



Contract no. 688320

MADFORWATER

**DevelopMent AnD application of integrated technological and management solutions
FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of
Mediterranean African Countries**

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1 Introduction

The Mediterranean region is characterized by increasing pressures over its natural resources and significant disparities among countries (UNEP/MAP, 2016). The region is considered as one of the most water scarce regions in the World with an average water availability below 1000m³ per capita for most of the countries located in the Southern and Eastern rims of the Mediterranean, and even below 500m³ in many of them (e.g. Algeria, Libya, Tunisia or Jordan). Growing population, irrigation expansion and urbanization are increasing pressures on water resources quantity and quality that will be likely exacerbated by political instability and climate change, reducing available water resources per capita and affecting socio-economic and environmental conditions. In light of this, a number of international initiatives are being developed to ensure sustainable development in the region and contribute to a sustainable management and use of water resources.

In this context, the MADFORWATER project tries to address different water resources management issues that include the low availability and use of locally-adapted technologies for wastewater treatment and reuse for irrigation; a lack or inefficiency of economic and regulatory instruments to foster water saving irrigation technologies and practices and water reuse in agriculture; limited capacity building and social acceptance of treated wastewater reuse in agriculture; and, in essence, insufficiently integrated water management strategies. To respond to these challenges, the MADFORWATER project general objective is *“to develop an integrated set of technological and management instruments for the enhancement of wastewater treatment, treated wastewater reuse for irrigation and water efficiency in agriculture, with the final aim to reduce water vulnerability in selected basins in Egypt, Morocco and Tunisia”* (MADFORWATER Document of Action – part B – page 1). The selected basins, chosen due to their relevance and representativeness for the Mediterranean region in relation to population, GDP, wastewater, hydrology and geographical location, are all subjected to exacerbating water scarcity, and count on high potential to increase wastewater reuse (currently 7% used), (MADFORWATER Document of Action – part B – page 1).

This Deliverable (D1.1) “Report on needs and priorities in the field of international cooperation agreements on water management in the target Mediterranean African Countries (MACs)” is part of Work Package 1 (WP1) “Water and water-related vulnerabilities in Egypt, Morocco and Tunisia”. The main objective of this work package is to analyze water stress and water vulnerability in the three MACs, paying special attention to wastewater treatment, water reuse and water efficiency in agriculture and the impacts on food security, socio-economic growth, sustainability of agriculture and environmental protection. For this, D1.1 aims to provide a revision of the water related goals within the international agreements joined by the three case study countries, while emphasizing the critical points that should be developed and reinforced in the near future through an integrated approach for water policies, initiatives and management. It also sets a reference framework and knowledge base for different activities in the MADFORWATER project. As shown in Figure 1, this report (as a result of Task 1.1) sets a reference for task 1.2, which will focus on the identification and analysis of water stress and will develop water vulnerability indicators and maps for the three MACs, and also for subsequent tasks 1.3 (water stress effects on food security and socio-economic development) and 1.4 on the water vulnerability assessment framework for exploring strategies for non-conventional water use. In addition, D1.1 will also set the baseline for WP5 for the review of country specific water policies with regard to the use of economic instruments for water management (task 5.1.), and for the development of strategies and

economic instruments for wastewater management (task 5.2) and for water reuse and water and land management in agriculture (task 5.3).

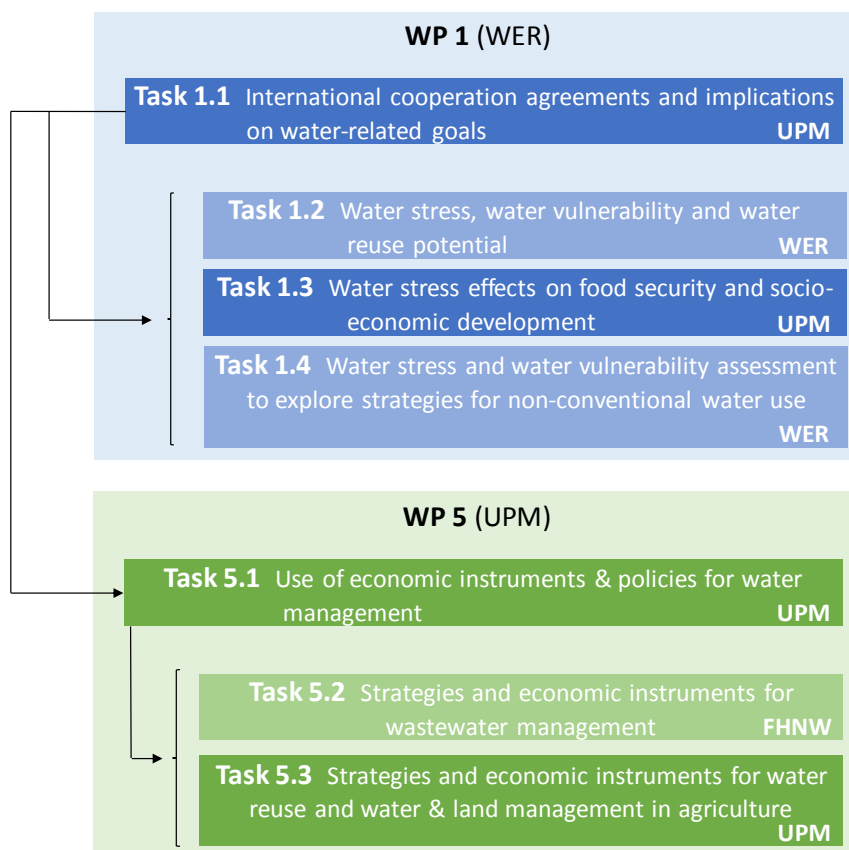


Figure 1. Relations among MADFORWATER project WPs and tasks related to Deliverable 1.1.

Source: own elaboration.

This document is organized in four sections:

Following the introduction (section 1), section 2 focuses on the revision of international water-related initiatives, that has been performed according to its level of aggregation, from global to national level. A selection of the main initiatives in place in the selected countries is presented along with their main objectives, means of implementation, targets, indicators (if proposed) and outcomes. Additional initiatives have been reviewed and are contained in ANNEX I.

