-2013	-	0.495	SONEDE=0.451 DGGREE=0.044 TOT=0.495
Withdrawals for Industrial Water Use	BCM/Year	2002-2013	-	0.089	SONEDE=0.046 MINERAL WATER= 0.001 PRIVATE WELLS=0.042 TOT= 0.089
Withdrawals for Agricultural Water Use (Blue water + Non-conventional water)	BCM/Year	No Historical Data	-	2.165	Counting volume of water charged by GDA 2.140 + 0.025 = 2.165
Annual Total Water Withdrawals	BCM/Year	No Historical Data	-	2.749	0.495 + 0.089 + 2.165 = 2.749
Green Water consumptions for Agriculture Water Use	BCM/Year	No Historical Data	5500	5.500	DGRE, 2012
Total Agricultural Water Uses	BCM/Year	No Historical Data	-	7.665	DGGREE
Withdrawals From Blue Surface Water	BCM/Year	2008-2013 Figure 8	0.589	0.615	DGBGTH, BIRH, 2012-13
Withdrawals From Blue Renewable Groundwater	BCM/Year	2001-2011 for Deep Aquifers (Figure 10) 1980-2010 for Shallow Aquifers (Figure 9)	1.194 (Deep Aquifers 0.692 (Shallow Aquifers)	1.511 in 2010	1.590 in 2011, 2012 data NA
Withdrawals from Non-Renewable Groundwater	BCM/Year	2001-2011	0.610	0.610 in 2010	0.564 in 2011 (CI+CT)
Total Withdrawals from Blue Water	BCM/Year	No Historical Data	-	2.736	0.615 + 1.511 + 0.610 = 2.736 DGRE, 2012/13

Agricultural Drainage Water Use	BCM/Year	No Historical Data	0.020	0.020	DGRE, 2011
Withdrawal from Desalinated Water	BCM/Year	2007-2012 (SONEDE) Figure 11	0.019 (SONEDE)	0.030 (SONEDE + Private)	SONEDE, 2012 DGRE, 2011
Total Withdrawals From Non-Conventional Water Resources	BCM/Year	No Historical Data	-	0.110	0.060+0.030+0.020 =0.110
Green Water Consumption for Livestock Fodder Water Use	BCM/Year	2002-2013	0.765	0.760	DGPA, DGEDA, DGSA,OEP, 2012
Bottled Water Production	BCM/Year	2012-2013	0.001	0.001	0.001 BCM in 2013 Office of Thermalism & Hydrotherapy 2012, 2013
Water &Land use Change					
Total Irrigated Agricultural Land	Ha	1970-2012 Figure 12	301,807	421,000.00	DGGREE
Total Rain-Fed Agricultural Land	ha	No Historical Data	-	4, 953,550.00	DGEDA
Total Pasture Land	ha	1995-2012 Figure 13	4, 509,320	4, 895,000.00	DGEDA
Total Forest Land	ha	1995-2012 Figure 13	1, 087,888	1, 151,218.00	DGF
Urban Encroachment on Green Cover	ha lost/Year	No Historical Data	-	10.000	10.000 ha lost/Year estimated DGACTA, OTEDD, CNT
Impact of Urban Encroachment on Water Resources (Indicators listed below)					
Decrease in Groundwater Recharge	BCM/Year	No Historical Data	-	0.00126	DGRE
Decrease in Water Consumptions of Green Cover	BCM/Year	No Historical Data	-	0.030	DGEDA, DGPA, DGF
Increase in Surface Runoff	BCM/Year	No Historical Data	-	0.03126	DGRE
Increase in Domestic Water Withdrawals	BCM/Year	No Historical Data	-	0.030	SONEDE, DGGREE
Water & Services					
Water Coverage and Accessibility					
Improved Urban Water Supply Coverage (Sector Ministry)	%	1984-2012 Figure 14	100	100	SONEDE
Improved Rural Water Supply Coverage (Sector Ministry)	%	1984-2012 Figure 14	67.0	93.4	SONEDE (49.7%), DGGREE (43.7%)
Improved Urban Sanitation Coverage (Sector Ministry)	%	1994-2012 Figure 15	74.5	85.4	ONAS
		No Historical Data	-	98.94	INS (2009) 2012 Data NA
Improved Rural Sanitation Coverage (Sector Ministry)	%	No Historical Data	-	5.1	ONAS
		No Historical Data	-	83.95	INS (2009) 2012 Data NA
Improved Water Supply Coverage (Sector Ministry)	%	1984-2012 Figure 14	84.6	97.8	Urban + Rural SONEDE, DGGREE
Improved Sanitation Coverage (Sector Ministry)	%	No Historical Data	-	58.4	ONAS
		No Historical Data	-	94.44	INS (2009) 2012 Data NA

Water Infrastructure					
Length of Water Supply Networks	Km	1983-2012 (SONEDE) Figure 16 1965-2012 (DGGREE) Figure17	SONEDE AA=31,563.5 km DGGREE 29,643.95 km	SONEDE: 48,459.00 km in 2012 ; DGGREE: 78,100.5 TOTAL: 126,559.5 km	SONEDE, DGGREE,
Length of Seewage Networks	Km	1975-2012 Figure 18	7,019	15,364	ONAS
Length of Irrigation Networks	Km	No Historical Data	-	NA	DGGREE
Length of Drainage Networks	Km	No Historical Data	-	NA	DGGREE
Dam Storage Capacity (Installed)	BCM	No Historical Data	-	2.152	DGBGTH, 2012
Water Supply Capacity	BCM/Year	No Historical Data	-	0.755	SONEDE, 2012
Desalination Capacity	BCM/Year	No Historical Data	-	TOTAL: 0.030 - 0.025 (SONEDE, not included drinking water treatment and deferrization plants capacity) - 0.010 (Private stations) TOT: 0.035	SONEDE, DGRE, 2012
Municipal Wastewater Treatment Capacity	BCM/Year	2008-2012	0.2934	0.2983	ONAS
Industrial Wastewater Treatment Capacity	BCM/Year	2008-2012	0.0193	0.0193	ONAS
Wastewater Collection Capacity	BCM/Year	2008-2012	0.2369	0.234	ONAS
Water & Energy					
Electricity Generated Using Hydropower	GWh/Year	2000-2012 Figure 19	82.3	110.56	2012, STEG, DGBGTH
Hydropower as percent of Total Generated Electricity	%	No Historical Data	1.0	1.0	2012, STEG
Installed Hydropower Capacity	MW	1956-2012 Figure 20	1.16	66.0	2012, STEG
Water used to generate Electricity	BCM/Year	2008-2012	0.503 205	0.830 848	2012, STEG, DGBGTH
Water & Population					
Total Population	1000 inhabitants	1921-2013 Figure 21	5,254.487	10,776.40	1966-2013 (INS) ; 10,982.754 in 2014 Census
Internal Renewable Water Resources Per Capita	CM/capita	No Historical Data	-	1,564	DGRE, 2012
Total Renewable Blue Water Resources Per Capita	CM/capita	No Historical Data	-	378.9	DGRE, 2012
Total Renewable Water Resources Per Capita	CM/capita	No Historical Data	-	1,585.3	DGRE, 2012
Total Available Water Resources Per Capita	CM/capita	No Historical Data	-	1,683.0	DGRE, 2012
Blue Water Withdrawal Per Capita	CM/capita	No Historical Data		254.00	DGRE, DGBGTH, 2010

Green Water Use Per Capita	CM/capita	No Historical Data	-	1,206.00	DGRE, DGGREE
Total Water Consumption Per Capita	CM/capita	No Historical Data	-	1,460.00	DGGREE, DGRE
Agricultural Water Withdrawal Per Capita	CM/capita	No Historical Data	-	201.00	DGGREE, DGRE
Industrial Water Withdrawal Per Capita	CM/capita	No Historical Data	-	8.25	DGRE
Domestic Water Withdrawal Per Capita	CM/capita	No Historical Data	-	46.0	SONEDE, DGGREE
Population Without Improved Water Supply	1000 inhabitants	1993-2013	-	-240 (SONEDE), -239.9 (INS)	1993-2013 (INS) *(INS 2009)
Population Without Improved Sanitation	1000 inhabitants	1966-2009	-	579.700 (INS)	1966-2009 (INS) *(INS 2009)
Water & Quality					
Dissolved Oxygen (DO)	Ppm	In hot spots of ANPE Control Network of Water Pollution 2010-2012	-	V1 : 7.7-8.5 V2 : 5.4-6.4 V3 : NA V4 : NA	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
pH	Dimensionless	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon, Ghar El Melh lagoon)	-	V1 : 7.8-11.2 V2 : 8.0-8.4 V3 : 7.7-8.8 V4 : 8.4-8.7	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Electric Conductivity (EC)	(m S/cm)	In hot spots of ANPE Control Network of Water Pollution 2010-2012	-	V1 : 1.5-2.5 V2 : 0.2-0.5 V3 : 1.7-46.8 V4 : 2.0-7.0	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Nitrogen Concentration (NO_3)	ppm	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon Ghar El Melh lagoon)	-	V1 : NA V2 : NA V3 : 2.0-128.2 V4 : NA	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Phosphorous Concentration (PO_4)	ppm	In hot spots of ANPE Control Network of Water Pollution 2006-2012	-	V1 : 1.3-33.0 V2 : 0.4-9.7 V3 : 0.1-71.8 V4 : 0.1-0.7	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Total Dissolved Solids	ppm	2004-2012 (Wadi El Bey, Korba lagoon, Bizerte lake) 2006-2012: (Wadi Meliane Halg El Menzel logoon, Ghar El Melh lagoon)	-	V1 : 730-1480 V2 : 110-220 V3 : 950-37800 V4 : 1200-5500	V1 : Medjerda Wadi V2 : Beja dams V3 : Bizerte lagoon V4 : Nabeul Groundwater
Bacteriological Analysis	-Number of samples -Unsuitable Cases (UC) %	1995-2012 (SONEDE)	-48,050 samples	-48,251 samples -UC :1.5%	1.5% <NT 09-14 limit and < WHO threshold

Fecal Choliform	Colonies/100 ml	2009-2012 SONEDE	1-3	1-3	Complies with the standards
Water & Health					
Diarrhea Prevalence	% of children under 5 years old	2000-2013 (Figure 22)	5.80	6.48	DHMPE, 2013
Dracunculiasis Reported Cases	%	2000-2013	0.00	0.00	DHMPE, 2013
Open Defecation Practice	Number	No Historical Data	-	348,540	INS, RGPH 2009
Percentage of Open Defecation	%	No Historical Data	-	3.2	INS, RGPH 2009
Cholera Reported Cases	Number/Year	2000-2013 Figure 22	0.00	0.0	DHMPE, 2013
Typhoid fever reported cases	Number/year	2000-2013 Figure 22	61	28	28 new reported cases in 2012 DHME, 2013
	Incidence rate (Cases number /100 000 inhabitants)	2000-2013 Figure 22	0.55	0.26	DHMPE, 2013
Hepatitis A Reported Cases	Number/year	2000-2013 Figure 22	675	412	412 new reported cases in 2012 DHMPE, 2013
	Incidence rate (Cases number /100 000 inhabitants)	2000-2013 Figure 22	7.33	3.82	DHMPE, 2013
Water & Ecosystems					
Number of Wetlands Sites Acknowledged by RAMSAR	Number	1981-2013 Figure 23	1.2	35	40 in 2013
Total Wetlands areas	ha	1981-2013 Figure 23	48,728	877,467	1,608,024 in 2013
Total Freshwater Species Count	Number	No Historical Data	-	260 terrestrial plant species, 50 aquatic plant species, 140 bird species (most of which are migratory). 7 species of freshwater fish in dams.	DG Forêts, RAMSAR, WWF, MAVA
Number of Endangered Species	Number	No Historical Data	-	Several species (>10)	DG Forêts, RAMSAR, WWF, MAVA
Number of Invasive Species	Number	No Historical Data	-	>500,000 birds in winter from Asia and Europe (ducks, coots and flamingos)	DG Forêts, RAMSAR, WWF, MAVA
Water & Climate					
Extreme Weather Events					
Flood Events in the Last Four Decades.	Number	1969-2012 : 21 Flood Events (9 Class 1+7 Class 1.5+5 Class 2)	21/44=0.47	1 Flood Event in February -March 2012 (Class 1.5)	Flood Events : 1969, 1973 (2), 1979, 1982 (2), 1986, 1990, 1995, 2000, 2003 (2), 2004, 2005, 2006, 2007, 2009 (2), 2011 (2), 2012.
Flood Events in 1969-1980	Number	1969-1980 4 Flood Events. (1 Class 1.5 + 3 Class 2)	4/12=0.33	-	Flood Events: 1969, 1973 (March), 1973 (December) and 1979 (March).

Flood Events 1981-1990	Number	4 Flood Events. (2 Class 1+ 2 Class 1.5)	4/10=0.4	-	Flood Events : 1982 (2), 1986, 1990
Flood Events 1991-2000	Number	2 Flood Events (1 Class 1 + 1 Class 1.5)	2/10=0.2	-	Flood Events: 1995, 2000
Flood Events 2001-2010	Number	2001-2010 8 Flood Events. (5 Class 1+ 1 Class 1.5 + 2 Class 2)	8/10=0.8	-	Flood Events: 2003 (2), 2004,2005,2006,2007, 2009 (April), 2009 (September).
Flood Events 2011-2013	Number	2011-2012 3 Flood Events. (1 Class 1+ 2 Class 1.5)	3/3=1.0	1 Flood Event in February -March 2012 (Class 1.5)	Flood Events: 2011 (2), 2012
Drought Events in the Last Four Decades.	Number	1969-2013 (12 Drought Events)	12/45=0.27	(0) Drought Events in 2012	Drought Events: 1977, 1987, 1988, 1993, 1994, 1996, 1999, 2001, 2002, 2008, 2010, 2013
Drought Events in 1969-1980	Number	1969-1980 (1 Drought Event)	1/11=0.1	-	Drought Events: 1977,
Drought Events 1981-1990	Number	1981-1990 (2 Drought Events)	2/11=0.2	-	Drought Events: 1987, 1988,
Drought Events 1991-2000	Number	1991-2000 (4 Drought Events)	4/11=0.4	-	Drought Events: 1993, 1994, 1996, 1999,
Drought Events 2001-2010	Number	2001-2010 (4 Drought Events)	4/11=0.4	-	Drought Events: 2001, 2002, 2008, 2010,
Drought Events 2011-2013	Number	2011-2013 (1 Drought Event)	1/3= 0.33	(0) Drought Events in 2012	Drought Events: 2013
Cost of Annual Damage Caused by Floods	$-% GDP	1969-2012	240 MDT/44 years = 5.5 MDT/Year	5.5 MDT/Year =3.1 M$/Year %GDP=0.007 (Non significant value)	GDP 2012 ($10^9$$)= 44.25654 GDP 2013 ($10^9$$)= 47.43029
Cost of Annual Damage caused by Droughts	$-% GDP	1969-2013	NA	NA	NA
Annual Human Losses related to Floods	Number	1969-2012	800/44	# 20/year	-
Annual Human Losses related to Droughts	Number	1969-2013	NA	NA	NA
Unusual Weather Events (Snow, Hail,…)	Number/Type	1983-2012	129 Snow Events AA =129/31 =4.2 159 Hail Events AA = 159/31= 5.13	13 Snow Events in 2012 16 Hail Events in 2012	INM, 2013
National Climate Change Adaptation Plan	Yes/No	-	-	Yes	-
Water &Socio-Economics					
Water Productivity					
Industrial Water Productivity (GDP/ Water Use)	$/CM	No Historical Data	-	145.33	GDP=12.93475B$ WU=0.089 BCM/Year

Agricultural Water Productivity (GDP/Water Use)	$/CM	No Historical Data	-	0.51	GDP=3.89392 B$ WU=7.665 BCM/Year
Employment in Agriculture " Job per Drop"	Jobs/MCM	No Historical Data	-	71.75	WU=7.665 BCM/Year Number of employed persons in agriculture: 550,012
Employment in Industry "Job per Drop	Jobs/MCM	No Historical Data	-	11, 993.67	WU=0.089 BCM/Year Number of employed persons in industry: 1,067,437
Tariffs and Affordability					
Water and Sanitation Charges as % of Average Household Income	%	1980-2010	-	1.26 in 2010	1980-2010 (INS) The survey is quinquennial (last survey 2010)
Water & Finance					
Percentage of National Budget directed to Water & Sanitation Sector	%	2008-2013	2.07	1.9	1.8 in 2013
Operation & Maintenance Cost Recovery for Water Supply and Sanitation	%	- 2007-2012	- 59.0	80 .7 70.0	- Water Supply (Source SONEDE) - Rural Water Supply (Source DGGREE)
Percent of GDP directed to Sanitation and Hygiene	%	2008-2013	0.15	0 .13	0 .13 in 2013
Foreign Aid for Water and Sanitation (loans and grants)	Million US$	2009-2010 1997-2012	- -	14.2 53.22 TOT: 67.42	SONEDE ONAS
Operation & Maintenance Cost Recovery for Irrigation	%	2007-2012	80	64	Irrigated Areas Source : DGGREE
Water & Trade					
Virtual Water Imports related to Trade in the Agricultural Sector	BCM/Year	1993-2013	-	10.22	Source : DGCE, Ministry of Trade
Virtual Water Exports related to Trade in the Agricultural Sector	BCM/Year	1993-2013	-	-6.03	Source : DGCE, Ministry of Trade
Virtual-Water net Flow Related to Trade in the Agricultural Sector	BCM/Year	1993-2013	-	4.19	Source : DGCE, Ministry of Trade
Water & Governance					
IWRM Plan	Yes/No	-	-	Yes	DGRE, BPEH
National Water and Sanitation M&E & R System	Yes/No	-	-	No	DGRE, BPEH
Surface Water Permits Issued to Date	Number	2008-2013 Figure 26	165	170	162 in 2013 BIRH, DGRE, CRDA
Total Volumetric Rights Associated with surface Water Permits	BCM/Year	2008-2013 Figure 26	0.00552	0.00544	0.00583 in 2013 BIRH, DGRE, CRDA
Volume associated with surface Water permits as a Percent of Annual Blue Surface Water Withdrawals	%	2008-2012	0.937	0.9	Annual Blue Surface Water Withdrawals: O.615 BCM/ Year.
Groundwater Well Permits Issued to Date	Number	2008-2013 Figure 26	1,304	1,232	1786 in 2013 BIRH, DGRE, CRDA
Total Volumetric Water Rights Associated with Well Permits	BCM/Year	2008-2013 Figure 26	0.05593	0.05174	0.08394 in 2013 BIRH, DGRE, CRDA