Section 3 (implementation and progress) of this deliverable is aimed to provide a deeper analysis of the water-related issues addressed by the selected initiatives, analyzing and comparing common targets to all initiatives and also presenting specific issues covered by a given particular initiative. Building upon the reviewed initiatives, the information has been complemented with additional sources such as the 2nd Arab State of the Water Report (AbuZeid et al., 2014). A set of key indicators has then been proposed as a tool for the assessment of progress of the water sector in the selected MADFORWATER countries.

To provide a brief overview of current situation of water resources in each of the selected countries, indicators have been quantified based on data availability. Additionally, this section outlines the main trends of recent national strategies and regulations as well as the

bilateral agreements related with water issues that the selected countries have undertaken with neighboring countries.

Finally, section 4 summarizes the main findings concerning the reviewed international and regional initiatives in Egypt, Morocco and Tunisia, and supported by the set of key indicators, this section elaborates on the main gaps and needs related to those initiatives.

2 International and regional water-related regulations and initiatives affecting water resources.

Global water-related agreements and initiatives have progressively focused into the most arid and water-sensitive areas, since water scarcity is worsening and external factors such as climate change are negatively impacting the state of water resources. The 3 MACs of MADFORWATER, (Egypt, Morocco and Tunisia) are among those countries in which depleting water resources hinder socio-economic and environmental development, and that deal with many issues threatening the water sector.

In this context, main water-related initiatives affecting Egypt, Morocco and Tunisia have been reviewed according to their relevance, continuity over time, update and/or effectiveness. Among all the initiatives, strategies and programs revised for the analysis (presented in ANNEX I of this document), we finally have selected five of them to be representative as follows (see Figure 2):

- The UN “Millennium Development Goals” (MDGs), as one of the first overarching initiatives internationally supported with such a wide scope.
- The UN “2030 Agenda for Sustainable Development” (Sustainable Development Goals - SDGs), as the most recent overarching international initiative.
- The “Mediterranean Strategy for Sustainable Development 2016-2025” (MSSD), as a regional initiative that builds on the previous strategy 2005-2015 and providing general framework for action.
- The “Africa Water Vision 2025”, as a regional (Africa-wide) initiative focused on water issues.
- The “Arab Strategy for Water Security in the Arab Region 2010-2030” as a water-specific regional initiative targeted to Arab countries, including the three MADFORWATER MACs (Egypt, Morocco, and Tunisia).

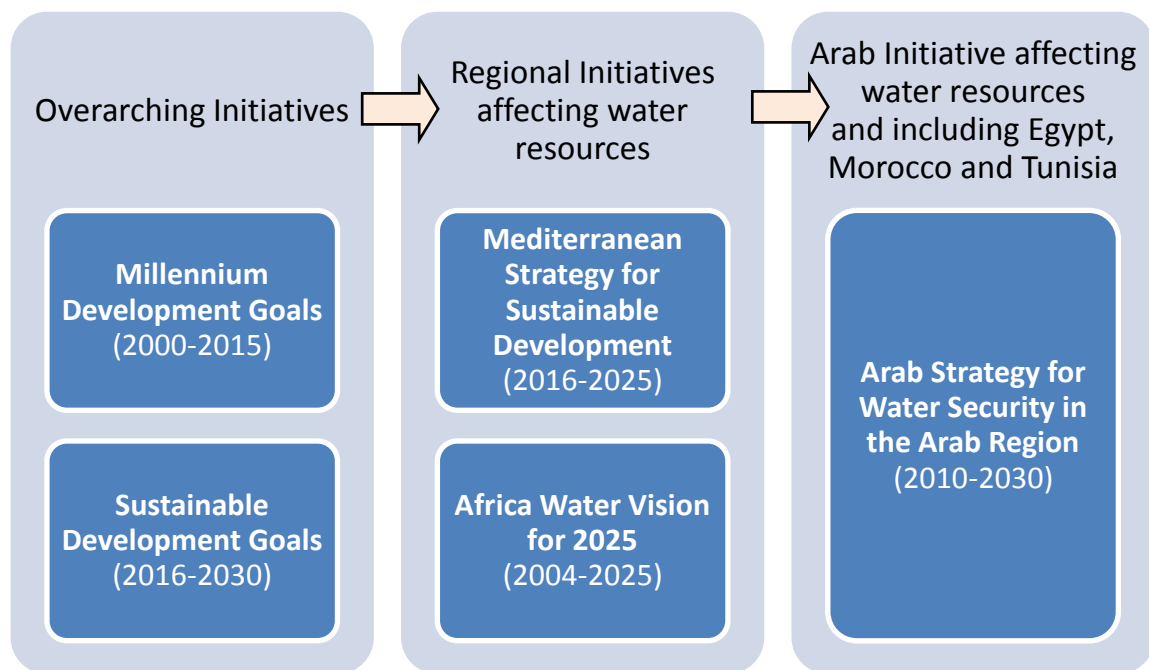


Figure 2. Selected international and regional water-related initiatives affecting water resources in Egypt, Morocco and Tunisia.

Source: own elaboration.

A short overview of the main elements of each of the five initiatives is included below, mainly focusing on the water-related topics referred.

2.1 Millennium Development Goals (MDGs)

Context and description

In September 2000, all 189 UN member states (at that time) and other international organizations adopted the UN Millennium Declaration in order to address extreme poverty from a multi-dimensional approach. The Millennium Development Goals (MDGs) constitute the main objectives pursued by the initiative, and these were translated into different targets according to the different areas to face while tackling poverty reduction.

A total of 8 MDGs and 21 targets were foreseen to be achieved by 2015, and were raised as follows:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Global partnership for development

In order to track the MDGs achievements, each of such challenges (goals) was supported and measured by a set of time-bound specific targets and indicators. A total of 60 indicators were developed in order to quantify the progress made in its multiple dimensions.

The UN Statistics Division was responsible for compiling and providing periodic information on the indicators' performance since 1990, and a database system was created (MDGInfo) to provide online information and enable the MDGs monitoring process.

Water-related goals and targets

Concerning water issues, these were particularly addressed in this initiative by the MDG No. 7 – Environmental Sustainability - and more specifically through its 7.A and 7.C targets (see Table 1).

Table 1. MDG 7 (Environmental Sustainability) targets and indicators.

MDG 7 targets	MDG No. 7 – Environmental Sustainability	Main MDG 7 indicators
7.A	Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources	<ul style="list-style-type: none"> • 7.1. Proportion of land area covered by forest • 7.2. CO2 emissions • 7.3. Consumption of ozone-depleting substances • 7.4. Proportion of fish stocks within their safe biological limits • 7.5. Proportion of renewable water resources used
7.B	Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	<ul style="list-style-type: none"> • 7.6. Proportion of terrestrial and marine areas protected • 7.7. Proportion of species threatened with extinction
7.C	Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation	<ul style="list-style-type: none"> • 7.8. Proportion of population using an improved drinking water source • 7.9. Proportion of population using an improved sanitation facility
7.D	Achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers	<ul style="list-style-type: none"> • 7.10. Proportion of urban population living in slums

Source: own elaboration based on (UN, 2000) and (UN-DESA, 2015).

In this regard, water was considered a key element for the sustainable development of communities. The water-related commitments by 2015 included to halve the proportion of population without access to drinking water and sanitation services, and considered the environmental pressures on water measured as the “proportion of renewable water resources used”.

Outcomes and way forward

At the end of the MDG programme, in 2015, the progress made was remarkable at global level, and performance was particularly good in the Northern-African countries.

According to the MDG final report (UN-DESA, 2015), in 2015 91% of the global population was using improved drinking water sources (76% in 1990) which means that 2.6 billion people gained access to improved drinking water sources since 1990. Further, the final MDG report states that from these 2.6 billion people, 1.9 billion gained access to piped drinking water on premises, joining the 58% global population enjoying this service in 2015. Regarding the sanitation facilities partial target, from 1990 to 2015 2.1 billion people gained access to improved sanitation services, which is a significant progress but was not enough to meet the MDG global target.

On the whole, MDG target 7.C – Access to safe drinking water and basic sanitation - was partly met by 2010, when the proportion of the global population using an improved drinking water source surpassed 90%. However, despite great progress achieved, the global objective concerning sanitation facilities was not met even by 2015 with only 68% of global population using improved sanitation facilities.

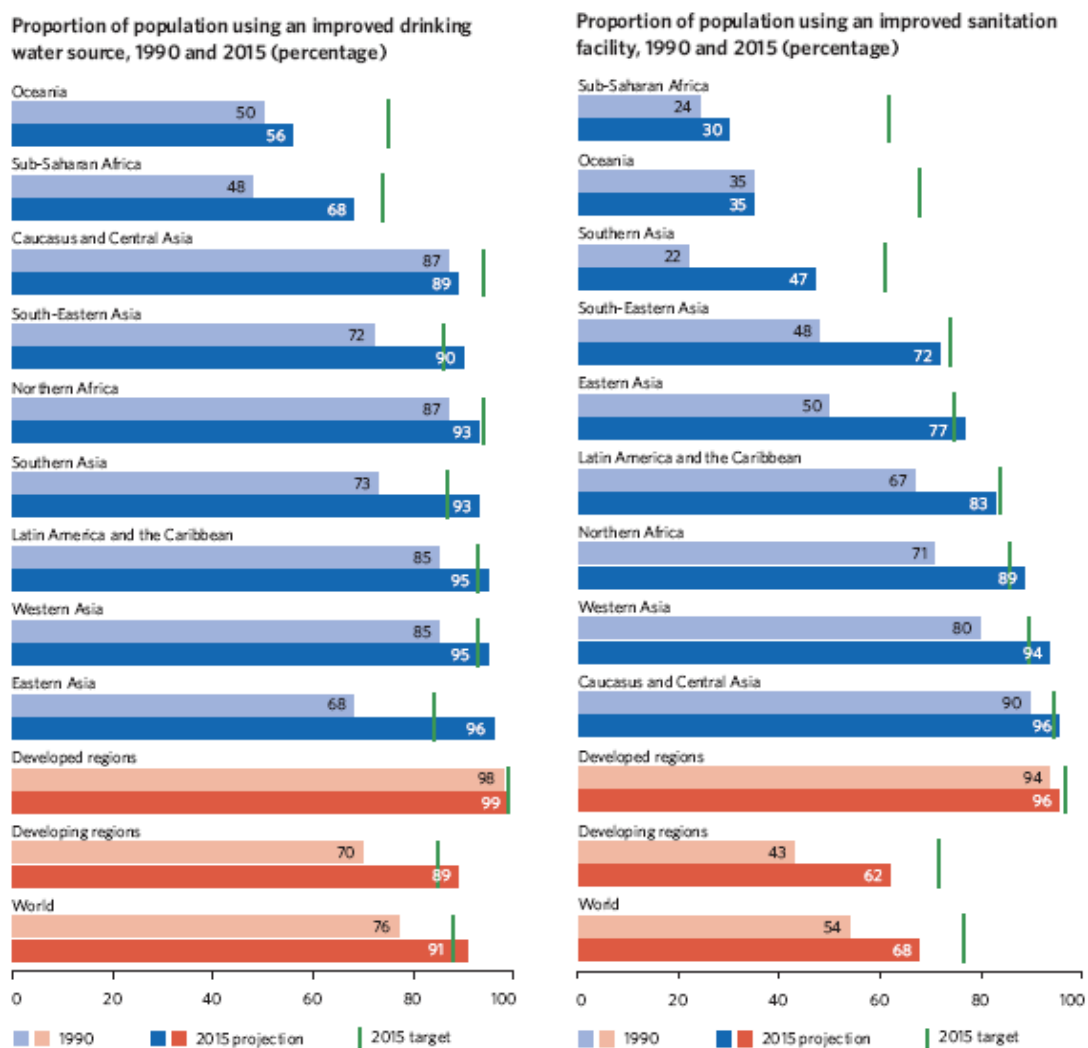


Figure 3. MDG 7.C achievements by regional grouping.
Source: UN-DESA, 2015.

Particularly analysing “Northern Africa” group, which is the sub-regional grouping including the three MADFORWATER MACs (UN-DESA, 2015), Figure 3 shows a better situation. The specific MDG 2015 target on drinking water was almost met with 93% of population using improved drinking water sources, while the sanitation target was even exceeded with 89% of Northern African countries having access to improved sanitation facilities.