Total Volume associated with well permits as a percent of Annual Blue Groundwater Abstractions	%	2008-2012	-	2.99 in 2010 2.28 in 2012	Annual Blue Groundwater Abstractions : 2.175 BCM in 2010 and 2.269 BCM in 2012
Number of unlicensed wells	Number/Year	No Historical Data	-	1,636 in 2010	BIRH, DGRE, CRDA
Irrigation & Drainage Related Complaints as a percentage of Irrigation Water Users	%	No Historical Data	-	NA	NA
Water supply and Sanitation Related Complaints as a percentage of Serviced Households.	%	2009-2012	-	2.83	-300,000 complaints in 2012, -Serviced population: 10,593,500 inhabitants in 2012 by SONEDE and DGGREE.
Number of Water Supply Meters Installed as a Percent of Total Number of Covered Households	%	2009-2012	-	Urban : %99.4 Rural : 45.5% Total : 83%	SONEDE Statistical Directory 2012
Number of Groundwater Meters Installed as a percent of Licensed Wells	%	No Historical Data	-	NA	NA
Number of Surface Irrigation Meters Installed as a % of Surface Irrigation Water Permits	%	No Historical Data	-	NA	NA
Physical Domestic Water Losses	MCM (%)	2009-2012	-	126.8 MCM (78.7%)	SONEDE
Overall Water Use Efficiency	%	No Historical Data	-	89.5	DGBGTH, DGRE, SONEDE
Water Sustainability/ Depletion Index	%	No Historical Data	-	48.4	DGBGTH, DGRE, DGGREE, SONEDE, ONAS
Wastewater and Drainage Outflows	BCM/Year	No Historical Data	-	0.292	ONAS, DGGREE, DGRE
Transboundary Wastewater and Drainage Outflows	BCM/Year	No Historical Data	-	0.00	ONAS, DGGREE, DGRE
Commercial Water Losses	BCM/Year (%)	2009-2012	-	0.0343 (21 .3%)	SONEDE
Physical Irrigation Water Losses	BCM/Year	-	-	38% estimated	DGGREE Efficiency rate in irrigated plots = 77%
Number of Water related citations (Water Laws Enforcement)	Number	2008-2013	224	188	267 in 2013 BIRH, DGRE, CRDA
Number of Water Users Associations	Number	No Historical Data	-	2,580 (1,327 Water Supply + 1,253 Irrigation)	DGGREE
Water Users Associations Agricultural Land Coverage	% of Ag. Land	No Historical Data	-	47,5% of Irrigated areas, 1.0 % of Agricultural land	DGGREE
Water & International Relations					
Transboundary Water Bodies Dependency Ratio	%	No Historical Data	-	6.5	((149+610) + (320+100) / (18.140)) * 100
Shared Waters related Bilateral/ Multilateral Agreements and/or Memorandums of Understanding and Cooperation Mechanisms	Number	-	-	1	Consultation Mechanism
Number of Riparians sharing all shared water bodies	Number	-	-	2	Estimated from INS census 2014

Number of Shared Water Resources	Number	-	-	2 Shared aquifers + 1 Shared river	2 Shared aquifers:NWSAS & Djeffara plain, 1 Shared river: Medjerda river

COMMENTS ON HISTORICAL DATA:

1. Water & Availability:

-Annual Average Precipitation Depth:

Historical Data: 1983/84-2012/13; Annual Average: 252.9 mm of the last 30 years; 2012 /13 Annual Precipitation Depth: 153 mm; Source: DGRE Pluviometric Directories.

- Annual Average Precipitation Volume:

Historical Data: 1983/84-2012/13; Annual Average: 39.2 BCM/Year of the last 30 years; 2012 /13 Annual Precipitation Volume: 23.7 BCM; Source: DGRE Pluviometric Directories.

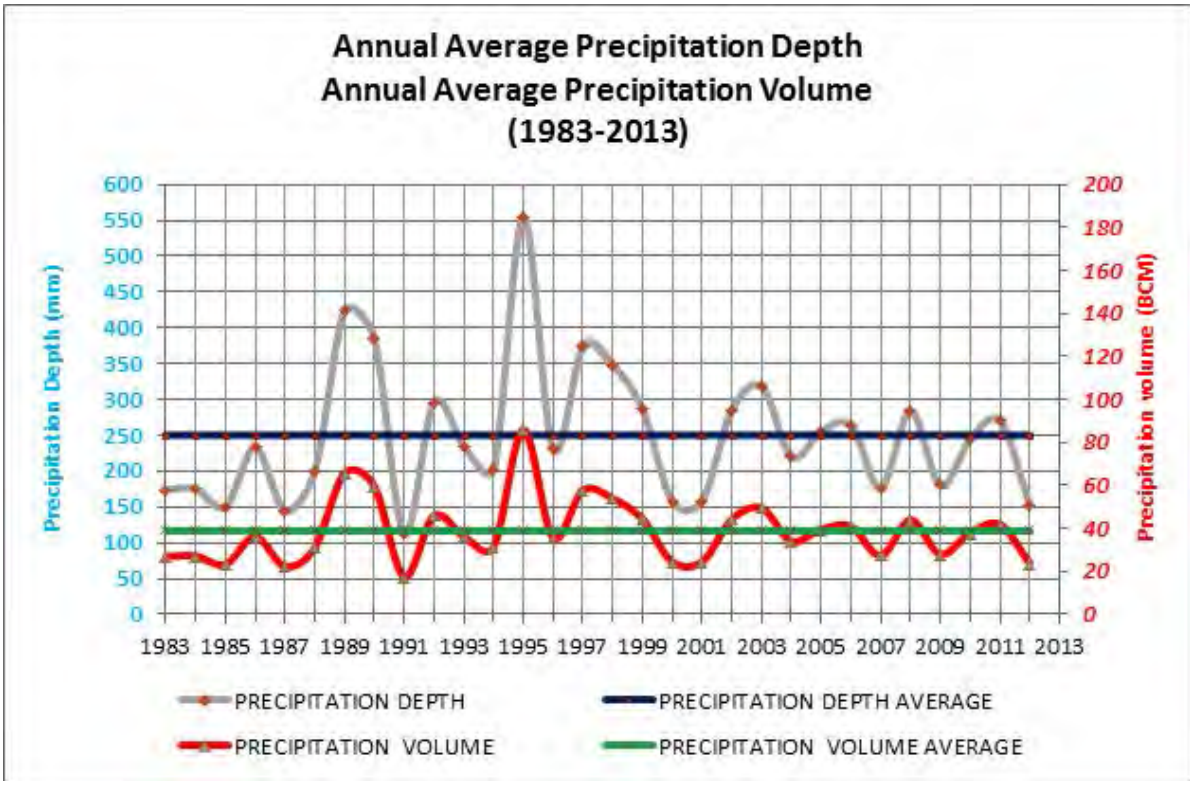


Figure 4. Annual Average Precipitation, Historical Data (1983-2013)

- Internal Renewable Surface Water (IRSW): The latest estimates of surface water were made in 1990, the potential was 2,700 MCM / Year, since the numbers have not changed.

Historical Data: 1968-2005; most recent estimate: 2,700 MCM/Year, Source: DGRE

IRSW= 2,700 MCM/Year

Table 19. Successive estimations of Tunisia Water Resources (1968-2005) in MCM/Year

Year	1968	1972	1980	1985	1990	1996	2000	2005
Surface Water	2000	2000	2580	2630	2700	2700	2700	2700
Phreatic Groundwater	160	230	490	590	670	720	737	745
Deep Groundwater	600	900	1030	1100	1170	1250	1399	1419
Total	2760	3130	4100	4320	4540	4570	4836	4864

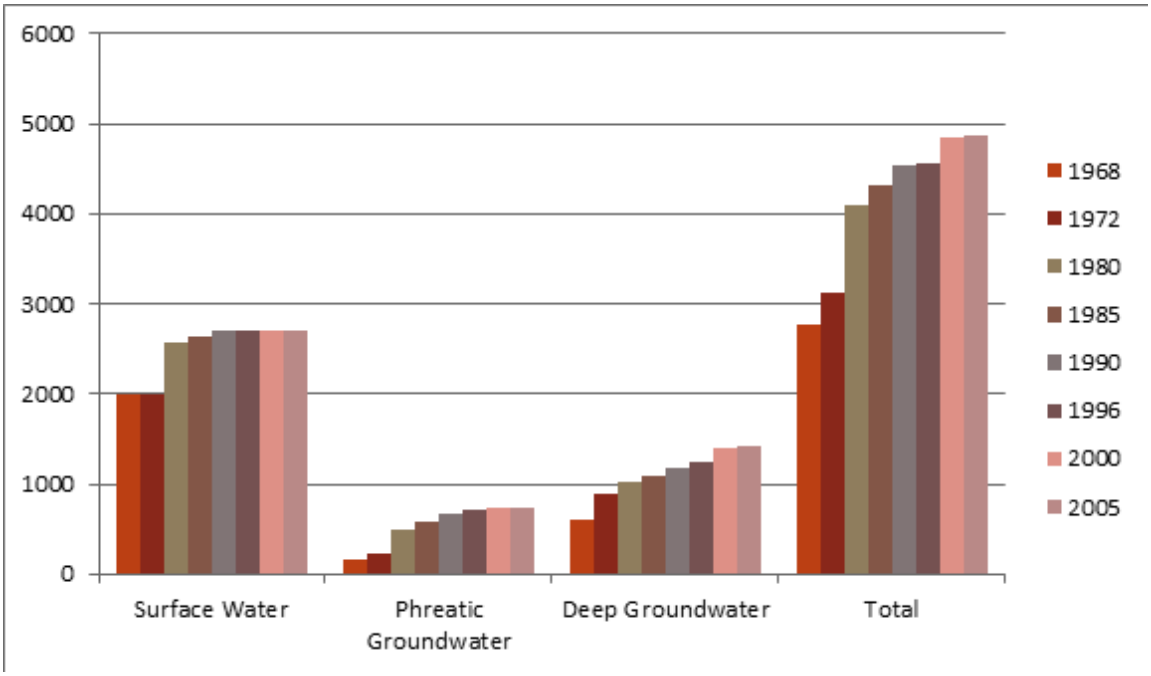


Figure 5. Successive estimations of Tunisia Water Resources (1968-2005) in MCM/Year

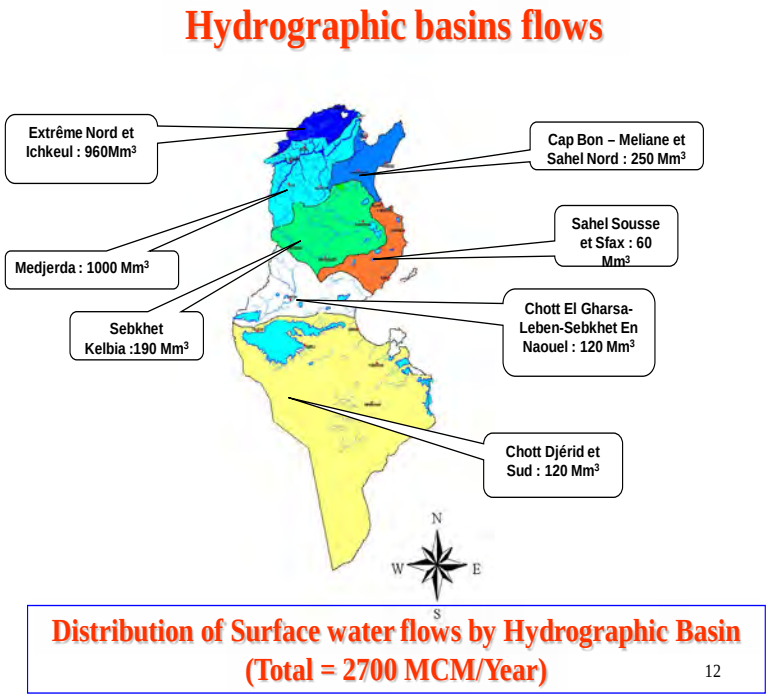


Figure 6. Hydrographic basins map (Distribution of surface water flows by watershed)

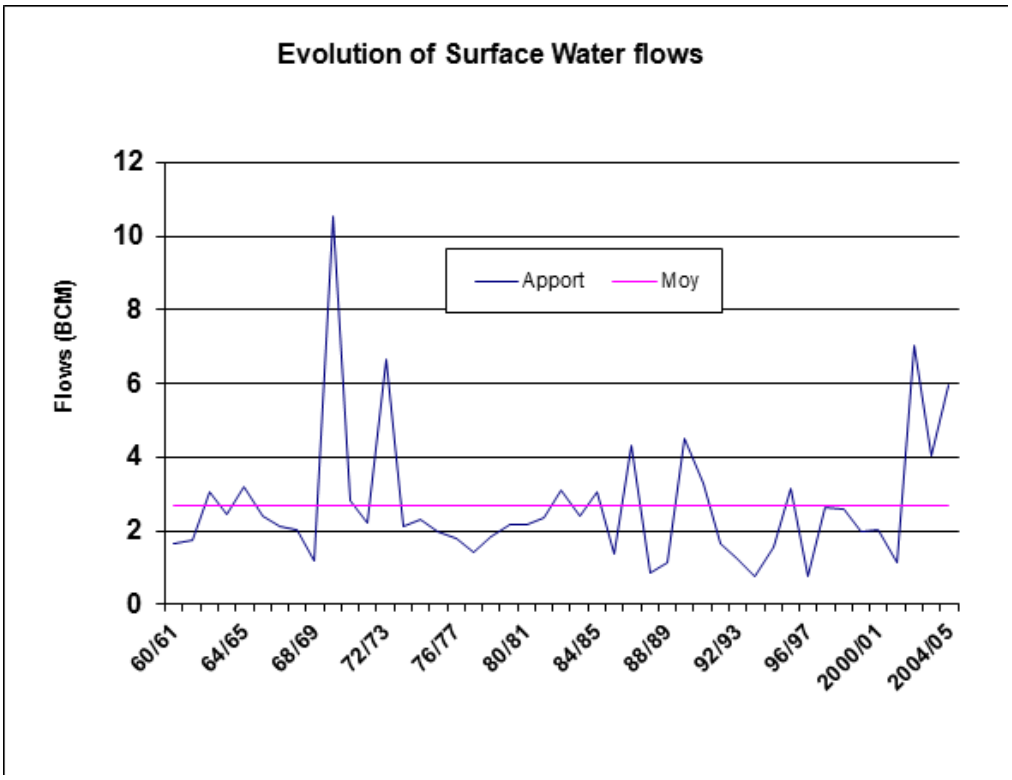


Figure 7. Evolution of Surface Water flows, Historical Data (1960-2005)

- Internal Renewable Groundwater (IRG): The latest estimates of groundwater resources were made in 2005, the potential was 2,164 MCM / Year, since the numbers have not changed.

IRG= (Phreatic Groundwater Resources + Deep Groundwater Resources) – (Non Renewable Groundwater) = (0,745 + 1,419) – 0,61= 1,554 MCM/Year.

Historical Data: 1968-2005; most recent estimate: 1,554 MCM/Year, Source: DGRE

- Total Internal Renewable Blue Water Resources (TIRBWR)=(IRSW+IRG)- (OSWG) = 2.700 + 1.554 – 0.400 = 3.854 BCM/Year
- Total Renewable Blue Surface Water (TRBSW) = (IRSW)+(ESWI)-(ESWO)= 2.7 + 0.320 – 0.190 = 2.830 BCM/Year.
- Total Renewable Blue Groundwater (TRBG)=(IRG)+(EGI)-(EGO) = 1.554 + 0.100 – 0.000 = 1.654 BCM/Year
- Overlap between Surface Water and Groundwater (OSW) = 0.400 BCM/Year
- Total Renewable Blue Water Resources (TRBWR)=(TRBSW)+(TRBG)-(OSG) = 2.830 +1.654 – 0.400 = 4.084 BCM/Year
- Total Blue Water Resources: (TBWR) = (TBSWR) + (TBGWR) – (OSWGW) = 2.830 +2.264 + 0.100 – 0.400= 4.694 BCM/Year or (TBWR) = (TRBWR + TNRBWR) = 4.084 + 0.610 = 4.694 BCM/Year.

2. Water & Uses:

- Annual Total Water Withdrawals: 0.495 + 0.089 + 2.165 = 2.749 BCM/Year
- Total Agricultural Water Uses: 7.665 BCM/Year
- Total Withdrawals from Blue Water: 0.615 + 1.511 + 0.610 = 2.736 BCM/Year
- Total Withdrawals from Non Conventional Water Resources: 0.060 + 0.030 + 0.020 =0.110 BCM/Year
- Withdrawals from Blue Surface Water:

Table 20: Withdrawals from dams

Hydrological Yea	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	Annual Average
Withdrawals (MCM)	576	613	534	608	615	589

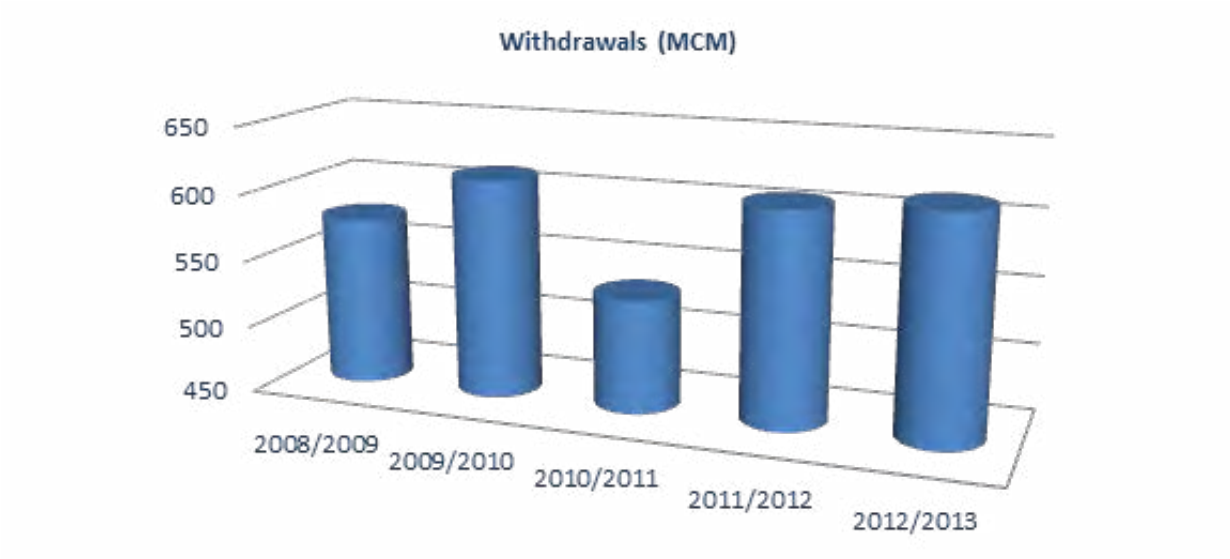


Figure 8. Withdrawals from dams 2008-2013 (Graph)

- Withdrawals from Blue Renewable Groundwater:

Table 21. Withdrawals from shallow aquifers

Year	1980	1985	1990	1995	2000	2005	2010	Annual Average
Withdrawals (MCM)	395	563	699	745	778	808	854	692

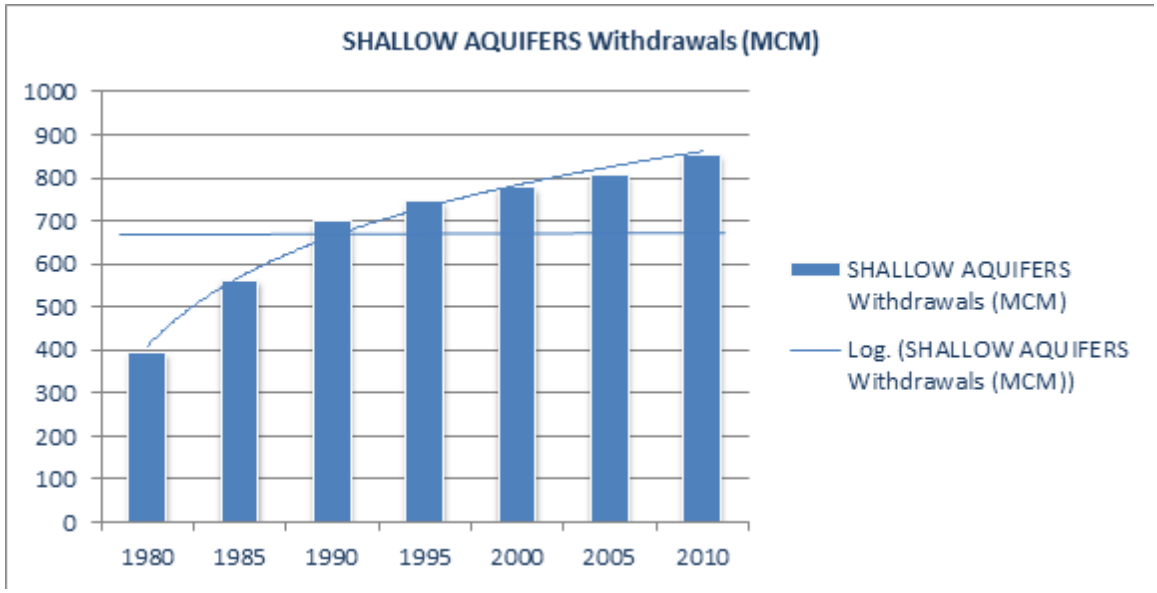


Figure 9. Shallow Aquifers Withdrawals, Historical Data (1980-2010)

Table 22. Withdrawals from deep aquifers included NRGW

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	AA
Withdrawals (MCM)	1,119	1,135	1,110	1,127	1,143	1,171	1,188	1,227	1,243	1,321	1,346	1,194

Source: DGRE

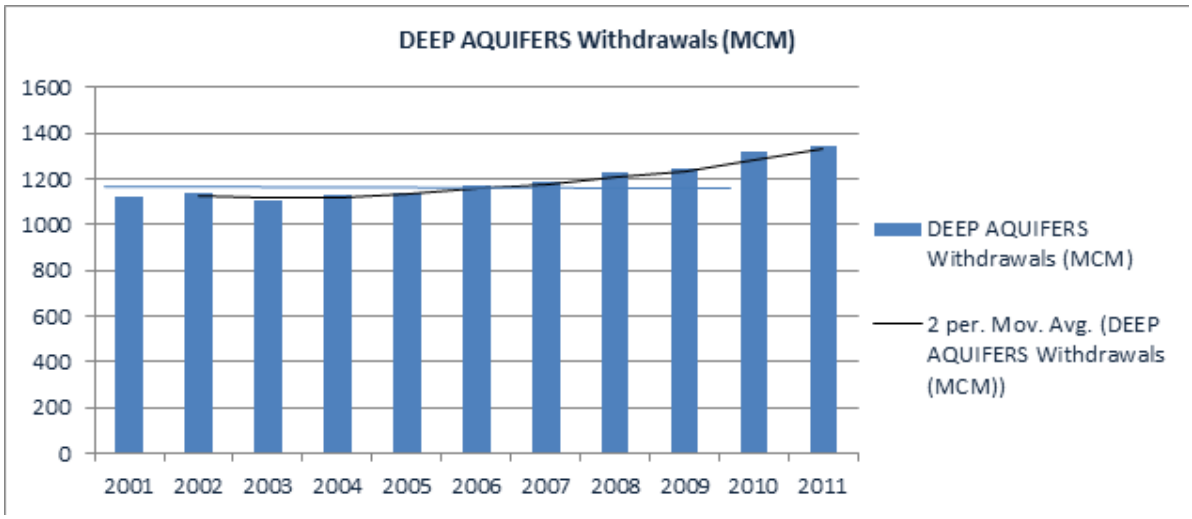


Figure 10. Deep Aquifers Withdrawals, Historical Data (2001-2011)

- Withdrawals from Desalinated Water:

Table 23. Withdrawals from desalinated water (SONEDE)

Year	2007	2008	2009	2010	2011	2012	AA
Withdrawals (MCM)	18.2	18.2	19.5	19.7	19.3	19.7	19.1

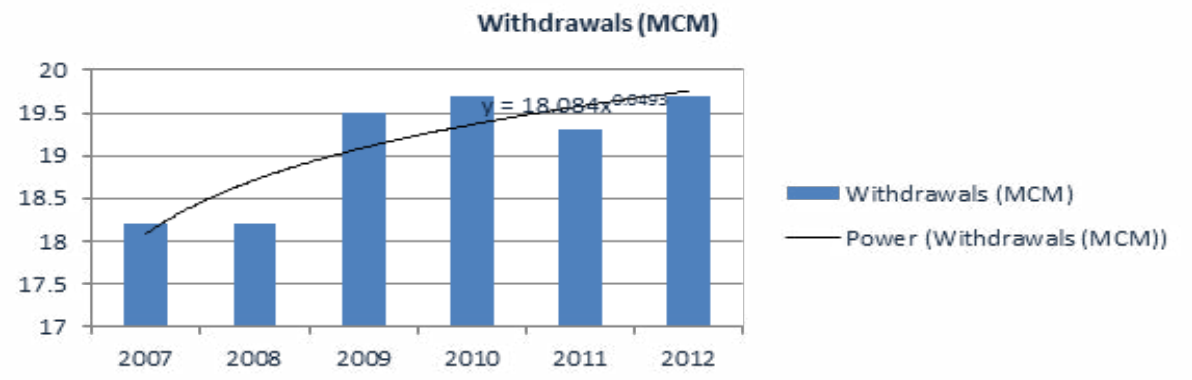


Figure 11. Desalinated Water Withdrawals, Historical Data 2007-2012 (SONEDE)

Table 23a. Green Water Consumption for Livestock Fodder Water Use (2002-2013)

Year	Livestock fodder areas (Rain fed areas) (ha)	Green Water Consumption for Livestock fodder water use(BCM/Year)
2002/2003	252,250	0.757
2003/2004	243,617	0.731
2004/2005	235,275	0.706
2005/2006	244,400	0.733
2006/2007	251,350	0.754
2007/2008	258,880	0.777
2008/2009	257,964	0.774
2009/2010	262,836	0.789
2010/2011	281,535	0.845
2011/2012	261,307	0.784
2012/2013	253,206	0.760
Annual Average	254,783	0.765

Source: Ministry of Agriculture

Green Water Consumption for Livestock fodder water use= 0.760 BCM in 2012/2013.

3. Water & Land Use Changes:

- Total Irrigated Agricultural Land:

Table 24. Irrigated Areas (1000 ha)

Year	1970	1975	1980	1985	1990	1995	1998	2000	2008	2009	2010	2011	Annual Average
Irrigated Area 1000 ha	164	185	208	223	243	260	273	275	416	416.95	418.5	421	301.807

Source: DGGREE

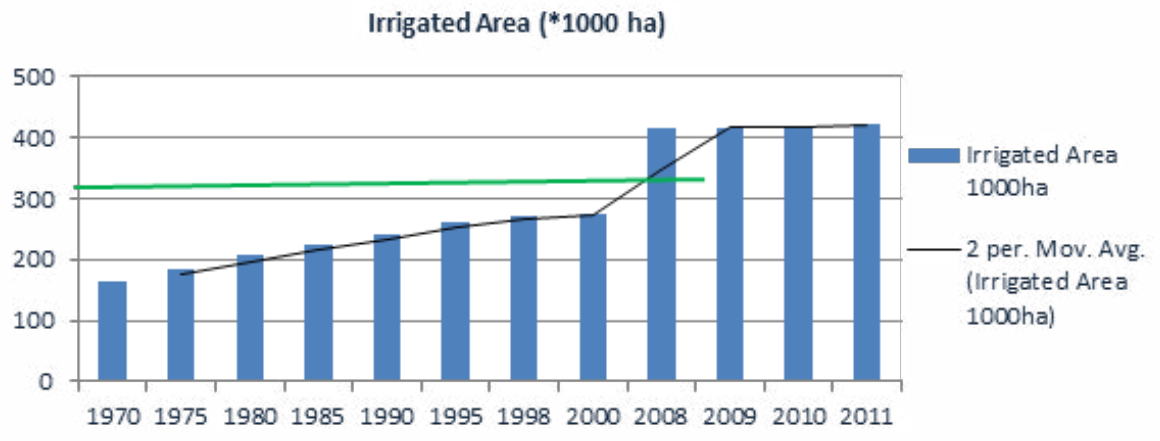


Figure 12. Irrigated Area, Historical Data (1970-2011)

- Total Rain-Fed Agricultural Land: 4,953,550 ha in 2012 and 4,970,930 ha in 2013 (Source DGEDA)
- Total Forest & Pasture Land: Historical Data: 1995-2012

Table 25. Total Forest & Pasture Lands (ha)

	1995	2010	2012	Annual Average
Total Forest Land (ha)	970,818	1, 141,628	1, 151,218	1, 087,888
Total Pasture Land (ha)	4, 132,186	4, 500,775	4, 895,000	4, 509,320

Source: DGF

Figure 13. Total Forest and Pasture land, Historical Data (1995-2012)

4. Water & Services:

Water Coverage and Accessibilility:

- Improved Urban Water Supply Coverage (Sector Ministry): 100%, Historical Data: 1984-2012, Source: SONEDE.
- Improved Rural Water Supply Coverage (Sector Ministry): 93.4%, Historical Data: 1984-2012, Source: SONEDE, DGGREE.
- Total Access to Water Supply (Urban + Rural): 97.8 %. This percentage is broken down as follows:
  - Percentage covered drinking water piped directly onto premises, including public taps, protected public dug wells and springs: 97.1 % (Source: INS, RNPE 2011).
  - Percentage covered by private dug/tube wells, bottled water and harvested rainwater: 2.9 %.
- Total Access to Sanitation Facilities (Urban + Rural): 94.4 %. This percentage is broken down as follows:
  - Percentage covered by piped sewer system: 60.4 % (Source INS), while ONAS gives 58.4 %.
  - Percentage of improved access to sanitation facilities: 34 % (Septic tanks, pit latrines, cesspools and seguia collectors)

- Shared facilities: 2.4 %
- Other unimproved: 3.2 %

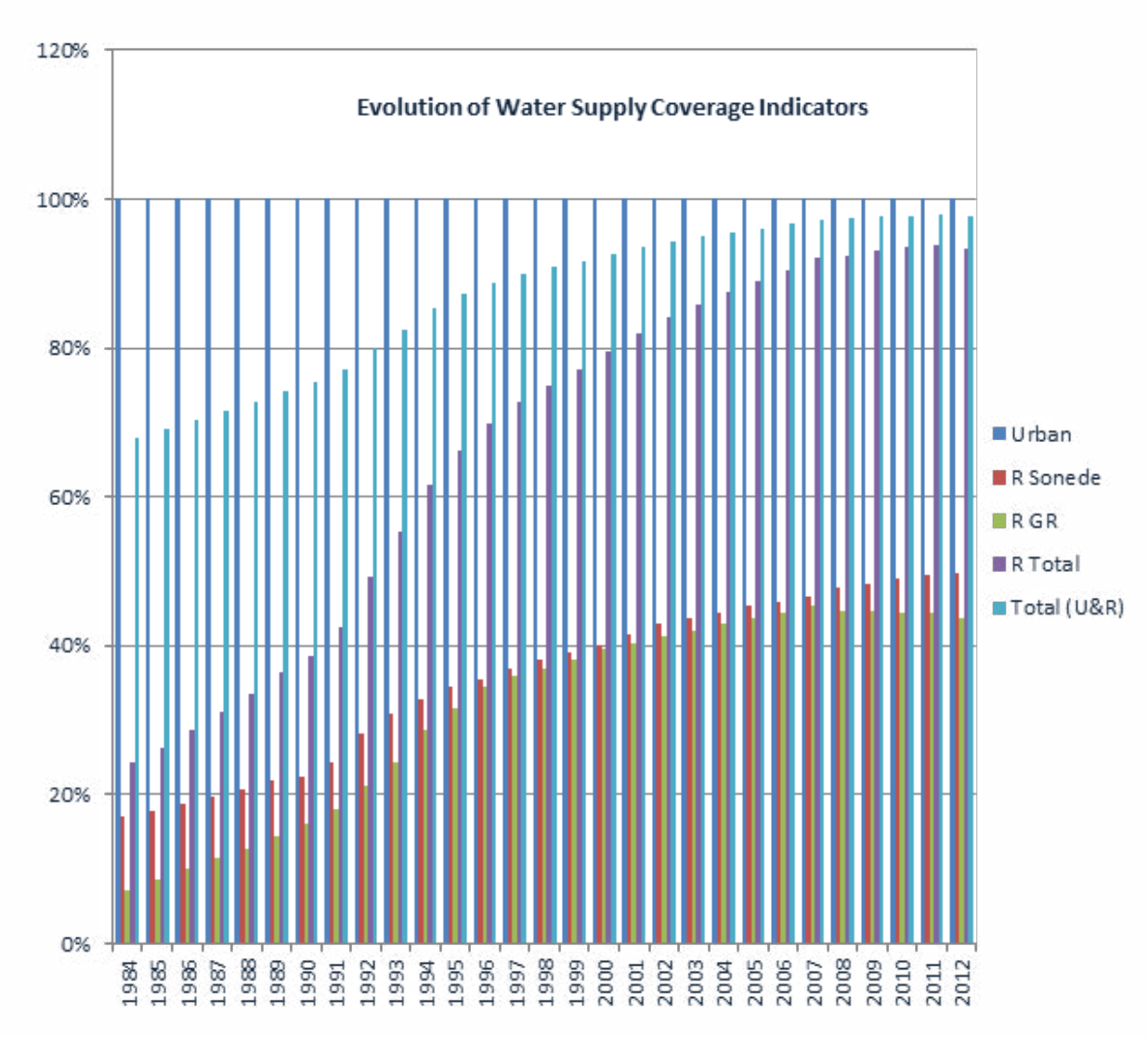


Figure 14. Water Supply Coverage indicators, Historical Data (1984-2012)

- Improved Urban Sanitation Coverage (Sector Ministry): 85.4%, Historical Data: 1994-2012, Source ONAS

IUSC = 98.94 % (2009 Value), No Historical Data, 2012 Data non Available, Source INS.

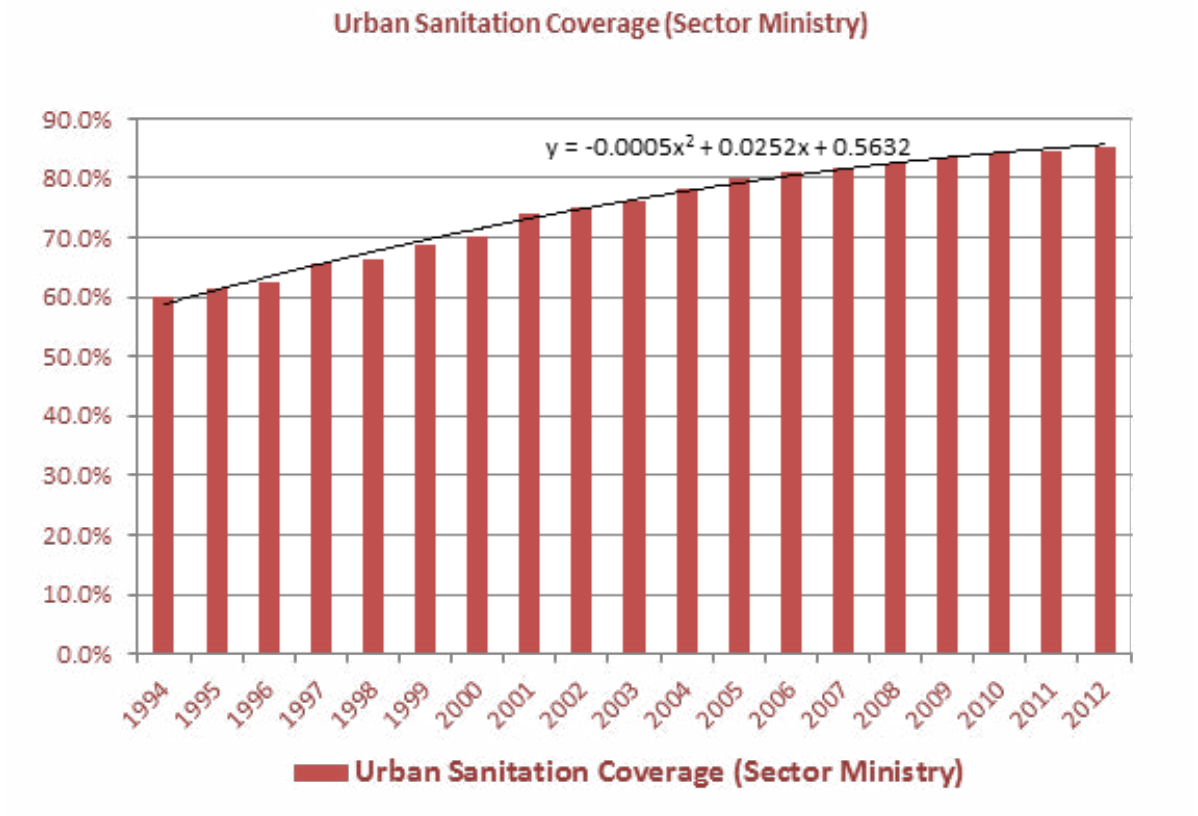


Figure 15. Urban Sanitation Coverage, Historical Data (1994-2012)

Source ONAS

- Improved Rural Sanitation Coverage (Sector Ministry):

5, 1 % in 2012, No Historical Data, Source ONAS

IRSC = 83.95 % in 2009, No Historical Data, 2012 Data non Available, Source INS

Water Infrastructure:

- Length of Water Supply Networks:

SONEDE: Historical Data (1983-2012), Annual Average 31,563.5 km, Length: 48,459 km in 2012, Source: SONEDE.