However, more work still needs to be done concerning water resources exploitation (target 7.A). According to the 2015 MDG progress report, water scarcity has three dimensions: physical (lack of water), economic (lack of infrastructure) and institutional (lack of institutions managing water supply). The agricultural sector is stated to be the major water consumer, using about 69% of total freshwater (globally) mostly for irrigation. According to the proportion of renewable water resources withdrawn, Northern-African countries are affected by severe water scarcity (78% of renewable water resources used). This figure highlights the need to develop further strategies, policies and technologies to deal with this urgent challenge.

2.2 Sustainable Development Goals (SDGs)

Context and description

After the experience and progress achieved with the MDGs, the scenario post-2015 was articulated through the UN so-called “2030 Agenda for Sustainable Development” (UN, 2015). This action plan, built on the MDGs, seeks to address the gaps of the previous programme and to achieve new goals in the coming 15 years.

As the previous initiative of the UN, the 2030 Agenda objectives were translated into specific goals (the so called SDGs) and targets, with associated indicators to measure impact and progress of the initiative. These key action areas were drafted into the following Sustainable Development Goals (SDGs), which are numerous and more detailed than the former MDGs:

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote wellbeing for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Achieve gender equality and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduce inequality within and among countries

11. Make cities and human settlements inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Water-related goals and targets

Given its increasing importance, water challenges within this Agenda have their own goal – SDG No. 6 – Availability and sustainable management of water, whose specific targets and proposed indicators are listed in Table 2.

Table 2. Specific targets of SDG No. 6 - Availability and sustainable management of water.

	SDG No. 6 targets	SDG No. 6 indicators
<i>Related with the water cycle</i>	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1: % population using safely managed drinking water services
	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1: % population using safely managed sanitation services
	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	6.3.1: % of wastewater safely treated
		6.3.2: % of water bodies with good water quality
	6.4 By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1: %change in water use efficiency over time
		6.4.2: Level of water stress: freshwater withdrawal as a % of available freshwater resources
	6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	6.5.1: Degree of IWRM implementation (0-100)
6.5.2: Proportion of transboundary basin area with an operational arrangement for water cooperation		

	SDG No. 6 targets	SDG No. 6 indicators
	6.6 By 2020, protect and restore water related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	6.6.1: % of change in water-related ecosystems extent over time
Related with implementation	6.a By 2030, expand international cooperation and capacity building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	6.a.1: Amount of water and sanitation related Official Development Assistance that is part of a government coordinated spending plan
	6.b Support and strengthen the participation of local communities in improving water and sanitation management	6.b.1: % local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

Source: own elaboration based on (UN, 2015) and (UN-WATER, 2016).

Implementation and way forward

According to the Sustainable Development Knowledge Platform (UN-DESA, 2016), the revision of SDG No. 6 will take place at the *High Level Political Forum on Sustainable Development – 2018*.

However, although the implementation of this program is still recent to provide progress information, the focus of the strategy on water management reflects the aim of addressing urgent water challenges not only in the short-term but with a holistic approach and long-term vision, highlighting the importance of improving knowledge and good governance practices.

While drinking water and sanitation facilities have experienced good improvements during the MDG program, this new UN strategy includes innovative aspects such as integrated water resources management (IWRM) or wastewater treatment that are expected to have wide and positive impact on global water scarcity management. Improvements have to be achieved taking advantage of synergies at different levels and addressing actual and potential conflicts among targets and actors. This SDG aims to tackle water stress from a cooperative and inclusive framework, complementing policies at national level.

2.3 Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025

Context and description

The Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025 “Investing in environmental sustainability to achieve social and economic development”, was adopted in February 2016 by the Contracting Parties to the Barcelona Convention (Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean), through an intensive collaborative process among regional and national organizations and stakeholders. According to this Decision, the Strategy establishes the policy framework and

guidelines for the translation of the 2030 Agenda for Sustainable Development at regional and national level.

This Strategy builds upon the review of the previous MSSD (2005-2015) and the conclusions of the UN Conference on Sustainable Development (Rio+20) which took place in 2012 and focused on the green economy within the sustainable development and poverty eradication context. Further, the Strategy aims to contribute to achieve the objectives of the Sustainable Development Goals (SDGs) and the 2030 Agenda for Sustainable Development.

On the whole, the MSSD 2016-2025 aims to provide the strategic framework, the necessary guidelines to adapt international programmes to regional conditions and to encourage regional cooperation, all this to achieve *“A prosperous and peaceful Mediterranean region in which people enjoy a high quality of life and where sustainable development takes place within the carrying capacity of healthy ecosystems”*.

It is worth to mention, that this vision of the MSSD should be accomplished through sound cooperation, solidarity, equity and participatory governance principles.

Objectives, strategic directions, targets and actions

The MSSD has an integrated approach that relies on 6 main objectives, addressing sustainability both for environmental and developmental issues. These main objectives may be seen as 4+2 objectives, since the first ones are related with the territorial approach of the Strategy and the last ones cover crosscutting aspects.

1. Ensuring sustainable development in marine and coastal areas
2. Promoting resource management, food production and food security through sustainable forms of rural development
3. Planning and managing sustainable Mediterranean cities
4. Addressing climate change as a priority for the Mediterranean
5. Transition towards a green and blue economy
6. Improving governance in support of sustainable development

For the effective implementation of the Strategy, the MSSD complements each main objective with a set of strategic directions, which in turn are supported by regional and national flagship initiatives, targets and actions.

Due to the fact that all the six objectives of the Strategy are inter-connected, the implementation of some of the objectives may influence others as synergies may be generated. However, despite this cross-cutting nature of the MSSD goals, the objective most related to natural resources management is the objective No. 2 *“Promoting resource management, food production and food security through sustainable forms of rural development”*.

This is well reflected in the MSSD 2016-2025 document, when the objectives of the Strategy are linked to the SDGs, and the Objective No. 2 is directly related to the SDG No. 6 *“Ensure availability and sustainable management of water and sanitation for all”* (see section 2.2 of this document).

This resource management-related objective No. 2 of the MSSD covers mainly two sustainability issues:

- Natural resources and ecosystem services (paying attention to water pollution and cross-border issues in natural resources management).
- Rural development and food (taking care of desertification processes, lack of access to water by local and small producers, lack of participation of local communities in natural resources management, and insufficient consideration of the water-land-food security nexus).