DGGREE: Historical Data (1965-2012), Annual Average 29,643.95 km, Length: 78,100.5 km in 2012, Source: DGGREE

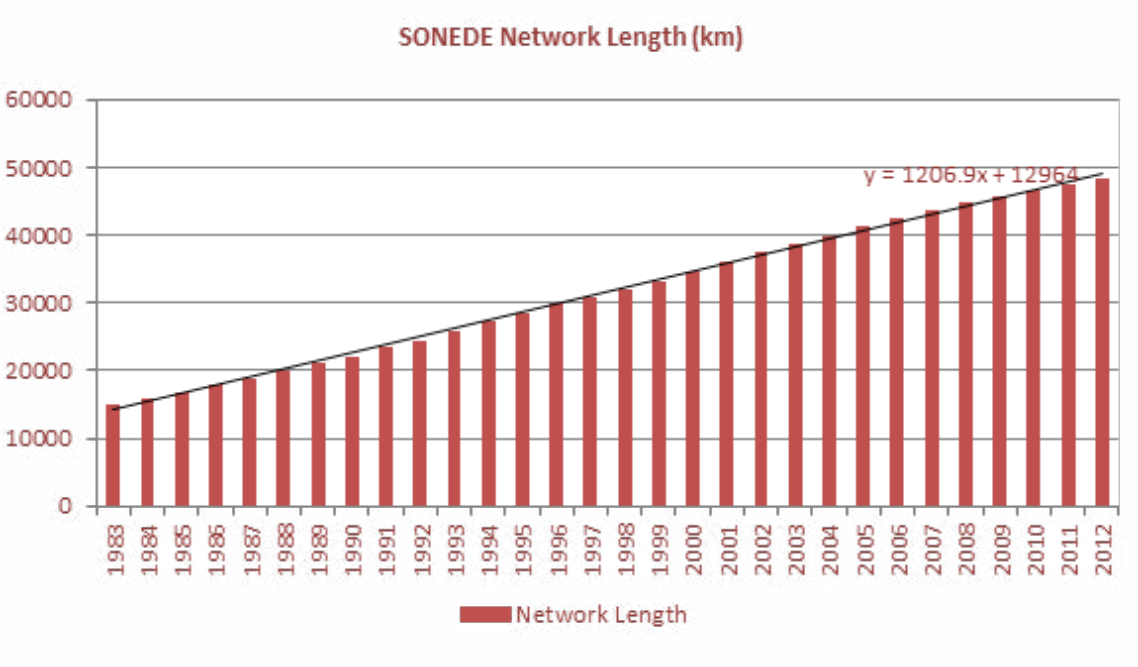


Figure 16. Water Supply Network Length, Historical Data (1983-2012) SONEDE

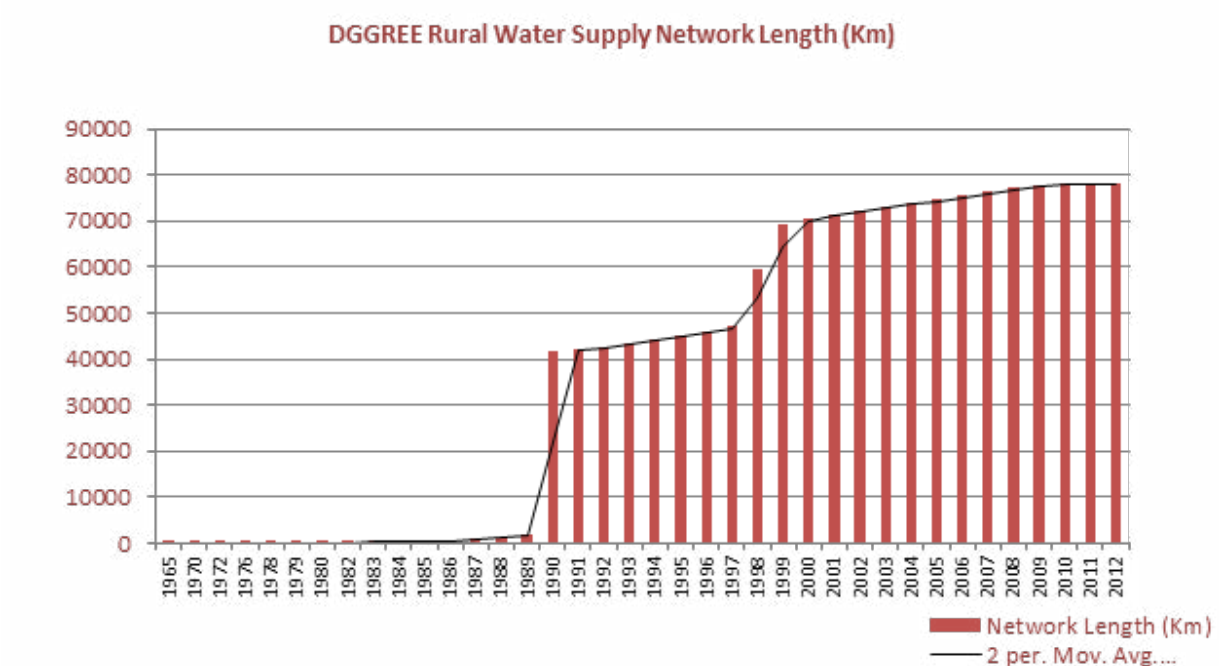


Figure 17. Water Supply Network Length, Historical Data (1965-2012) DGGREE

- Length of Sewage Networks:

Historical Data (1975-2012), Annual Average: 7,019 km, Length: 15,364 km in 2012, Source: ONAS

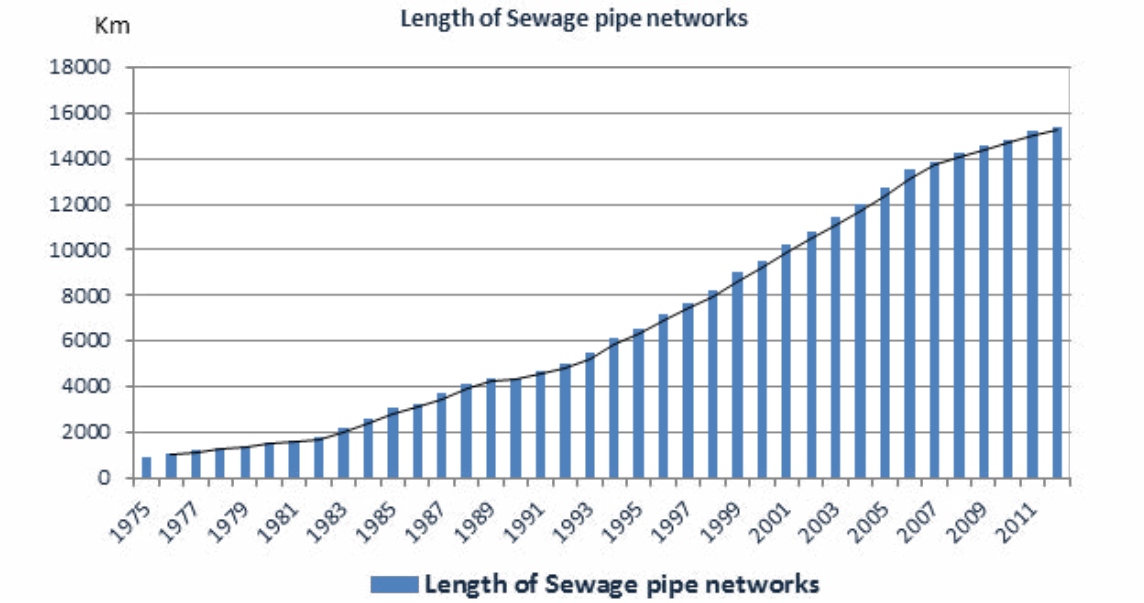


Figure 18. Length of ONAS Sewage pipe Networks, Historical Data (1975-2012)

- Municipal Wastewater Treatment Capacity:

Historical Data (2008-2012), Annual Average: 0.2934 BCM, Municipal Wastewater Treatment Capacity: 0.2983 BCM in 2012.

- Industrial Wastewater Treatment Capacity:

Historical Data (2008-2012), Annual Average: 0.0193 BCM, Industrial Wastewater Treatment Capacity: 0.0193 BCM in 2012.

Table 25a. Municipal & Industrial Wastewater Treatment Capacity, Historical Data (2008-2012)

Year	2008	2009	2010	2011	2012	Annual Average
Municipal Wastewater Treatment Capacity (MCM/Year)	289.2	290.8	294.5	294.5	298.3	293.4
Industrial Wastewater Treatment Capacity (MCM/Year)	19.3	19.3	19.3	19.3	19.3	19.3
Wastewater Collection Capacity (MCM/Year)	234.5	238.8	240.0	237.3	234.0	236.9

Source: ONAS

5. Water & Energy:

- Electricity Generated Using Hydropower: 110.56 GWh/Year by 7 hydropower plants built between 1956 and 2003, Historical Data: 2000-2012, Annual Average: 82.3 GWh/Year, (Source: STEG 2012).

- Hydropower as % of Total Generated Electricity: Electricity Generated Using Hydropower (GWh)/ Total Generated Electricity (GWh) = (110.56) / (14 123.2)*100 = (0.7) # 1 % in 2012 (Source: STEG 2012)
- Installed Hydropower Capacity: 66.00 MW in 2012 disaggregated as follows: (1) Nebeur Hydropower plant: 13 MW, (2) El Aroussia : 4.8 MW, (3) Fernana: 9.7 MW, (4) Kasseb: 0.66 MW, (5) Sidi Salem: 36 MW, (6) Bouheurtma: 1.2 MW, (7) and Sejnane: 0.6 MW (Source STEG 2012), Historical Data: 1956-2012, Annual Average: 1.16 MW (Source STEG 2012).
- Water Used to Generate Electricity: 830.8 MCM in 2012 disaggregated as follows: (1) Nebeur Hydropower plant: 44.5 MCM, (2) El Aroussia : 0.0 MCM, (3) Fernana: 37.9 MCM, (4) Kasseb: 32.4 MCM, (5) Sidi Salem: 701.7 MCM, (6) Bouheurtma: 14.3 MCM, (7) and Sejnane: 0.0 MCM, Historical Data: 2008-2012, Annual Average: 503, 205 MCM/Year (Source STEG 2012).

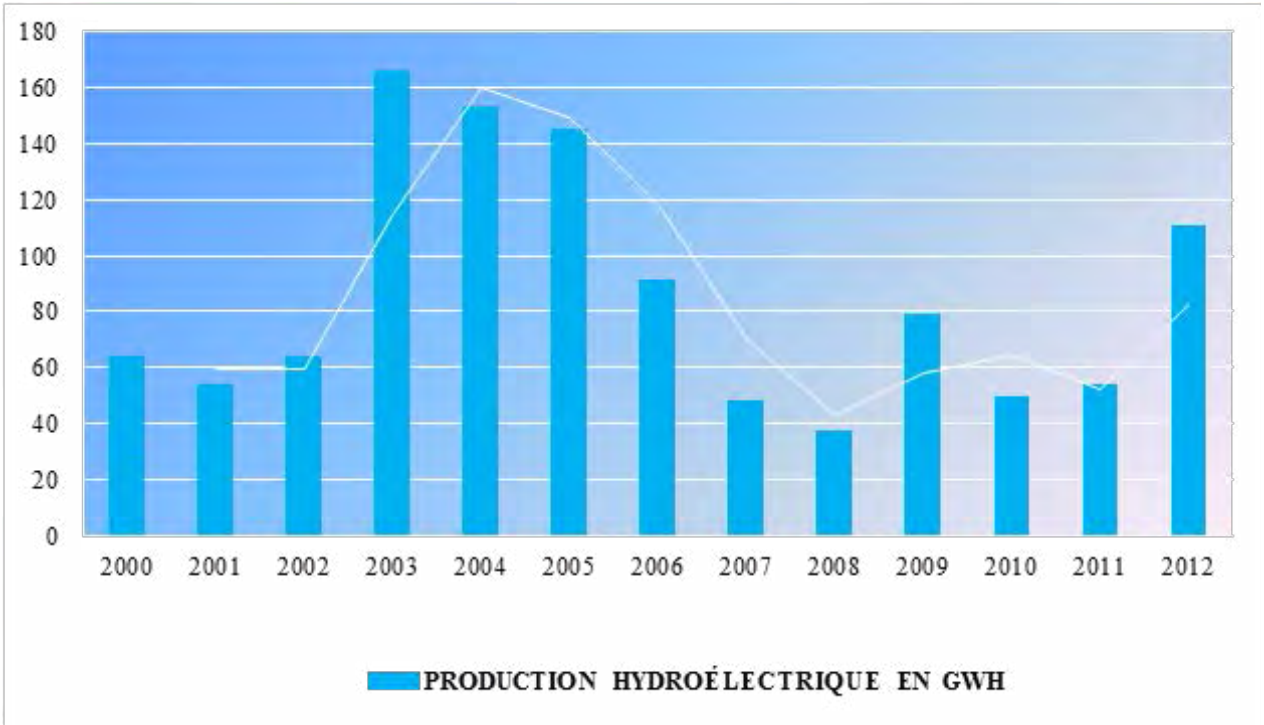


Figure 19. Electricity Generated Using Hydropower, Historical Data (2000-2012)

Photo 1. Turbining (Beni Metir Dam)

Source: STEG

Table 26. Installed Hydropower Capacity

Year	Hydropower Plants Number	Pump sets Number	Installed Hydropower Capacity (MW)
1956	2	3	17.8
1958	1	1	8.5
1962	-	1	1.2
1969	1	1	0.66
1983	1	1	36
2003	2	2	1.8
TOTAL	7	9	66

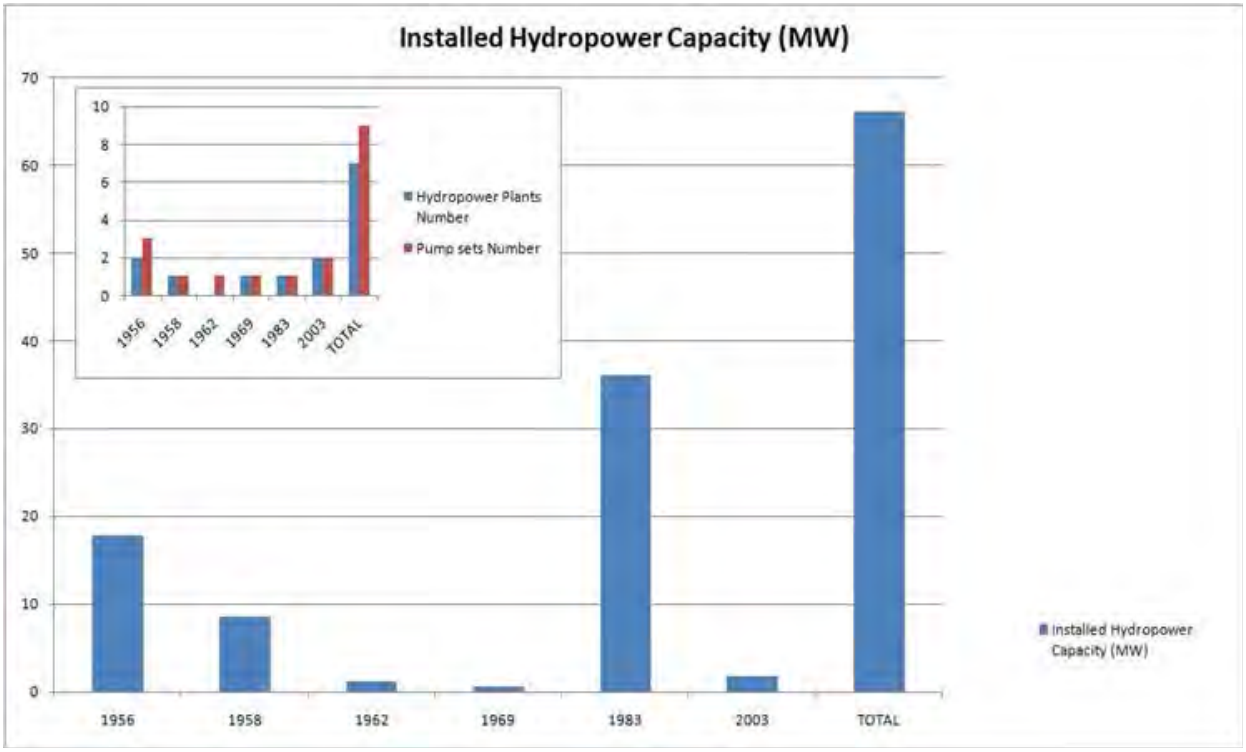


Figure 20. Installed Hydropower Capacity, Historical Data (1956-2013)

Photo 2. Hydro electricity Generation

6. Water & Population :

- Total Population: Different national censuses in Tunisia gave the following results:

Table 27. Population Growth (1921-2014)

Census Yea	Number of inhabitants
1921	2, 093, 939
1926	2, 159, 708
1931	2, 410, 692
1936	2, 608, 313
1946	3, 230, 952
1956	3, 783, 169
1966	4, 533, 351
1975	5, 588, 209
1984	6, 966, 175
1994	8, 785, 711
2004	9, 910, 872
2014	10, 982, 754

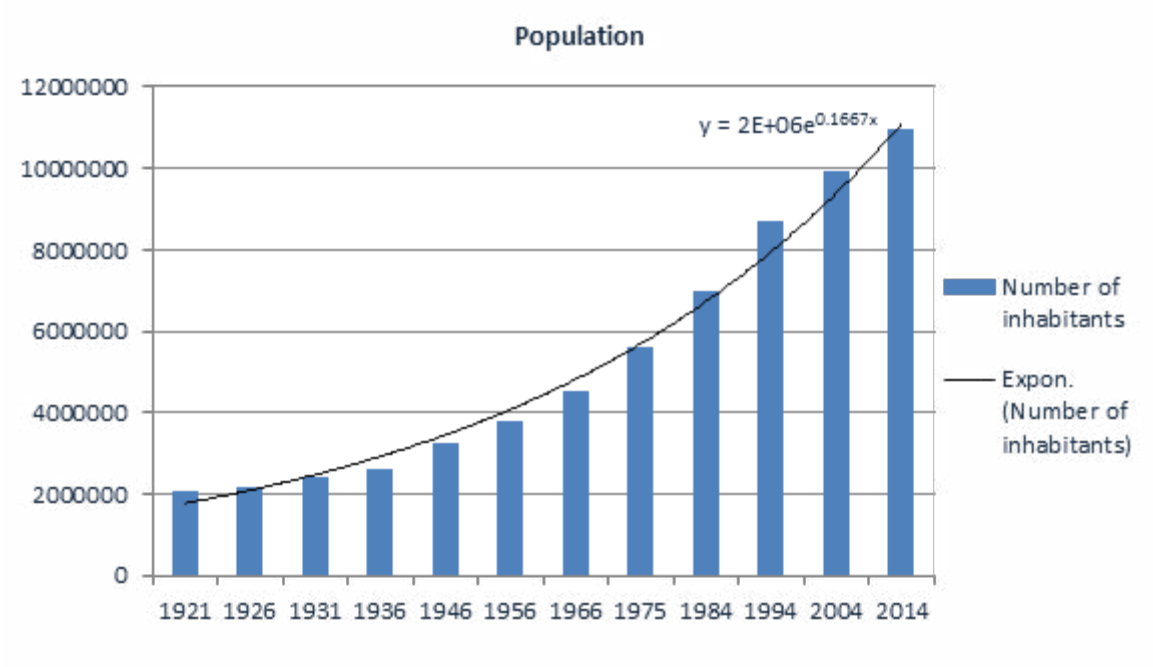


Figure 21. Population Growth, Historical Data (1921-2014)

- Internal Renewable Water Resources Per Capita = (Total Internal Renewable Blue Water Resources (TIRBWR) + Total Renewable Green Water Resources (TRGWR))/ Population = 3.854 BCM/Year + 13.000 BCM/Year)/ 10 776 400 capita = 1564 CM/Capita/Year.
- Total Water Consumption Per Capita: 1,460 CM/capita
- Agricultural Water Withdrawal Per Capita: 201.0 CM/capita

- Industrial Water Withdrawal Per Capita: 8.25 CM/capita
- Domestic Water Withdrawal Per Capita: 46.0 CM/capita

7. Water & Quality:

Parameters monitored are: Dissolved Oxygen, pH, Electric Conductivity, Nitrogen and Phosphorous concentrations, Total Dissolved Solids, and Fecal Choliform.