As already mentioned, to ensure that these relevant issues are addressed, each main objective has its strategic directions to develop. In the case of MSSD objective 2, there are 5 strategic directions formulated as follows:

- 2.1 Promote the sustainable use, management and conservation of natural resources and ecosystems
- 2.2 Promote conservation and use of indigenous or traditional plant varieties and domestic animal breeds, value traditional knowledge and practices in rural management decisions
- 2.3 Promote networks of ecologically protected areas at national and Mediterranean level and enhance stakeholder awareness on the value of ecosystem services and the implications of biodiversity loss
- 2.4 Promote inclusive and sustainable rural development, with a specific focus on poverty eradication, women’s empowerment and youth employment, including equitable and sustainable access to basic local services for rural communities
- 2.5 Ensure access of local producers to distribution channels and markets, including the tourism market

These strategic actions are further developed through several actions needed at regional and national level, and complemented by a set of targets built on the SDG basis that aim to bridge the gap between environmental sustainability and socio-economic development.

According to the MADFORWATER approach the most water-related strategic direction is direction 2.1 and, within this direction, the actions directly related with water resources are presented in

Table 3.

Table 3. Water related actions and indicators within MSSD Strategic Direction No. 2.1 – Promote the sustainable use, management and conservation of natural resources and ecosystems.

Actions at national level	Indicators
<p>2.1.4. Put in place participative cross-sectoral resource management strategies to ensure that renewable natural resources are extracted in ways that do not threaten the future use of the resources, and without exceeding their maximum sustainable yield.</p>	<ul style="list-style-type: none"> • Water efficiency index • % water used in sustainable water management practices for agriculture • No. of river basins with IWRM schemes

<p>2.1.5. Achieve a sustainable balance between production of food, use of water and use of energy, through improving energy and water use efficiency, promoting the use of renewable energy sources as well as through the introduction of institutional and legal reforms.</p>	<ul style="list-style-type: none"> • Water use efficiency (by sector) • Energy use efficiency • Rate of renewable energy used in provision of water & sanitation services • % of wastewater treated by country (target 90% by 2025) • % of wastewater reused by country
<p>2.1.6. Develop socio-economic models for national strategic choices for water allocation between agriculture, industry, tourism and domestic uses, taking into account environmental and social aspects as well as economic development needs.</p>	<ul style="list-style-type: none"> • Economic efficiency for water use (by sector)
<p>Actions at regional level</p>	<p>Indicators</p>
<p>2.1.9. Develop or strengthen cross border water cooperation programmes</p>	<ul style="list-style-type: none"> • Participation of countries in cross border integrated water resources management processes.

Source: adapted from UNEP / MAP, 2016.

As already mentioned, additionally, objectives 5 and 6 of the MSSD strategy are cross-cutting goals that address environmental challenges including the management of water resources. Among these objectives, three strategic directions should be highlighted as directly addressing water issues:

- Strategic Direction 5.2 - Review the definitions and measurement of development, progress and well-being. This direction reveals the importance of developing indicators related to environmental and social aspects of progress within national databases, and the accessibility of such statistics on societal progress.
- Strategic Direction 6.3 – Promote implementation and compliance with environmental obligations and agreements including through policy coherence based on inter-ministerial coordination. This direction includes as indicators of progress the number of global and regional agreements related to environmental sustainability in the Mediterranean countries, partnership initiatives and inter-ministerial coordination mechanisms.
- Strategic Direction 6.4 – Promote education and research for sustainable development. This direction evidences the importance of the science-policy dialogue and capacity building at all levels.

Other important issues included under objectives 5 and 6 are related with collaborative partnerships and environmental innovation, awareness initiatives on environmental and social impact / investment, monitoring and warning systems and cooperation programmes and networks.

Implementation and monitoring

Further than these objectives and directions, the MSSD includes key priorities to support the implementation of the Strategy. These priorities are organized around three axes:

- Institutional framework
- Financial resources
- Monitoring system

Concerning the institutional framework, the Strategy foresees the Mediterranean Action Plan (MAP) system as leader and guide with respect to the coordination of implementation of the different actions and directions along with follow-up processes. A key cornerstone supporting these activities would be the Mediterranean Commission on Sustainable Development (already within the MAP system). However, attention should be focused on the development and strengthening of regional institutional structures and processes.

As the MSSD pursues ambitious goals, significant funding will be needed. To this aim, the Strategy comprises specific actions intended to strengthen and improve its financing capacity and investment facilities for funding its actions with sound social and economic foundations.

With regard to the monitoring processes needed to assess the Strategy's performance, the MSSD highlights the need for a double approach: the follow-up of the implementation of actions and the progress of the broader development issues. It is envisaged that the establishment of a *"dashboard of sustainability indicators"* tailored to the Mediterranean region will permit the monitoring and evaluation of the progress towards sustainability and the assessment of its adequacy to local Mediterranean contexts.

2.4 Africa Water Vision 2025

Context and description

The *"Africa Water Vision for 2025: Equitable and Sustainable Use of Water for Socioeconomic Development"* which was endorsed by the African Union in 2004, is the result of the joint efforts of several organizations and stakeholders such as the World Bank, the UN Economic Commission for Africa and the African Development Bank (AfDB).

This vision was conceived to address the number of socio-economic threats and the challenges related to water management taking place in Africa. The Africa Water Vision for 2025 was designed as an enabling framework to achieve *"an Africa where there is an equitable and sustainable use and management of water resources for poverty alleviation, socio-economic development, regional cooperation and environment"* (UN-Water/Africa, 2003). This initiative recognizes the variability of climate and rainfall, climate change or desertification processes as the main natural threats affecting water resources in Africa, while the most important factors are considered the inappropriate governance and institutional arrangements, environmental degradation and pollution of water resources (poor resource protection) or the unsustainable financing of water supply and sanitation investments.