- Historical Data for Wadi El Bey (Hot spot in Nabeul Governorate): 2004-2012

Table 28. Water Quality Historical Data Wadi El Bey (2004-2012)

Sampling Date	April 2004	June 2005	May 2006	Oct 2006	April 2007	Nov 2007	May 2008	Nov 2008
pH (Dimensionless)	6.3-7.9	6.3-8.2	6.7-8.2	6.3-8	6.3-8	6.7-8.4	7-8	6.7-8
Salinity TDS (g/l)	1.2-2.1	0.9-1.8	1.6-4.4	1.1-2.4	0.7-2	1-2	0.7-5.2	1.1-7.2
Nitrates (mg/l)	50-410	50-325	60-325	45-260	40-140	10-85	10-70 (March)	10-250

March 2009	Sept 2009	Febr 2010	Sept 2010	May 2011	Sept 2011	Febr 2012	Nov 2012	NQE
7-8.3	6.5-7.8	7-8	7.5-8	7-8.5	7-8.5	8.2-8.5	7 .3-7.6	**6-9**
O.5-2.3	0.7-2.5	2.5-3	2-2.5	1-3	1-3.5	1.5-1.81.1	11	-
10-20	10-90	-	10-30	1-15	67-97	-	3-80	**50**

Source: ANPE, 2013

Watershed of Wadi El Bey:

The watershed of Wadi El Bey covers an area of 464 km2. He is the main water course in the region of Grombalia- Bou Argoub Soliman. It is fed by various industrial, agricultural and domestic discharges.

Effluent composition of Wadi El Bey watershed, namely releases from Grombalia WWTP and those from industries, affect directly some parameters indicators of Wadi El Bey water quality as salinity and COD whose concentration increases dramatically.

- Historical Data for SONEDE drinking water (bacteriological analysis):

8. Water & Health:

- Diarrhea Prevalence (% of children under 5 years old) = 6.48% in 2012 (Source DHMPE). Historical Data: 2000-2013, the annual Average 2000-2013 is 5.80%.
- Dracunculiasis Reported Cases (%) = 0.00 % in 2012 (Source DHMPE), unsignaled in Tunisia for a long time.
- Open Defecation Practice (Number) = (85 218 households *4.09) = 348 540 inhabitants in 2012 (Source INS, RGPH 2009 edited in 2012)
- Percentage of Open Defecation (%) = (348 540)/ (10 776 400) = 3.2 % (Source INS, RGPH 2009

edited in 2012)

- Cholera Reported Cases (Number per year) = 0.00 % in 2012 (Source DHMPE). The Annual Average 2000-2013 is 0.00 %.
- Hepatitis A Reported Cases = 412 new reported cases in 2012 (Source DHMPE)

Incidence rate (Cases number /100 000 inhabitants) = 3.82 in 2012 (Source DHMPE). The Annual Average 2000-2013 is 7.33 %

- Typhoid fever Reported Cases = 28 new reported cases in 2012 (Source DHMPE)

Incidence rate (Cases number /100 000 inhabitants) = 0.26 in 2012 (Source DHMPE). The Annual Average 2000-2013 is 0.55 %

Table 29. Historical Data on Water & Health Indicators (2000-2013)

Year	Diarrhea Prevalence (% of children under 5 years old)	Typhoid fever Incidence rate (Cases number /100 000 inhabitants)	Hepatitis A Incidence rate (Cases number /100 000 inhabitants)	Cholera Incidence (Cases number)	Drinking Water Salinity (% Sampling < 2 g/l)
2000	5,7	0,70	4,75	0	-
2001	5,4	0,45	9,75	0	-
2002	6,24	0,31	10,77	0	-
2003	6,5	0,47	7,29	0	83,9
2004	5,38	1,71	9,51	0	82,5
2005	5,6	1,01	7,21	0	85,7
2006	5,45	0,60	6,30	0	84,4
2007	5,11	0,47	12,74	0	89,2
2008	6,7	0,48	8,47	0	87,4
2009	4,67	0,49	7,23	0	87,4
2010	5,13	0,27	6,81	0	86,8
2011	5,68	0,17	2,23	0	88,0
2012	6,48	0,26	3,82	0	87,6
2013	7,2	0,36	5,70	0	85,7
Average	**5,80**	**0,55**	**7,33**	**0**	**86,2**

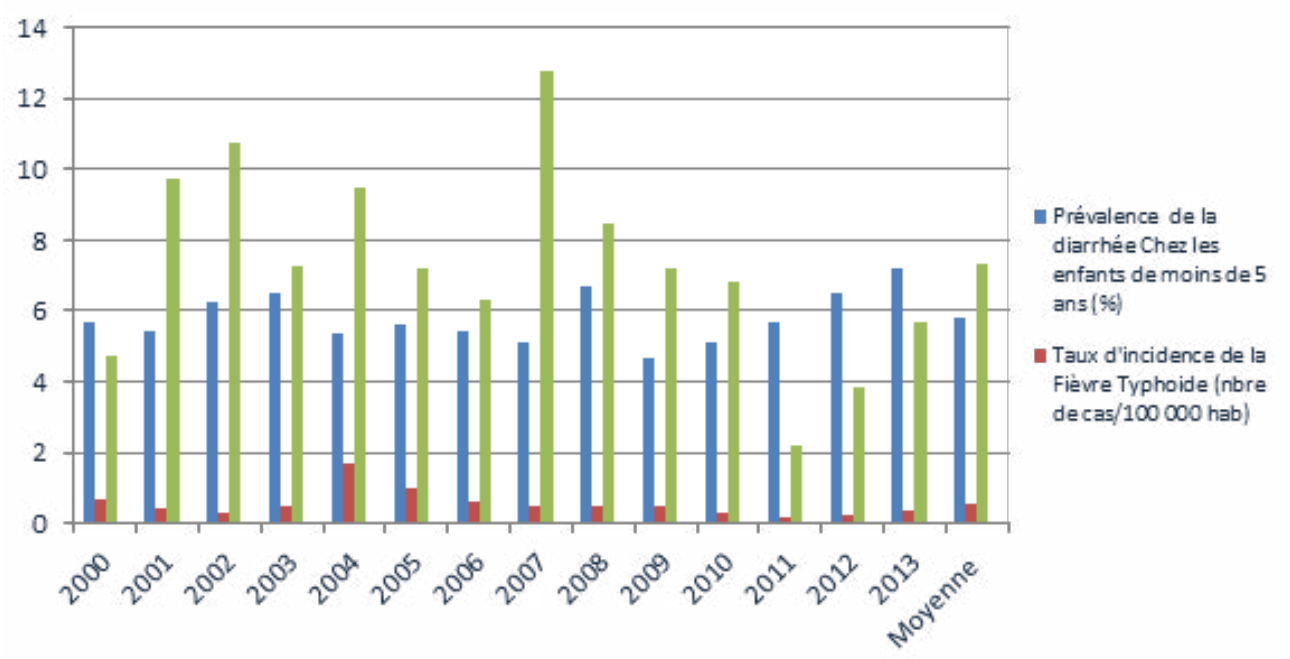


Figure 22. Historical Data on Water & Health Indicators (2000-2013)

9. Water & Ecosystems:

Historical Data: 1981-2013

- 35 Wetlands Sites Acknowledged by RAMSAR in 2012; 40 Wetlands Sites Acknowledged by RAMSAR in 2013; Annual Average: 1.2 sites
- Total Wetlands areas: 877,467 ha in 2012; Total Wetlands areas: 1,608,024 ha in 2013; AA: 48,727 ha

Table 30. Number and Areas of Wetlands Sites, Historical Data (1981-2013)

Date	1981	2007	2012	2013
Number of Wetlands Sites Acknowledged by RAMSAR	1	19	35	40
Total Wetlands areas (ha)	12,600	713,903	877,467	1,608,024

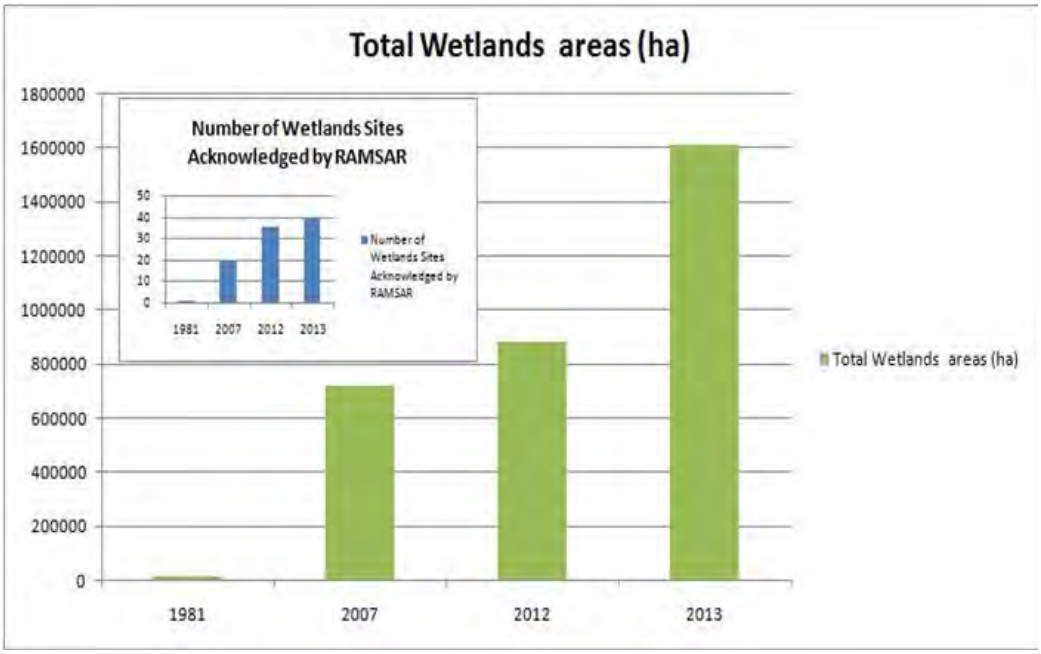


Figure 23. Number and Areas of Wetlands Sites, Historical Data (1981-2013)

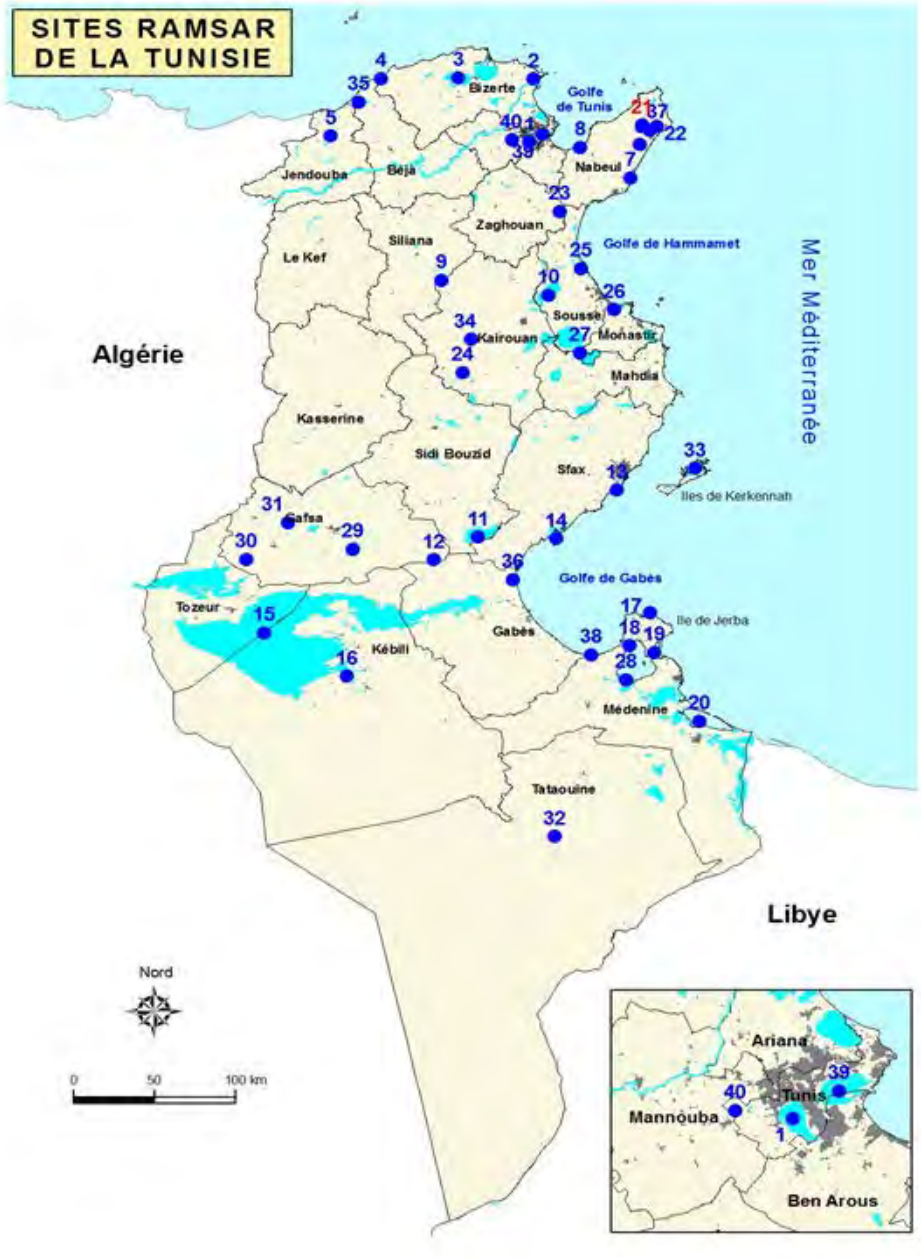


Figure 24. Ramsar Wetlands map

Analyses Bactériologiques

Désignation	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Nombre de prélèvements	33175	38901	45714	48174	49864	51278	51236	49396	51125	53938	52884	51767	47458	47964	47082	47569	49150	48251
Cas propres %	98,2%	98,0%	98,2%	98,1%	97,7%	98,2%	98,6%	98,9%	98,4%	98,5%	98,3%	98,3%	98,8%	98,7%	99,0%	99,1%	99,0%	98,5%
Cas impropres %	1,8%	2,0%	1,8%	1,9%	2,3%	1,8%	1,4%	1,1%	1,6%	1,5%	1,7%	1,7%	1,2%	1,3%	1,0%	0,9%	1,0%	1,5%

Tab1 Tab-Texte AB

10. Water & Climate:

- Flood Events in the Last Four Decades: Historical Data (1969-2012), 21 Flood Events (9 Class 1+7 Class 1.5+5 Class 2), these events occurred in1969, 1973 (2), 1979, 1982 (2), 1986, 1990, 1995, 2000, 2003 (2), 2004, 2005, 2006, 2007, 2009 (2), 2011 (2), and 2012; Annual Average: 21/44= 0.47; only one Flood Event occurred in February -March 2012 (Class 1.5). Source DGRE
- Drought Events in the Last Four Decades: Historical Data (1969-2013), 12 Drought Events, these events occurred in 1977, 1987, 1988, 1993, 1994, 1996, 1999, 2001, 2002, 2008, 2010, and 2013, Annual Average: 12/45 =0.27; only one Drought Event occurred in 2013. Source DGRE
- Cost of Annual Damage Caused by Floods: Historical Data (1969-2012), Cost: 240 MDT/44 years #5.5 MDT/Year =3.1 M$/Year.

GDP 2013 (109$) = 47.43029; Cost of Annual Damage Caused by Floods in % GDP= 0.007.

- Annual Human Losses Related to Floods: Historical Data (1969-2012), AA= 800/44 # 20/Year
- Unusual Weather Events (Snow, Hail,…): Historical Data (1983-2012), 129 Snow Events ,AA =129/31 =4.2 and 159 Hail Events, AA = 159/31= 5.13.

In 2012, 13 Snow Events and 16 Hail Events occurred. Source INM

Photo 3. Overflow of wadi Medjerda

Source: DGRE

Photo 4. Flooded Mabtouh Plain downstream of wadi Medjerda

Source: DGRE

La destruction de la voie ferrée de la Compagnie Phosphate Gafsa (région de Redeyef, Gouvernerat de Cafsa)

Photo 5. Flood Event in September 2009 in Redeyef –Gafsa (Destruction of the CPG railway in Redeyef)

La destruction de la conduite d'amenée d'eau d'irrigation de Tebedit à l'Oasis de Richet Naam
(région de Metlaoui, Gouvernerat de Cafsa)

Photo 6. Flood Event in September 2009 in Redeyef –Gafsa (Destruction of the irrigation pipe of Tabedit-Richet Naam)

Photo 7. Flood Event in September 2009 in Redeyef –Gafsa (Destruction of works of water and soil conservation in Tarfaoui river)

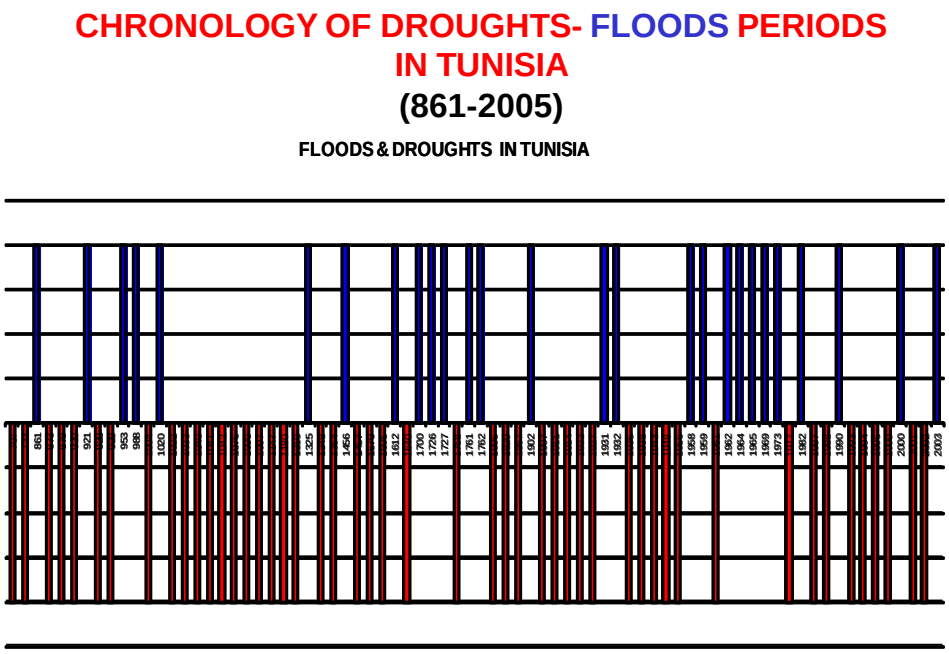


Figure 25. Chronology of Droughts-Floods in Tunisia, Historical Data (861-2005)

11. Water & Socio-Economics:

Water Productivity:

- Industrial Water Productivity:

IWP=12.93475 (B$)/0.089 (BCM/Year)= 145.33 $/CM in 2012, Source INS, DGRE.