Objectives and implementation

According to the Africa Water Vision 2025, the accomplishment of such a holistic vision involves the completion of a number of key challenges as follows:

1. Sustainable access to safe water and sanitation supply (meet basic needs)
2. Enough water for food and energy security
3. Availability of enough water quality and quantity for ecosystem and biodiversity preservation
4. Development of institutional framework for effective and integrated water management (both national and transboundary water basins)
5. Regional cooperation and development within water basins (natural assets for all)
6. Capacity building for water professionals
7. Development of a sustainable financial framework to support water data collection, monitoring system and dissemination of information
8. Development of effective and sustainable strategies for addressing natural and human threats to water resources (including climate variability and change)
9. Establishment of sustainable and efficient water pricing systems (equity, efficiency, sustainability)
10. Public awareness and political commitment for the sustainable water resources management (including gender issues, youth concerns and participatory approaches)

In order to address the specified issues and challenges, the following issues are considered by the Vision as critical success factors to which the whole strategy should adhere (UN-Water/Africa, 2003):

- Open decision-making processes and accountability
- Information and knowledge transfer processes
- Regional cooperation towards common objectives (synergies and solidarity)
- Clear vision of current state and desired situation, and the way to achieve it
- Adoption of equitable and sustainable financing and cost-recovery practices
- Political commitment and local participation

The Vision emphasizes that regional cooperation, partnerships and solidarity among countries sharing water resources is mandatory for the achievement of its mentioned goals. Further, at national level, a change in the approaches related to policies, strategies, institutions, legal arrangements and management practices will be needed in order to accomplish the vision of the initiative.

For a proper implementation of the Africa Water Vision 2025 a framework for action was designed, establishing targets and milestones as intermediate goals to reach the complete Vision. These actions are structured under four major categories (UN-Water/Africa, 2003) as follows:

1. Strengthening governance of water resources
2. Improving water wisdom
3. Meeting urgent water needs
4. Strengthening the financial base for the desired water future

Each action is developed through ranges of intermediate milestones and targets, to be achieved at different levels (local, national, sub-regional and regional) and time frames (2005, 2015, 2025), as shown in

Table 4. Further, the AWV states that for a successful monitoring of the Vision's achievements, such milestones and targets should be supported by specific indicators and criteria for assessment of attainments.

Table 4. Actions and targets for the implementation of the Africa Water Vision 2025.

1. Improving Governance of Water Resources			
Actions	2005 Target	2015 Target	2025 Target
<i>1. Development of national policies and comprehensive institutional reform</i>			
In process of development	100% countries		
Full implementation		100% countries	100% countries
<i>2. Enabling environment for regional cooperation on shared water</i>			
Initiated in existing river-basin organizations	100% organizations		
Implemented in existing river-basin organizations	50% organizations	100% organizations	
Initiated in new river-basin organizations		100% organizations	
Implemented in new river-basin organizations		50% organizations	100% organizations
2. Improving Water Wisdom			
Actions	2005 Target	2015 Target	2025 Target
<i>1. Systems for information generation, assessment and dissemination</i>			
Established at national level	50% countries	100% countries	
Established for international river basins	30% basins	100% basins	

Established at Africa-wide level			100% complete
2. Sustainable financing for information generation and management			
Review of global experience	100% complete		
Implementation at national level	50% complete	100% complete	100% complete
Implementation at river-basin level	30% complete	100% complete	90% countries
Implementation at Africa-wide level		30% complete	3 established
3. IIFRM Capacity Building			
Create public awareness and consensus	100% countries		
Knowledge gaps identified	100% countries		
Partnerships for strategic assistance	100% countries	60% countries	
National research institutes established	20% countries	2 established	
Regional research institution established	1 established	100% countries /basins	
Gender/youth concerns mainstreamed	30% countries		
3. Meeting Urgent Water needs			
Actions	2005 Target	2015 Target	2025 Target
1. Proportion of people without access			
to safe and adequate water supply	Reduce by 25%	Reduce by 75%	Reduce by 95%
to safe and adequate sanitation	Reduce by 25%	Reduce by 70%	Reduce by 95%
2. Water for achieving food security			
Water productivity of rain-fed agriculture and irrigation	Increase by 10%	Increase by 30%	Increase by 60%
Size of irrigated area	Increase by 25%	Increase by 50%	Increase by 100%
3. Development of water for agriculture, hydropower industry, tourism and transportation at national level	5% of potential	10% of potential	25% of potential
4. Conservation and restoration of environment, in biodiversity, and life-supporting ecosystems			

Allocation of sufficient water for environmental sustainability	Implemented 30% countries	Implemented 100% countries	Implemented 100% river basins
Conserving and restoring watershed ecosystem	Under development		
<i>5. Effective management of drought, floods and desertification</i>	Under development	Operational 50% countries	Operational 100% countries
4. Strengthening Financial base for desired water future			
Actions	2005 Target	2015 Target	2025 Target
<i>1. Sustainable financing for policy and institutional reform and capacity building</i>	Operational 60% countries		
<i>2. Sustainable financing for information generation and management</i>	Secured 100% countries		
<i>3. Financing urgent water needs</i>			
Implementation of pricing and full cost recovery	Operational 50% countries	Operational 100% countries	
Increasing private sector participation	Operational 30% countries	Operational 100% countries	
Mobilizing finance from national and international sources	Secured 50% countries	Secured 100% countries	

Source: UN-Water/Africa, 2003, pp. 20-21.

Initial funding from global and regional development partners will be required to start urgent actions on water management. This will represent one of the main obstacles while achieving the objectives of the Vision, since investments will be necessary for some key issues such as institutional reforms, capacity-building or infrastructure development to increase water productivity. According to the strategy, the AfDB estimated an initial indicative figure of US\$ 20 billion/year to cover only basic and minimum objectives, increasing up to US\$ 180 billion/year to carry out the complete action framework.

Outcomes and way forward

With the successful implementation of its specific targets and actions, the Africa Water Vision 2025 considers that the future of water resources in Africa will be affected in the following ways:

- New policy, strategy and legislative frameworks envisaged (decentralization; IWRM principles; alignment of economic, environmental and energy sectors, water quality management; “polluter pays” principle; water re-use...)
- Bottom-up institutional arrangements established (close vertical integration enhanced by horizontal integration with other sectors; transparency; market orientation)
- Demand-responsive water allocation systems
- Basic needs met and food self-sufficiency achieved (food security)

The consecution of most of the outcomes of this Vision requires actions and cooperation at several levels. African Economic Commissions and Africa-wide organizations should take part and get involved in national and regional actions proposed. Actions should be prioritized as the creation of enabling environments and legal frameworks is crucial for the development of this strategy. Socio-economic development, environmental protection, technology and governance practices are factors driving and determining the successful implementation of the Africa Water Vision by 2025.