- Agricultural Water Productivity:

AWP=3.89392 (B$)/7.665 (BCM/Year) = 0.51 $/CM in 2012, Source: INS, DGRE, DGGREE.

- Employment in Agriculture "Job Per Drop": 55,012 persons/7.665 BCM/Year= 71.75 Jobs/MCM in 2012, Source: INS, DGRE, DGGREE.
- Employment in Industry "Job Per Drop": 1,037,437 persons/0.089 BCM/Year= 11, 993.67 Jobs/MCM in 2012, Source INS, DGRE.

Tariffs & Affordability:

- Water and Sanitation Charges as % Average Household Income: Data are for 2010 because the survey is quinquennial.

Water and Sanitation Charges= 22.996 DT (Invoice) +3.015 DT (Water tanks) +6.645 DT (Mineral water) = 32.656 DT per person in 2010 (Source: INS)

Average Household Income: 4,861.1 DT in 2010 (Source INS).

Water and Sanitation Charges as % Average Household Income= 32.656 DT*100/4,861.1 DT = 0.7% in 2012

12. Water & Finance:

- Percentage of National Budget directed to Water & Sanitation Sector:

2012 Value: Water & Sanitation Budget = 492.8 MTDN= 308.9856 106 $, Total National Budget =25 551.0 MTDN = 16 020.447 106 $ and % of National Budget directed to Water & Sanitation Sector is 308.9856 106 $/ 16 020.447 106 $ = 1.9%.

2013 Value: % of National Budget directed to Water & Sanitation Sector is: 1.8%; Source: INS, Ministry of Finance, Ministry of Agriculture, ONAS, DHMPE.

- Percentage of GDP directed to Sanitation and Hygiene:

2012 Value: Sanitation and Hygiene Budget = 91.5 MTDN = 57.3705 106 $, GDP = 70 584.6 MTDN = 44.256544 109 $ and % of GDP for Sanitation and Hygiene is 57.3705 106 $/44.256544 109 $ = 0.13%.

2013 Value: % of GDP for Sanitation and Hygiene is also: 0.13%; Source: INS, ONAS, DHMPE

- Operation & Maintenance Cost Recovery for Water Supply and Sanitation =80.7% in 2012 (Source SONEDE)
- Operation & Maintenance Cost Recovery for Irrigation =64 %in 2012 (Source DGGREE)
- Foreign Aid for Water and Sanitation: 14.2 Million US$ in 2012 for SONEDE and 53.22 Million US$ in 2012 for ONAS. TOTAL: 67.42 Million US$ in 2012.

13. Water & Trade:

Historical Data: 1993-2013

- Virtual Water Imports, Exports and Virtual-Water Net Flow Related to Trade in the Agricultural Sector:

Virtual Water Imports: 10,225.342 MCM in 2012

Virtual Water Exports: 6,032.021 MCM in 2012

Virtual-Water Net Flow: 4,193.321 MCM in 2012

Source: DGCE (Ministry of Trade)

14. Water & Governance:

Table 31. Water & Governance indicators (2008-2013)

	2008	2009	2010	2011	2012	2013
Surface Water Permits issued	117	179	194	170	170	**162**
Total Volumetric Rights associated with Surface Water Permits (MCM)	4.095	5.370	6.79	5.61	5.44	5.832
Groundwater Well Permits issued	1096	1519	1446	1227	1232	1786
Total Volumetric Water Rights associated with Well Permits (MCM)	49.320	60.76	65.07	52.761	51.744	83.942
Number of unlicensed wells	-	-	1636	-	-	-

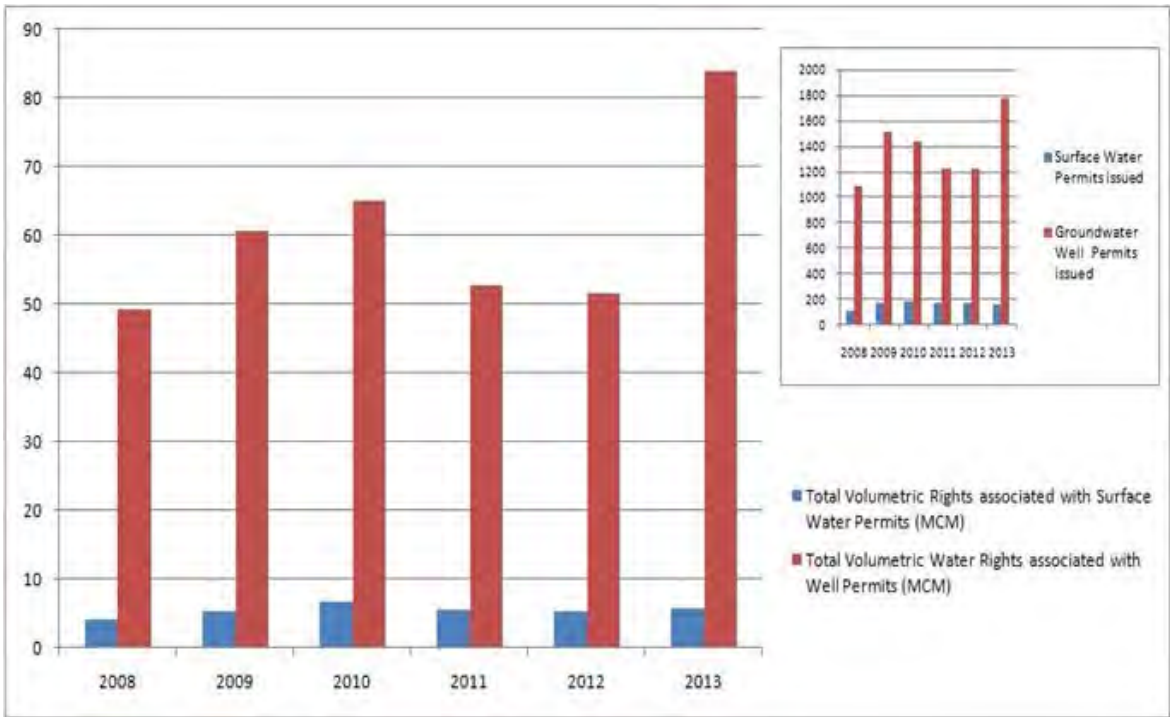


Figure 26. Water & Governance indicators 2008-2013 (Graph)

In conclusion, most values in 2012 are available except for indicators that are not monitored and evaluated regularly and for which there is still no institution in charge for their development and monitoring and where an institutional gap persists (Rural sanitation, Rainwater use).

It turned out that some additional specific indicators are not monitored regularly or require additional capacity for monitoring; these indicators will be monitored and evaluated regularly once capacity will be strengthened.

Data on Water & Finance indicators are confused and are not homogeneous (allocated credits, commitment appropriations, enrolled appropriations, payment, etc.).

NWSAS indicators are not representative, data are not significant and do not reflect the issue of NWSAS particularly governance and water policy

The historical data, despite their existence and their availability were not communicated in time by NTF members. Once received, they allowed us to be informed on the status of indicators, trends and possible reasons for their fluctuations.

6. Policy Recommendations

The existing system of monitoring, evaluation and reporting of the state of water, in Tunisia, despite its shortcomings and limitations, helps to the knowledge of the state of water and environment in the country. So that, it can fully play its role, and be in line with the efficient systems at regional, continental and global scale, it is necessary to improve, enrich, strengthen, expand and upgrade it. For this, we recommend the following reforms:

- Complete the development of Water Information System (SINEAU) and its various components to evolve as a decision support system that can be used on progress in water sector
- Construct information sub-systems (or DBMSs) within the related institutions that do not have them, to be integrated in SINEAU
- Lift the institutional gap of rural sanitation and rainwater management (use)
- Enhancement of institutional arrangements
- Establish departments or entities dealing with monitoring, evaluation and reporting of the status of water in key institutions in charge of water, and reform the relevant legislative texts.
- Implementation of M&E&R sub-systems in all the institutions in charge of water resources
- Implementation of a national M&E&R system at the central level and appoint DGRE or BPEH of its management
- Improving Monitoring process
- Implementation of a dissemination and awareness strategy
- Capacity building and strengthening training program
- Establish a MEWINA unit within DGRE or BIRH.

References

Besbes M, Hamdene A, Chahed J and Hamza M, 2008. World water Development Report 3. Case study in Tunisia. Document prepared for WWAP (UN. World Water Assessment Program).

Chahed J., Hamdane A., and Besbes M. 2008. A comprehensive water balance of Tunisia: blue water, green water and virtual water. Water International, 33:4, 415-424

Chaieb H. and Hamza.M. 2013. Responses to Misr consult questionnaires based on data collected from Tunisia MEWINA project national taskforce.

DGF/GTZ.1994 : Gestion de la faune sauvage et des parcs nationaux en Tunisie

DGF. 1995: Résultats du premier inventaire forestier national en Tunisie

DGF. 1995: Résultats du premier inventaire pastoral national en Tunisie

DGF.2010 : Inventaire des forêts par télédétection, Résultats du deuxième inventaire forestier et pastoral national

DGF/ WWF Bureau de Tunis, Programme Méditerranée.2012 : Les zones humides d'importance internationale en Tunisie, 35 sites RAMSAR

DGRE : Annuaires pluviométriques, hydrométriques, exploitation des nappes phréatiques et profondes, suivi de la qualité des eaux souterraines.

Lebdi.F. 2009. National needs assessment and delineate UNDP interventions in Tunisia. UNDP Press.

INS, Institut National de la Statistique. 2013. Population statistics for Tunisia. Available at: http://www.ins.nat.tn. Accessed: March. 2013.

INS, Institut National de la Statistique. 2014. http://rgph 2014.ins.tn

Jemmali H., and Matoussi M. 2013. A multidimensional analysis of water poverty at local scale: application of improved water poverty index for Tunisia. Water Policy. 15: 98-115.

Khanfir R., El Echi M., Louati M., Marzouk A., Frigui H., and Alouini A.1998. EAU21: Stratégie du secteur de l'eau en Tunisie à long terme 2030. Ministère de l'Agriculture. République Tunisienne.

Maplecroft. 2012. Water Stress Index Values for 2012. Available at: www.maplecroft.com. Accessed: March, 2013.

MARH. 2007. National Strategy for the adaptation of Tunisian agriculture and ecosystems to climate change. Ministère de l'Agriculture et des Ressources Hydrauliques. République Tunisienne.

MEED.2007. Protection of Ecosystems from Climate Change and Climate Change Adaptation Report. République Tunisienne.

MEED/ANPE/OTEDD/GTZ.2010: Etude de l'évolution urbaine de l'agglomération du Grand Sousse

MEED/ANPE/AQUAPOLE/LIFE/COPEAU : Réseau de contrôle de la pollution de l'eau en Tunisie, Rapports annuels 2006-2012

MEWINA RAR.2014: Tunisia Water Sector M&E Rapid Assessment Report, Mohamed Hamdi Nour, Mekki Hamza.

ONAS. 2012. Statistiques des Abonnés ONAS. 2012 Annual Report. Office National de l'Assainissement. RépubliqueTunisienne.http://www.onas.nat.tn.

SONEDE. 2012. Société Nationale d'Exploitation et de Distribution des Eaux. Annual Report. République Tunisienne.

SONEDE/DCPEG/DSP.2012 : Rapport des statistiques, Année 2012

SONEDE/DCPEG/DSP.2013 : Rapport des statistiques, Année 2013

SONEDE/DCPEG/DSP.2014 : Les statistiques de la SONEDE (2002-2013)

STEG. 2013. La société tunisienne d'électricité et du gaz. Available at: http://www.steg.com.tn/fr. Accessed on: March,2013.

UNDP. 2013. United Nations Development Program. Country Profile: International Human Development Indicators. Available at: http://hdrstats.undp.org/. Accessed on : March, 2013.

Annex

AMCOW Water and Sanitation M&E Template

Country Background Information Sheet

Country Name: **Tunisia**

<table>
<tr><th>Items</th><th>Information</th></tr>
<tr><td>1. Population trends for the last 4 years, and GDP.</td><td>
<table>
<tr><th>Years</th><th>2000</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th></tr>
<tr><td>Urban pop.</td><td>5979900</td><td>6971600</td><td>7055400</td><td>7156145*</td><td>7241575*</td></tr>
<tr><td>Rural pop.</td><td>3572600</td><td>3575500</td><td>3618400</td><td>3621408*</td><td>3644952*</td></tr>
<tr><td>Total pop.</td><td>9552500</td><td>10547100</td><td>10673800</td><td>10777553*</td><td>10886527*</td></tr>
<tr><td>GDP (10^9 USD)</td><td>18.45468</td><td>39.77751</td><td>40.58608-</td><td>44.25654**</td><td>47.43029***</td></tr>
</table>
Source : INS (* pop on 1st July, **semi-final, *** provisional);
1DT=0.627 USD on 27/3/2013.
</td></tr>
<tr><td>2. Basis of the existing water sector Policy/ Reform and potential policy targets.</td><td>Important issues addressed in the existing Water Sector Reform?
Public policy of water in Tunisia was established based on the following strategic objectives:
(i) ensure the supply of drinking water to all inhabitants (ii) develop tourism and ensure food security of the country by restricting imports of food and agricultural products and by encouraging the export (iii) stabilize rural incomes. Actually other objectives are added such as improving the efficiency of irrigation systems ensuring better use of water resources. Thus the objective sought by the state is that the share of irrigated agriculture in the national production passes from 35% to 50%. These policies have gone through two major steps that led to a switch from a policy based on the sustained mobilization of water resources in order to improve the supply, to a policy of management and valorization of these water resources in order to manage the global demand.
Meanwhile the focus is more on finding unconventional resources. This research includes: (i) the reuse of treated wastewater, and to a certain extent, desalination of brackish and saline water, (ii) and integrated water resources management (IWRM).</td></tr>
<tr><td></td><td>The objectives of the new water policy in Tunisia seek to: (i) ensure continuing suitability between needs and water resources by increasing supply and controlling of the demand, (ii) identify imbalances at the scale of natural regions of the country (iii) consider ways to readjust imbalances in the context of integrated management.
This evolving policy hasn't ceased to be modernized and completed to address key issues and resulted in the development of national or sector strategies and action plans and programs to implement these strategies.</td></tr>
<tr><td></td><td>Major reforms in the water sector and sanitation:
BPEH restructuring, revision of the Water Code, Renaissance of the National Council of water, review of legal, regulatory and contractual hydraulic groups framework, review of the Tunisian standard NT09-14 on the quality of drinking water; revision of the NT106-03 on the reuse of treated wastewater; workshop to launch the project development and implementation of SINEAU (26/03/2013), national Consultation Workshop on the review and analysis of the state of implementation strategies and / or action plans for wastewater in Tunisia (05/03/2013), water table on the water local management (25/12/2013), local governance legal framework of water in Tunisia (27/05/2014),consultation workshop on governance and financing of water sector (18/02/2014) ...</td></tr>
<tr><td></td><td>Main potential targets by 2016:
(i) mobilization of 95% of water resources, (ii) the irrigated area using water-saving equipment reaches 93% (iii) 90% of the cost of water for irrigation systems and rural water supply is recovered (iv) efficiency rate of the parcel irrigated is 78%(v) accessibility to drinking water in rural areas is 98%</td></tr>
</table>

<table>
<tr><td>3. Knowledge of international and African Milestones on Water and Sanitation.</td><td><u>Which are the ones well known and used in the county? Specify how it is used</u><u>.-</u>
-<u>The Millennium Development Goals</u> (MDGs) adopted by the General Assembly of the United Nations (UN) in 2000,who declared the decade 2005-2015 as the Decade of Water for Life, target international goals in the sector of water and the environment. Goal 7 aims to preserve the environment, and by2015, the percentage of the population that does not have sustainable access to safe drinking water or to sanitation will be reduced to half its value now (target 7c).
The rates achieved by the country in terms of water supply and sanitation are as follows:
Accessibility to drinking water is 100% in urban areas and 93.9%in rural areas. For sanitation, the rate of access is 99% in urban areas and 84% in rural areas, which reflects the significant efforts made in this area.</td></tr>
<tr><td></td><td>-<u>The shared African water vision 2025</u> aims that Africa have equitable and sustainable management of water resources for poverty alleviation, socio-economic development , regional cooperation and the preservation of the environment. The realization of this vision depends on four axes: (i) strengthening the governance of water resources, (ii) improving the efficiency of water usage (iii) meeting the urgent needs for water, (iv) strengthening financing of water in the future. These areas are broken down into 12 targets. For example, for axis3 target1, the African vision plans to reduce by 25% in 2005 and 75% by 2015 the proportion of people without access to safe drinking water and sanitation. The rate of inaccessibility to water and sanitation in Tunisia in 2013 was reduced respectively by 91.9% and 77.8% and are therefore in line with the objectives of the African Water Vision 2025. The efforts performed by Tunisia for the achievement of the vision targets meet the objectives in general.</td></tr>
<tr><td></td><td><u>-Sharm Elscheickh commitments</u> to accelerate the achievement of water and sanitation in Africa, signed by the Heads of State and Government of the African Union, on the occasion of the 11th Ordinary Session of conference in Sharm Elscheickh, Egypt, from 30 June to 1 July 2008, these commitments are also considered for the monitoring of the progress to achieve the various targets.</td></tr>
<tr><td>4. Trend of the 3 latest reviews in national water Policy and Reforms.</td><td>
<table>
<tr><th>Reviews</th><th>Review 1</th><th>Review 2</th><th>Review 3</th></tr>
<tr><td>Drivers of the Reviews</td><td>WATER - 21; Study of the water sector in Tunisia long term 2030 (MARH 1998)</td><td>The project PISEAU 1

(2007-2001)</td><td>- The project PISEAU 2 (2008-2014)

- study of the sustainable management of water resources (2008)</td></tr>
<tr><td>Targeted Impacts and effectiveness</td><td>-Introduction of the IWRM

-management of water demand

- Use of non-conventional water</td><td>Improvement of rural water supply

- Optimization of monitoring of surface water and groundwater

- design of SINEAU</td><td>-Improvement of governance

- Implementation of subsystems S & E and SINEAU

- Participative management of groundwater

- Pilot operations of rural sanitation

-Quality improvement and enhancement of TW

- Implementation of SOW M&E&R system

- Revision and amendment of the Water Code. Bill revising and implementing decrees

(2010-2014)

- Water Rights in the new constitution (Article 44) (2014)</td></tr>
</table>
</td></tr>
</table>

5. Comments on the national water sector regarding the strengths, weaknesses, opportunities, threats and outstanding problems.	*Water resources of the country are limited. In order to exploit and develop this potential, Tunisia has established the legislative framework and institutions necessary for the realization of ambitious programs on the water sector. It has developed policies, national strategies and action plans for the sustained mobilization, management, protection and enhancement of water resources. The important improvements mobilization, storage, transfer and handling produced water in recent decades, with the development of various sectors of the economy and significantly reduced the vulnerability to the vagaries of climate: water security, mitigation the effect of drought, protection against flooding. Tunisia raised the challenge of mobilizing her water resources to serve the socio-economic development and welfare of its population, so that the Tunisian now has a level of water comfort that has not been matched in the past. Today, Tunisia faces the problems of, effective management, integrated and sustainable conservation, resource protection and enhancement of its maximum, to meet growing demand, future needs and control risks.*
	The sector has achieved remarkable performance in terms of water supply and sanitation with a very positive impact on the quality of life and economic activity. Despite the achievements, the water sector still faces problems that hinder its proper functioning particularly in terms of monitoring and evaluation. Among these problems, we can mention : IWRM is still under development, the water stakeholders are not yet fully involved, ineffective management of groundwater, storm water is not used outside the agriculture sector ,pricing and the mismatch between the price of drinking water production and sales of, the institutional gap for rural sanitation ...
	Similarly, the national information system on water (SINEAU) offers a dynamic database and a unified system to all sub systems management. However, monitoring and evaluation is still under development, and only some subsystems (SYGREAU, COPEAU) are operational. Also, governance needs to be improved or even enhanced by the introduction and application of the principles of good governance

Country Water and Sanitation Performances Evaluation Sheet

Country Name: **Tunisia**

<table>
<tr><th>Performance Category</th><th>Country Information</th></tr>
<tr><td>Theme 1: Infrastructure of water for economic development.
PC. 1.1. Water and Energy
Target:
Increase the use of hydro-energy by 10% between 2000 and 2015.</td><td>-The national theoretical hydropower potential is estimated at 1000 GWh, the theoretical exploitable potential is 250 GWh, the economically feasible is 165 GWh and the installed capacity is currently estimated at 66 MW on a set of eight hydro-electric dams. The hydropower is nearly 1% of the total energy produced by the country.
-<u>Specific actions taken to achieve the target</u>: STEG proceeded to achieve the following: (i) renovation and modernization of old hydro power plants by using modern equipment like static excitation, microprocessor based controls, electronic governors, high speed static relays, data logger, vibration monitoring etc; but it is not enough to achieve the target</td></tr>
<tr><td></td><td>Level of achievement
<table>
<tr><th>years (i)</th><th>2000</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th></tr>
<tr><td>- Hydroelectric potential economically feasible GWh(P)</td><td>160</td><td>165</td><td>165</td><td>165</td><td>165</td></tr>
<tr><td>-Hydro-electric capacity installed MWh(C)</td><td>64</td><td>66</td><td>66</td><td>66</td><td>66</td></tr>
<tr><td>-Index of the usage of the hydropower (HpuI = C/P)</td><td>0.4</td><td>0.4</td><td>0.4</td><td>0.4</td><td>0.4</td></tr>
<tr><td>Growth rate R_iHpuI(%) = $(HpuI_i - HpuI_{2000})/HpuI_{2000}$</td><td>-</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
-<u>Sources of verification and specific comments</u>: Annual operating report of STEG Centre for Hydraulics Production which is part of the Department of Renewable Energy Production attached itself to the Central Directorate of Electricity Production. The economically feasible hydropower potential and the installed hydroelectric capacity have not changed since several years. Target will not be achieved in 2015.</td></tr>
<tr><td>PC. 1.2. Water and Agriculture

<u>Targets:</u>
-Increase water productivity Rain fed agriculture & Irrigation by 30% from 2000 to 2015.

<u>and</u>

-Increase the size of irrigated areas by 50% from 2000 to 2015</td><td><u>-Specific actions taken to achieve the target:</u>
Improving the efficiency of water use
Level of achievement for agricultural productivity:
<table>
<tr><th>Years (i)</th><th>2000</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th></tr>
<tr><td>-Agricultural GDP (10^9 USD) (A)</td><td>1.62832</td><td>3.06728</td><td>3.42405</td><td>3.84175</td><td>3.88802</td></tr>
<tr><td>-Total water withdrawn for irrigated and rain fed agriculture (10^9 m^3)(B)</td><td>6.040 (1.879*+ 4.161**)</td><td>8.634 (2.203*+ 6.431**)</td><td>9.310 (2.210*+ 7.100**)</td><td>6.279 (2.247*+ 4.032**)</td><td>8.373 (2.313*+ 6.060**)</td></tr>
<tr><td>-Water Return to Environment 10^9 m^3 (C)</td><td>0.133</td><td>0.140</td><td>0.150</td><td>0.130</td><td>0.140</td></tr>
<tr><td>Water productivity (USD/m^3) Wp=A/(B-C)</td><td>0.27562</td><td>0.36111</td><td>0.37380</td><td>0.62477</td><td>0.47224</td></tr>
<tr><td>Rate of increase R_iWp(%) = $(Wp_i - Wp_{2000})/Wp_{2000}$</td><td>-</td><td>31.01</td><td>36.62</td><td>126.67</td><td>71.33</td></tr>
</table>
*Total water withdrawn for irrigated areas: surface water+ groundwater
** Total water withdrawn for rain fed agriculture
Water Return to Environment is estimated</td></tr>
</table>

- Achievement on irrigated areas:

Years (i)	2000	2010	2011	2012	2013
-Irrigated areas**(IA) in hectares**	275 000*	418 500*	420 000*	421 000*	437 500**
Rate of increase R_iIA(%) = $(IA_i - IA_{2000}) / IA_{2000}$	-	**52.18**	**52.72**	**53.09**	**59.09**

*Source DGGREE
**Source DGEDA

Sources of verification:

- *INS, DGEDA and DGGREE*
- *Agricultural GDP : source DGEDA of MA*
- *Course of 27/03/13 : 1TDN : 0.627 USD*
- **Conclusions**:
- *The rate of increase of water productivity has surpassed 30% and therefore the target was achieved*
- *The rate of increase of irrigated area has surpassed 50% and therefore the target was achieved.*

PC. 1.3. Water for multiple Uses

Target:
Increase the Water Demand Satisfaction Index ***(WDSI)*** by 10% from 2000 to 2015.

Specific actions taken so far for the milestone:
Achievement:

Years (i)	2000	2010	2011	2012	2013
- *Total all sectors Water Demand 10^9m^3 (A)	9.553	10.547	10.673	10.777	10.886
- **Total all sectors water supply (B)	10.760	15.027	16.334	10.608	14.488
- WDSI = B/A	**1.126**	**1.424**	**1.530**	**0.984**	**1.331**
Rate of increase R_iWDSI (%) = $(WDSI_i - WDSI_{2000}) / WDSI_{2000}$	-	**26.4**	**35.8**	**-12.6**	**18.2**

** Value is calculated based on 1000 m3/capita/yr as per AMCOW guidelines*
*** Values include blue, green, grey, and silver waters*
Target is met but is highly controlled by the fluctuation in green water. Also, the 1000 m3/capita/yr might not be realistic for Tunisia

Sources of verification:
Surface water abstraction from dams (DGBGTH), pumping from rivers (wadis) (BIRH) groundwater abstraction from deep aquifers (DGRE), precipitation intercepted by rain fed (estimated), use of treated waste water (ONAS, DGGREE), use of desalinated water (SONEDE and private users), use of rainwater tanks-majels (INS).

Theme 2: Management and protection of water resources

PC. 2.1: Transboundary basins and water resources management

Specific actions taken so far for the milestone:
Establishment of a consultative mechanism for the joint management of the North Western Sahara Aquifer System(NWSAS), operated by Tunisia, Algeria and Libya

Existence of a Management Plan for Effective Water or IWRM plan and year of adoption:

- *There is no stated plan for the Integrated Water Resources Management; however the main institutions responsible for water work separately for the promotion of IWRM through its various components, as well as improving governance and effective management of water resources.*
- *A national plan for Integrated Water Resources Management at the national level and across borders, which identifies priority steps that must be taken to reform the system of water management to the principles of IWRM to develop by 2015.*

Target:
Develop a national Water Efficiency Plan by 2015.

Elements of the legislative and regulatory environment:

- The water code developed in 1975 is being revised and / or redesigned to update it and to adapt to current conditions. It remains the most appropriate instrument for the preservation and protection of water resources.
- The recent Renaissance of the National Council of Water (Decree No. 407/2010 dated March 9, 2010) will assist the Minister to decide on strategic issues in the sector, while involving all stakeholders in the water, including civil society.

<table>
<tr><td></td><td><u>Elements of institutional arrangements:</u>
- The BPEH recently renewed and charged by the Minister's office, in coordination with stakeholders in the hydraulic sector, to: (i) planning the mobilization of conventional water resources and the development of non-conventional water resources in order to meet the medium and long term, growing needs of water consummation in different sectors, (ii) annual program allocation of water resources to different users in order to develop such resources, (iii) ensure the ongoing monitoring of deployment of the hydraulic sector especially in emergency situations, which consist mainly in periods of drought or floods or during any failures in any production or distribution water facility, (iv) ensure coordination between institutions producers and distributors of water resources in the hydraulic field.
- The BPEH is in charge of coordinating the study of strategic water in 2050 in Tunisia.
- DGRE is responsible for the coordination and management of the national information system on water (SINEAU).</td></tr>
<tr><td></td><td><u>Elements of Financial Structure:</u>
- The investment project in water sector (PISEAU 2) is financed by the IBRD, AfDB and AFD. The implementation of SINEAU and the strategic study on Water 2050 are financed by the AWF. The revision of the Water Code is funded by BIRH while preservation strategy groundwater is funded by the European Union. Efficient project management of water resources and the study of the sustainable management of water resources are funded by GIZ.</td></tr>
<tr><td></td><td><u>Management instruments:</u>
Existence of tools and methods that help decision makers to take the best decision. These instruments are: the Water Code, the National Council for water, The hydraulic public water domain commission, the National Commission for Sustainable Development, SINEAU, BPEH, and BIRH etc.
<u>Sources of verification and specific comments</u>:
- Ministry in charge of Water and institutions.</td></tr>
<tr><td>PC. 2.2. Transboundary Infrastructure Development Rainwater
<u>Target:</u>
Increase by 10% from 2008- 2015.</td><td>☐ Not applicable</td></tr>
<tr><td>PC. 2.3. Groundwater
<u>Target:</u>
AGC Roadmap implemented at More than 80%.</td><td>☐ Not applicable</td></tr>
<tr><td>PC. 2.4. Rainwater

<u>Target:</u>
Increase the share of rainwater use in total municipal water consumption up to 10% by 2015.</td><td>☐ <u>Specific actions taken so far for the milestone:</u>
- Encouraging the use of rainwater
☐ Achievement:
<table>
<tr><th>Years (i)</th><th>2008</th><th>2011</th><th>2012</th><th>2013</th></tr>
<tr><td>- Total municipal water supply(A)</td><td>488.8</td><td>563.7</td><td>601.3</td><td>628.7</td></tr>
<tr><td>- Rainwater use (Mm^3) (B)</td><td>12.6</td><td>8.76</td><td>10.20</td><td>10.7*</td></tr>
<tr><td>- Water use from other sources (Mm^3) (C)</td><td>(41.7+83.7)</td><td>(44.0+69.3)</td><td>(44.4+57.2)</td><td>(45.0+46.1)</td></tr>
<tr><td>Total municipal water consumption (%) (Twc = A+B+C)</td><td>626.8</td><td>659.7</td><td>713.1</td><td>689.0</td></tr>
<tr><td>Percentage of rainwater usepRu (%)=B/ Twc .</td><td>2.01</td><td>1.32</td><td>1.43</td><td>1.55</td></tr>
</table>
*estimated at 90 000 families.</td></tr>
<tr><td></td><td><u>Sources of verification and specific comments:</u>
-The quantities of water are removed from municipal provided statistical reports SONEDE, storm water are estimated on the basis of the general census of population and housing 2004 and on the results of the Labor Force Survey 2009 of INS; the withdrawals from wells and boreholes come from DGRE directories.
-The figures for rainwater used needs to be revised and better defined</td></tr>
</table>

PC. 3.1. Urban Water Supply

PC. 3.2. Urban Sanitation

PC. 3.3. Rural Water Supply

PC. 3.3. Rural Sanitation and Hygiene

Specific actions taken so far for the milestone:

Developing Infrastructure of water supply and sanitation in urban and rural areas especially in the North West and in the South regions.

Achievement in water supply:

Years (i)	**1990**	**2010**	**2011**	**2012**	**2013**
-Urban access (%)	100	100	100	100	100
-Rural access (%)	38,7	93,5	93,8	93,4	93,9
-Total access (%) (W)	**75,4**	**97,8**	**97,9**	**97,8**	**98,0**
Rate of Inaccessibility reduction for water IRwat (%) = $(W_i\text{-}W_{1990})/(100\text{-}W_{1990})$	-	**91.0**	**91.5**	**91.0**	**91.9**

Target:
Reduce by 50% from 1990 to 2015, the proportion of the population without improved drinking water source, and the proportion without improved sanitation facility *(Urban/Rural / Total).*

Achievement in improved sanitation:

Years (i)	**1990**	**2010**	**2011**	**2012**	**2013**
-Urban access (%)	94	98 97 (JMP)	98	98 97 (JMP)	99*
-Rural access (%)	43	84 77 (JMP)	84	84 77 (JMP)	84*
-Total access (%) (S)	**73**	**94** **89 (JMP)**	**93.8**	**94** **90 (JMP)**	**94***
Rate of Inaccessibility reduction for sanitation IRsan (%) = $(S_i\text{-}S_{1990})/(100\text{-}S_{1990})$	-	**77.8**	**77.0**	**77.8**	**77.8***

2013 figures are estimated

Targets are achieved based on national and JMP improved water supply and sanitation definitions

Sources of verification:

The data sources are: (i) the INS through censuses of 1974, 1984, 1994, 2004 and INS national survey on population and housing for 2009

It is recommended to remove the institutional shortcomings of rural sanitation and extend the scope of ONAS rural or load another appropriate institution management, (iii) MDG 2011 report, AfDB, AEC, AU, and UNDP(data of 1990 and 2008), (iv) African Water Report to AU. Summit 31/01/2014 for WHO/UNICEF/JMP data.

PC. 4.1. Adaptation to Climate Change

Specific actions taken so far for the milestone (New initiatives to improve resilience):

Developing a strategy, action plans and programs for implementation

Existence of a National Climate Change Adaptation Strategy and Year of adoption:

A national adaptation strategy of Tunisian agriculture and ecosystems to climate change (MARH, 2006) and a study on the protection of ecosystems and adaptation to climate change (ME, 2007), have been developed. This strategy is based on sectoral strategies related to water resources, ecosystems, agro-ecosystems and the agricultural sector as a whole. This strategy was adopted.

Target:
Develop and implement, at least 1 Climate Change Adaptation Strategy by 2015.

Existence of Actions Plans on Water for Climate Change resilience:

Action plans and implementation of this strategy based on: (i) the control of excess water in wet years by the development of surface storage techniques (structural design for a multi-year adjustment) and underground (recharge of ground water), (ii) the future management / risk management, focusing mainly on the mobilization of new resources, optimizing management, water conservation, rationalization and enhancement of water, (iii) and concrete measures for the development of legislation, institutional, and especially the strengthening of modest capacity to adapt to climate change. It is a series of action plans for drought, flooding, water quality, protection of wetlands, coastal management ...

	Existence of Programmes for implementing the Actions plans: *Detailed activities programs for the implementation of action plans exist, they are broken down by component:* ***1)climate**: (i) establishment of a monitoring system based on climate and remote sensing early warning to the farm level, (ii) implementation of a System for Collecting Real Time Hydrological measurements and Announcement Flood Tunisian wadis (SYCOHTRAC) (iii) dissemination of information in the form of climate indices in all economic sectors, (iv) conduct a study on the sustainable management of water resources in Tunisia (OTEDD) (v) conduct a study on early warning system for the management of risks to climate extremes and climate change in Tunisia.**2) water resources**: (i) revise the Water Code and commit to implement it rigorously to protect water resources and taking into consideration the climate change, (ii) further review the water pricing by taking into account the conservation of ecosystem services.**3) ecosystems**: (i) continue the program of water management - however by ecosystem, rather than by watershed - to take into account the environmental benefits of these services**(4) agricultural systems**: (i) rigorously enforce the planned agricultural map (use of land and crops) while adapting to future climate change.* *A system of M & E for adaptation to climate change (case of agriculture) is being implemented by OTEDD.*
	Sources of verification and Specific comments: *Sources of verification are: (i) for climate: MA, DGRE, INM, OTEDD (ii) for water resources: MA, DGRE, BIRH, SONEDE, DGGREE (iii) for ecosystems: MA, ME (iv) and for agricultural systems: MA, DGPA, CRDA.*
PC. 4.2. Water-related Hazards	**Specific actions taken so far for the milestone *(water disaster prevention initiatives)*:** *There is a national committee to fight against natural disasters and to organize rescue efforts. There is also a regional committee for combating water related hazards in each governorate. These committees have operations manuals and plans for disaster preparedness and disaster management.*
Target: Establish at least 1 Early warning System for disaster prevention at national level by 2015.	**Existence of Early Warning Disaster prevention System and Year of establishment:** o *For the prevention and management of flood risks, the DGRE has put in place in 2008, a system to collect hydrological measurements in real time and announcements of flood in Tunisian wadis (SYCOHTRAC). This system allows the acquisition, collection, processing and dissemination of information in real time, enabling a quick decision during heavy rainfall and floods. It is a network of operational alert for a good understanding of climatic events, providing early warnings for the protection of property and persons against the devastating effects of extreme events. It includes :(i) a network of 130 automatic observation stations for measuring rainfall and water levels in wadis and dams, powered by solar panels. It is equipped with data acquisition system that stores collected information and transmitting the information via (GSM) modules with capture, storage*
	and transmission of data through the network mobile (GSM) (ii) eleven call centers and data retrieval based on the DGRE, DGBGTH, and the CRDA (iii) and a computer system (WINMONI) for managing the stations, alarming and gathering and validating the data in the data base SYCOHTRAC. The SYCOHTRAC is also a tool for decision support that allows the consultation and data visualization in real time. A software program (PHy) (rainfall, Hydrometry) allows the access to the database through the WEB technology via the intranet network (AGRINET) of MA allowing operators and decision-maker to: (i) check the database under tabular and / or graphical forms, (ii) editing the rainfall or hydrological sheets, (iii) and take immediate and adequate decisions.
	o *In addition, the AMU countries have established a Maghrebian observatory for the drought, which is a part of the drought early warning system (SMAS) project. The objectives are: the prevention of environmental degradation caused by drought, improving the diagnosis capabilities of the drought crisis and the development of adaptation strategies to reduce the impact of drought using an early warning system (EWS) allowing a regular monitoring of environmental change in the Maghreb countries, and strengthening institutional ability for early warning and drought risk management. The expected results are: (i) the production of indicators of structural and economic vulnerabilities in each country, (ii) the development of structural vulnerability maps, (iii) the integration of EWS products in development plans, (iv) and spreading of EWS products on the Web. The current monitoring tools for measuring the drought impacts, in Tunisia are: (i) meteorological indicators (compared to normal, deciles, or standard precipitation index SPI, reflecting periods of deficit and excess rainfall), agronomic indicators, socio-economic indicators, hydrological, ecological, and socio-economic (ii) remote sensing, (iii) and climate forecasts.*