2.5 Arab Strategy for Water Security in the Arab Region (ASWS)

Context and description

Approved by the Arab Ministerial Water Council (AMWC) in 2012, the complete name of this initiative is *“Arab Strategy for Water Security in the Arab Region, to meet the Challenges and Future Needs for Sustainable Development 2010-2030”*.

The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), commissioned by the AMWC in coordination with the Secretariat of the League of Arab States, drafted this strategy as a framework to guide water resources development and management within the changing and challenging environment of food security and climate change. The Strategy also focuses on strengthening the coordination and cooperation among national, regional and international water-related institutions and organizations in order to support decision-making processes in the Arab States to achieve water and food security.

The objectives of the Strategy can be grouped into three main domains:

- Economic and developmental domain: objectives concerning the provision of water services, the application of integrated water resources management (IWRM), technology transfer, etc.
- Political domain: objectives related to Arab water rights, cooperation among Arab States in shared water resources management, commitments under the MDGs/SDGs, etc.
- Institutional development domain: objectives in relation to human and technical capacities development, social awareness of regional water issues, scientific research, etc.

In addition, the Strategy is based and complies with other initiatives already adopted by the Arab States such as the Joint Arab Economic Action Charter, the Arab Strategy for Sustainable Development 2005-2025 or the Sustainable Development Initiative in the Arab Region, among others.

Objectives and implementation

As already mentioned, the main objective of this Water Security Strategy is to meet current and future water challenges in order to achieve water security under the requirements for the sustainable development of the Arab region.

The Strategy acknowledges that this holistic vision may be achieved by accomplishing a number of specific objectives as follows:

- Optimization of available water resources use
- Drinking water and sanitation services aligned with MDGs
- Protection of ground and surface water resources (pollution and depletion)
- Development of conventional and non-conventional water resources
- Adaptation and mitigation strategies to deal with CC impacts on water resources
- Integrate IWRM principles within Arab States' water policies
- Development and training of teams in the Arab water sector
- Strengthening of the scientific research's role in water resources management
- Protection of Arab water rights in shared waters (with non-Arab states)
- Protection of Arab water rights in occupied Arab territories
- Strengthening of cooperation among Arab States in relation to shared water resources
- Enhancement of the exchange of information and experiences among Arab States
- Attraction of Arab investments in Arab water projects
- Identification and support of desalination and water treatment modern technologies (expansion of use in the Arab region)
- Exploitation of water-related comparative advantages of Arab States
- Raise of water and environmental protection awareness among civil society (involvement on decision-making processes)

Further, these 16 specific objectives of the Strategy are structured and oriented around a number of key themes, highlighting the focus of the Strategy on providing a sound knowledge base to decision-makers in order to develop natural resources management strategies and policies tailored to local conditions (natural, social and economic) that fed into the latest technologies available. Such key themes also reinforce the importance of developing water information systems to monitor a constantly changing sector.

As evidenced in the objectives of the Water Security Strategy, other key element of the initiative is the implementation of integration principles and climate change adaptation in the water sector management, with participation of relevant local actors and users of water resources. In addition, the adoption of such approaches, including the promotion of non-conventional water use through desalination and wastewater treatment, will lead to an increase of the water use efficiency particularly in the agricultural sector since it is the largest water consumer in the Arab region (AMWC, 2012). Finally, to ensure the sustainability over time of this ambitious plan, it is necessary to train qualified technical staff in the concerned institutions and governments seeking the quality, efficiency and expansion of the system.

The Arab Strategy for Water Security is intended to be implemented through national water-related Ministries and institutions of the Arab States, thus benefiting both from the Arab States expertise and from national institutions knowledge on water issues. The Strategy is regarded as a complementary support to national initiatives and legal frameworks, and is deeply rooted in full cooperation principles that should involve all relevant actors (from authorities to civilian population).

According to the Strategy, funds for its implementation fall under the competence of the AMWC, which does not prevent Arab States from obtaining funding from other regional and international institutions as well as the cooperation among themselves.

Follow-up and progress indicators

The Strategy recognizes the need of coordination and follow-up that should be performed through 3 different units:

- ACSAD is proposed to be the technical arm of the AMWC leading the coordination unit
- Closely associated with ACSAD, there should be another unit managing information (already existent and new findings) and the integrated database on water and natural resources in the Arab Region.
- The Centre for Water Studies and Water Security is proposed to be in charge of the follow-up and coordination of projects related to the Arab water rights.

The evaluation of the Strategy shall be done every five years, and should include an assessment of the topics and targets shown in

Table 5, and described as follows:

- Provide updated **information on the water sector** in the Arab countries: The objective is to create a knowledge base for Arab States in order to develop cooperation strategies among them on shared water resources management. An integrated and “official” database would be a useful tool for water management at national and transboundary level.
- Achieve sustainable development, addressing **water availability and CC impact**: Effective policies and appropriated institutional frameworks are needed for the correct management and preservation of water resources. The Strategy seeks to increase the economic and social return of all water uses, as well as decreasing the water supply deficit.

- **Raise awareness** of water issues: Participation of civil society and the private sector in water management will contribute to a better understanding of water sector as well as it will improve water management mechanisms.
- **Build human and institutional capacities** in Arab States water sector: Improved water management and increased performance of water institutions will be only possible with trained and qualified staff in all areas of water management. Particular attention should be paid to the development of capacities to deal with the management of shared water resources among neighbouring countries and restoration of water rights.
- Increase available **funding, industrial and technological base** for the water sector: Arab investments, private participation in project financing and management, and Arab technological innovation should be increased in the water field of the Arab region.
- Provide an **enabling framework for cooperation** among Arab countries concerning shared water in the region.

Table 5. Topics, targets and indicators of the ASWS.