	o *Similarly, the DHMPE of the Ministry of Health is also working very hard at the prevention and management of health risks associated with water and the environment in case of natural disasters. Regarding the monitoring of the state of drought in different meteorological stations in the country, INM develops cards of Standard Precipitation Index (SPI); the mapping of this index shows the areas that are affected by drought.*
	-Elements of risk knowledge are: Sectoral studies, documents and guides exist as guide of the sustainable management of water resources, drought guide, and management of extreme climate change. They clarify the risks and provide appropriate responses and mitigation strategies to address a specific risk. Observation networks and monitoring of specific indicators and early warning systems help to know the risks.
	- Elements of the Monitoring, analysis and prediction of risks: Monitoring, analysis and forecasts of the risks are conducted with a monitoring and information system. *-Elements of the Communication or dissemination of alerts and warnings: Alerts and warnings are communicated or distributed according to an agreed communication strategy on risk management. All channels of monitoring and information can be used.*
	-Elements of local capacity to respond to the warnings received: There are emergency plans and supporting infrastructure at multiple levels. *-Sources of verification and specific comments: national committee to fight against natural disasters and rescue organization and the regional committees in each governorate.*
PC. 5.1. Institutional arrangements PC. 5.2. Ethics, transparency, empowerment	**Specific actions taken so far for the milestone:** *- Restructuring of BPHE, revision of the Water Code, establishment of the national Water Council ,workshop to launch and implement the development project of SINEAU (26/03/2013) ,national consultation workshop on the review and analysis of the state of implementation of strategies and / or action plans for wastewater in Tunisia (05/03/2013), water table on the water local management (25/12/2013), local governance legal framework of water in Tunisia (27/05/2014),consultation workshop on governance and financing of water sector (18/02/2014) ...*
PC. 5.3. Public and private roles PC. 5.4. Right to water PC. 5.5. Regulatory approaches	**Existence of policies and reforms of the water, and when the last update: in reference to the following documents:** *-WATER 21 - Study of the water sector in Tunisia long-term 2030 (MARH 1998)* *- PISEAU project 1 (2001-2007) followed by PISEAU 2 (2008-2014)* *- Study of the sustainable management of water resources (2008)* *- Revision and amendment of the Water Code. Bill revising and implementing decrees (2010-2014)* *- Water Rights in the new constitution (Article 44) (2014)*
Target: Institute/update, by 2015, water sector policy reforms that reflect good governance principles of:	**-Existence of Water sector policy that reflects good governance principles, and Year of latest update:** *-The study of the water sector (1998) established the future strategic direction of the sector and laid the basis and the foundations of integrated water resources management (IWRM)* *The study recommends an integrated approach for the management of water resources and taking into consideration at the same time the management of groundwater and surface water, the management of the quantity and quality of water and the balanced participation between state and users. In addition, it recommends that while pursuing the mobilization of new water resources, a strategy of "demand management" should be conducted in order to reduce losses and protect the quality of water resources, improve the socio-economic effects for the use of water and to minimize environmental damage.*
(i) Partnership commitment; (ii) ethics -transparency, equity and fairness; (iii) responsibility and accountability; (iv) inclusiveness, participation, predictability and responsiveness; and (v) coherence.	*It seems that we are moving towards a future where allocations between the various water usages are optimized economically and the available water resources are used with an integrated manner. The principles and frameworks of management must ensure a transformation towards a sustainable and equitable solution for everyone.* *The long-term strategic study of the water sector in Tunisia is based on the prediction of the resources for future mobilization projects and on the evolution of the demand for some socio-economic indicators...*

	Given the limited water potential of the country, the increased needs will lead to a rigorous and sustainable integrated management of the resource by:(i) searching for new resources, (ii) the use of non-conventional waters (iii) improving the efficiency of water infrastructure and water conservation (iv) the management of water quality, preservation of the resource and the protection of ecosystems and the environment, (v) mitigation of extreme events (droughts and floods) (vi) the optimization of data collecting systems , accessibility to the information for everyone and the development of a water information system (vi) the development of a public-private-partnership (vii) the implementation of legislation and strengthening the responsibilities of the water management institutions(viii) and the search for tools and appropriate , innovative and diversified funding
	- PISEAU also aims to: (a) promote the integrated management of water resources by (i) the establishment and implementation of an institutional framework and implementation of sectoral reforms to adopt a management demand (changes in tariff policy, new institutional arrangements), (ii) improving the capacity of government, GIC and private sector operators to manage resources in an efficient manner, and (iii) better real-time management of surface and groundwater, and (b) promote the conservation of water resources and environmental protection. PISEAU 1 is based on the following investment components: irrigation management, rural water supply, groundwater management, conservation of water resources and environmental protection, and capacity building. PISEAU 2 continues the investment in the same components. It supports the strengthening of the monitoring networks of water resources, the establishment of the: SINEAU, monitoring system for soil quality and pollution control , groundwater management, the conduct of pilot operations on rural sanitation and improving the quality and value of treated wastewater. *- The study of the water sector and PISEAU also recommended that the governance of water and sanitation must be improved.*
	Governance is a complex process that involves the participation at several levels beyond the state. The water governance has four main interrelated dimensions: (i) a social dimension that is equitable use of the resource, (ii) an environmental dimension that allows sustainable use of the resource and ecosystem integrity, (iii) an economic dimension: efficient use of the resource, the role of water in economic growth, and (iv) a political dimension to ensure that all stakeholders, users and citizens have equal access to water opportunities.
	The characteristics of good governance are: efficiency, sustainability, participation, accountability, integration, ethics, motivation, transparency, fairness, consistency, openness, and communication. The keys for a good governance are: political will and public-private partnership with respect to the needs and dignity, regulations for the quality of services, service providers efficient and accountable, good policies, effective institutional structures, and public participation. - Revision and amendment of the Water Code. Bill revising and implementing decrees (2010-2014)
	The new Water Code deals with the objectives and general principles, delimitation and preservation of public water domain, governance in the water sector, regimes to use the water, uses and water utilities, prevention and risks related to water, regime control and monitoring, and transitional and final provisions. - Water Rights in the new constitution (Article 44) (2014) Article 44: "The right to water is guaranteed. The water preservation and the rationalization of its operating is the responsibility of the State and the society. "
	Elements on Partnership and commitment: *ONAS has already initiated activities in partnership with the private sector for the operation of sanitation facilities (network, pumping stations and treatment plants). The rate of private sector involvement in the operation of the infrastructure was 12% in 2005, rose to 16% in 2011 and fell to 13% in 2012 and 2013. Similarly SONEDE intends financing, building and operating sea water desalination plant of Djerba by BOT concession contract.* **Elements on Ethics - transparency, equity and fairness:** *existence of legislative and regulatory frameworks*

<table>
<tr><td></td><td><u>Elements on responsibility and accountability</u>:
each institution knows and accepts responsibility for his actions, existence of legislative and regulatory frameworks
<u>Elements on inclusiveness, participation, predictability and responsiveness</u>:
Duty to respond to the need of the demand, clear objectives and impact assessment existence of manuals of procedures.
<u>Elements on Coherence</u>:
coherent frameworks
<u>Sources of verification:</u>
The documents mentioned above. However, it is necessary to update and consolidate the 2015 political reforms in the area of water and sanitation, which reflect the principles of good governance.</td></tr>
<tr><td>PC. 6.1. Financing Local Authorities

<u>Targets:</u>

-Allocate immediately at least 0.5 % of GDP to sanitation & hygiene.</td><td>Specific actions taken so far for the milestone:
Water, sanitation and hygiene budget in recent years is still insufficient to achieve the targets.
Achievement for GDP allocation: (MTDN)
1 TDN=0.627 $ on 27/03/2013
<table><tr><th>Years (i)</th><th>2008</th><th>2011</th><th>2012</th><th>2013</th></tr><tr><td>- GDP (A_1)</td><td>55 267.8
(34.652911 $10^9$$)</td><td>64 730.6
(40.586086 $10^9$$)</td><td>70 584.6*
(44.256544 $10^9$$)</td><td>75 646.4*
(47.430293 $10^9$$)</td></tr><tr><td>- Sanitation and Hygiene Budget (B_1)</td><td>93.0
(58.311 $10^6$$)</td><td>109.1
(68.4057 $10^6$$)</td><td>91.5
(57.3705 $10^6$$)</td><td>96.9
(60.7563 $10^6$$)</td></tr><tr><td>Percentage of GDP for Sanitation and Hygiene gdpSH (%) = B_1/A_1</td><td>0.17</td><td>0.17</td><td>0.13</td><td>0.13</td></tr></table></td></tr>
<tr><td><u>and</u>

-Allocate immediately 5% of national budget for water & sanitation.</td><td>*2012 semi-final; 2013 provisional (Source INS)
Sanitation data: Source ONAS 06/2014
Hygiene data: Source DHMPE 30/06/2014
Achievement for national budget allocation: (MTDN)
1 TDN=0.627 $ on 27/03/2013
<table><tr><th>Years (i)</th><th>2008</th><th>2011</th><th>2012</th><th>2013</th></tr><tr><td>- Total National Budget (A_2)</td><td>16 068.3
(10 074.824 $10^6$$)</td><td>20 350.0
(12 759.45 $10^6$$)</td><td>25 551.0
(16 020.477 $10^6$$)</td><td>26 792.0
(16 798.584 $10^6$$)</td></tr><tr><td>- Water and Sanitation Budget (B_2)</td><td>396.6
(248.6682 $10^6$$)</td><td>424.3
(266.0361 $10^6$$)</td><td>492.8
(308.9856 $10^6$$)</td><td>480.2
(301.0854 $10^6$$)</td></tr><tr><td>Percentage of national Budget to Water and Sanitation

BdgWS (%) = B_2/A_2</td><td>2.5</td><td>2.1</td><td>1.9</td><td>1.8</td></tr></table></td></tr>
<tr><td></td><td>Sources of verification
(i) For GDP and total national budget of the country, the source is INS (ii) Water, sanitation and hygiene budget, the data source is the Ministry of Finance, Ministry of Agriculture (GBO program), ONAS and DHMPE.
Need to bring the percentage to 0.5% of GDP on hygiene and sanitation and to 5% the percentage of GDP national budget for water and sanitation.</td></tr>
<tr><td>PC. 6.2. Pricing Strategies

PC. 6.3.Pro-poor financing Strategies</td><td>Specific actions taken so far for the milestone:
Describe the Water Tariff Structure:
Minimum life line demand (l / person / day): 20 m^3/ connection / quarter or 45 l / person / day.
Minimum salary of the population SMIG (48 hours per week): TDN 319,904 or $ 189.38.
Rate (USD or EURO / local currency): 1 Tunisian dinar for $ 0.592 (24/06/14).</td></tr>
</table>

Target: Set by 2015, water tariff system that addresses cross-subsidy and the need of poor.	Example for Indicator: - Lifeline Water (l/ca/day): 100 - Minimum salary of the population (TD/month): 319.9 - For a hypothetical 5 persons family: - water used = 100 l/c/d * 5 * 30 /1000= 15 m^3 - (minimum billed =20 m3) - cost at 0.155 TD /m3 = 3.1 TD - % of minimum monthly income = 3.1/319.9 = 1 % < 3%

Target is met.

Tariff Structure: The water tariff was adjusted 2 times in 2013.

The first adjustment by decree of 13.06.2013 and the second by decree of 26.12.2013 (in force).

Consumption categories (m^3/ quarter)	*Rate (local currency* mls/m^3 and USD/m^3*)*
0-20	155 mls/m^3 which is 0,09 USD/m^3
21-40	270 which is 0,159
41-70	365 which is 0,216
71-100	665 which is 0,393
101-150	815 which is 0,482
151-500	1135 which is 0,672
≥ 501	1190 which is 0,704

Adjustments for cross-subsidy:

Adjustments	*Rate*
Rural hydrants (Standpipes)	155 mls/m^3 = 0,09 USD/m^3
Tourism	1190 mls/m^3 = 0,704 USD/m^3

Fixed charges are in addition to this fee, the value is determined by the diameter of the counters: D15 (DT 4.400 / quarter), D20 (8.160), D30 (15.080), D40 (27.700), D60 and D80 (70.400), D100 (113.250) and D150 (295.000).

This tariff reflects the equalization and access for the poor (social group) and encourages saving water.

Tariff for rural areas if any:

Same price for Connecting Rural, while for the population served by hydrant, the price is social.

- **Describe the sanitation services pricing if there is any:**

Consumption categories (m^3/quarter)	Rate in millimes/m^3 and USD/m^3
0-20	17 mls/m^3 = 0.010 USD/m^3
21-40	28 mls/m^3(0-20), 170 (21-40)
41-70	180 (0-20) then 285 (21-70)
71-100	285 (0-70) and 472 (71 - 100)
101-150	300 (0-70) then 490 (71-150)
>= 151	300 (0-70) then 606 (after 71)

Fixed charges (RF) to be added:

- *Tourism usage: RF = 8688 + 1080 mls/m^3*
- *Industrial usage and polluting activities: RF = 8688 + {617 mls/m^3: equipped & low pollution or 845 mls/m^3: average pollution or 845+410*Q mls/m^3: heavy pollution}, Q = coefficient of pollution*
- *Industrial usage not connected: {equipped and low pollution: 0 or polluter: RF = 8688 + 617 mls/m^3}*
- *Administrative usage: RF = 8688 + 845 mls/m^3*
- *Other usages: commercial, professional or other: RF = 8688 + {Consumption <10 m^3/quarter: 574 mls/m^3 or consumption> 10 m^3/quarter: 717 mls/m^3}*

- **Sources of verification:**

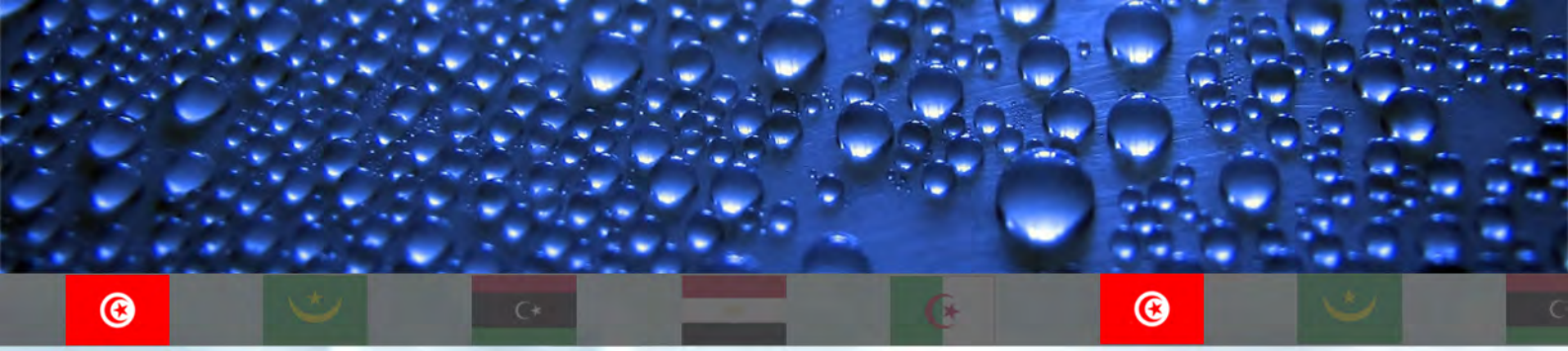
SONEDE for water billing and ONAS for sanitation billing

PC. 7.1. Education and capacity development *Target:* *To be identified.*	**Not to be reported.**
PC. 7.2. Information *Target:* Enhance by 2016, the national water and sanitation Monitoring, Evaluation and Reporting (M&E, &R) Systems in a way to be in line with the pan African M&E.	**Specific actions taken so far for the milestone:** - *launching of the development project and establishment of SINEAU 26/03/2013 in Tunis.* *- Strengthening of the existing monitoring and evaluation and reporting systems to be in line with the Pan African SE.* **Existence of national Water & Sanitation M&E, & R System, and Year of Establishment:** *-There is no ''declared'' M&E&R water and sanitation national system, on the other hand some institutions have management sub-systems for the data from the water sector such as the SYGREAU for the DGRE, the COPEAU for the ANPE, the SISOLS for the DGACTA and the aggregate monitoring system of the water sector under implementation at the BPEH, while other institutions have simple databases.* *-The SINEAU: the national information system on water, which presents a dynamic portal, must bring together all the existing and the future sub systems. A workshop on the development project and the establishment of SINEAU just took place on 26/3/2013 in Tunis.*

Recent updates in the M&E System:

Items	Year 1	Year 2	Year 3	Target year
- New incorporated elements (PISEAU 1 : 2001-2007) (PISEAU 2 : 2009-2014)	Study of the SYGREAU, COPEAU, SISols and other databases and data management system (SGD)	Study, design and development of the SINEAU	Study, design and development of the SINEAU	2007
-Improvement and harmonization of the existing sub management information systems existing at the regional and national level. -Establishment of a data management system (SGD) in a way to be in line with the Pan African M&E System (AMCOW) to track the progress towards achieving the MGDs OMD . (MEWINA project: 2012-2014) -Implementation of water resources M&E&R system at national level in line with the Pan African system -Establishment of MEWINA Project Management Unit -Operational MEWINA national focal unit	Establishment of the SINEAU 2012 -Tunisia's water sector M&E Rapid Assessment Report -NWSAS Transboundary Rapid Assessment Report	Establishment of the SINEAU 2013 -Developme nt of a minimum set of indicators, standards and criteria for water & sanitation sector in Tunisia -National state of the water monitoring and evaluation operational framework and guidelines	Establishment of the SINEAU 2014 -National Baseline State of the Water Report - National Action Plan for SOW Reporting Mechanism Report	2014 2015-2019
Drivers	IWRM	Governance improvement	Achievement of the targets	2015

	<u>Elements of the pan African M&E incorporated:</u> *-Improvement, harmonization and strengthening of the existing sub management information systems (*SMIS). *- Establishment of a data management system in line with the Pan African system of monitoring and evaluation (AMCOW)* **Sources of verification:** *DGRE/MA*
PC. 7.3. Water and Technologies *<u>Target:</u>* *To be identified.*	**Not to be reported.**
PC. 7.4. Professional Networks/ Associations *<u>Target:</u>* *To be identified.*	• **Not to be reported.**



MEWINA

مشروع التقييم والمتابعة لقطاع المياه بدول شمال أفريقيا

Monitoring and Evaluation for Water In North Africa

Monitoring &Evaluation of the Water Sector In North Africa (MEWINA) Project
North - African Ministers Council On Water (N-AMCOW), Technical Secretariat
c/o CEDARE, 2 ElHegaz Street, Heliopolis, Cairo, Egypt
Phone: (202) 2451-3921 / 2 / 3 / 4, Extension: 656
Fax: (202) 2259-5673, (202) 2451-3918
E-Mail: namcow@cedare.int
Web Site: namcow.cedare.int/mewina