TOPIC	ASWS targets / indicators
<i>Updated Status of Water in the Arab Region</i>	Existence of a comprehensive and updated database among Arab States
	Ease of access to information
	Performance of improved hydrological monitoring networks
<i>Sustainable development aligned with water resources availability and CC impact</i>	Existence and degree of implementation of policies, regulations and institutional frameworks for IWRM
	Protection of water resources from environmental degradation (reduction of the degradation already existent)
	Reduction of water supply deficit
	Achievement of the Third Millennium Principle (access to drinking water and sanitation)
	Policies and actions on CC adaptation
<i>Awareness of water and environmental security</i>	Increase of civil society and private sector participation in water resources management
	Increase of awareness and education on water resources preservation
	Increase of interest (e.g. Arab and international water days)
<i>Human and institutional capacities related to water management in the Arab States</i>	Programmes and centres for training and qualification
	Increase of the number of qualified personnel in water management
	Improvement of performance of water-related institutions
	Completion of agreements on shared water resources among Arab States and neighbouring countries
	Restoration of water rights in occupied territories
<i>Available funding and "Arab industrial and</i>	Increase of Arab investments in the water sector

TOPIC	ASWS targets / indicators
<i>technological base” in the water sector</i>	Increase of financing and management of Arab water projects by the private sector
	Increase of use and production of Arab-made products in water-related fields
<i>Cooperation among Arab States (mechanisms and frameworks) and mutual agreements on shared water resources management</i>	Increase of agreements on shared water in the Arab Region

Source: adapted from (AMWC, 2012).

3 Implementation and progress in the MADFORWATER project selected countries

The objective of this section is to review the main water-related goals covered by the international and regional initiatives selected, in order to identify those areas that should be reinforced in future agreements and strategies.

To this aim, a limited set of related indicators is proposed as a tool for the assessment of the progress achieved by the three target countries of the MADFORWATER project – Egypt, Morocco and Tunisia – in water-related issues. Indicators will be used to show to state of some of the water issues covered by the reviewed initiatives impacted at national level in such countries, and will also help to identify those gaps and needs that should be addressed as priorities in the agreements and initiatives to be developed in the coming years.

3.1 Selection of indicators for assessing water management

Due to its international nature, the SDGs have been taken as the overarching initiative setting out global water-related targets. In addition, as an Arab-specific strategy particularly focused in water, the ASWS has been also considered as a primary document for the identification of key water targets. The result of such study on water-related topics covered is shown in Table 6.

An identification number (Target ID) has been assigned to each one of the targets considered in Table 6, in order to relate them with the set of indicators proposed in the subsequent Table 7 of this section.

Table 6. Revision of water-related targets from the selected international and regional strategies.

Target ID	Sustainable Development Goals water-related targets	Arab Strategy for Water Security water-related targets
1	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Achievement of the Third Millennium Principle (access to drinking water and sanitation)
2	6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	
3	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	Protection of water resources from environmental degradation (reduction of the degradation already existent)
4	6.6 By 2020, protect and restore water related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	
5	6.4 By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	
6	6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	Existence and degree of implementation of policies, regulations and institutional frameworks for IWRM
		Completion of agreements on shared water resources among Arab States and neighboring countries
		Increase of agreements on shared water in the Arab Region
		Improvement of performance of water-related institutions
		Increase of the number of qualified personnel in water management
7	6.a By 2030, expand international cooperation and capacity building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	Increase of awareness and education on water resources preservation
		Programmes and centres for training and qualification

Target ID	Sustainable Development Goals water-related targets	Arab Strategy for Water Security water-related targets
		Increase of Arab investments in the water sector
8	6.b Support and strengthen the participation of local communities in improving water and sanitation management	Increase of civil society and private sector participation in water resources management
9		Existence of a comprehensive and updated database among Arab States
		Ease of access to information
10		Performance of improved hydrological monitoring networks
11		Reduction of water supply deficit
12	11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015J2030, holistic disaster risk management at all levels	Policies and actions on CC adaptation
	13.2 Integrate climate change measures into national policies, strategies and planning	
13	15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	
14		Increase of interest (e.g. Arab and international water days)
15		Restoration of water rights in occupied territories
16		Increase of financing and management of Arab water projects by the private sector
17		Increase of use and production of Arab-made products in water-related fields

Source: own elaboration based on (AMWC, 2012) and (UN, 2015).

In addition to which has been presented in Table 6, the MSSD and the AWV provide additional targets beyond the scope of the SDGs and the ASWS. Both initiatives are in line with the focus of the ASWS in the need for developing information systems, sustainable financing, cooperation and enabling institutional frameworks to achieve an integrated and effective water resources management. Particularly, the MSSD and the AWV provide two additional targets supplementing the proposed set as follows:

- **Target ID 18: MSSD direction 2.1.6.** Development of socio-economic models for national strategic choices for water allocation between sectors (agriculture, industry, tourism and domestic uses), taking into account environmental and social aspects as well as economic development needs (UNEP/MAP, 2016).
- **Target ID 19: AWV target 4.3.** Financing urgent water needs through the implementation of water pricing and full cost recovery mechanisms (UN-Water / Africa, 2003).

In order to develop a sound and limited set of indicators to assess the state of water related goals in the MADFORWATER MACs, the UN SDGs indicators have been taken as a basis. As already presented, the SDGs indicators cover water-related issues such as water quality, efficiency and wastewater treatment and reuse (among others), which are very much in line with the focus and approach of the MADFORWATER project.

As extracted from the UN-Water Task Force on Indicators, Monitoring and Reporting final report (UN-WATER, 2009a), indicators have been selected according to SMART criteria. This means that indicators must be Specific, Measurable, Achievable, Relevant and Time-bound. The objective is not to have a detailed set of indicators measuring specific water-related goals, but to have a set of representative, general and quantifiable indicators that help to evaluate the state of water-goals in the MADFORWATER countries (Egypt, Morocco, Tunisia), and that are available in the public databases.

However, some of the reviewed initiatives provide water-related targets beyond the SDGs spectrum that are worthy to include in the analysis, but do not count yet on public, developed and specific indicators for the assessment of the implementation. For such cases, additional indicators from several monitoring systems and task forces have been reviewed. Such additional indicator sources are further detailed in ANNEX I of this document and they are, namely:

- The Task Force on Indicators, Monitoring and Reporting (UN-Water)
- The 2nd Arab State of the Water Report 2012 (CEDARE, AWC)
- The Monitoring and Reporting System for the Water Sector in Africa (AMCOW)¹

It is also worth to mention, that three of the targets (11, 14 and 15) do not have any indicator proposed, and should be further revised.

¹ The Monitoring and reporting system only applies for two of the three target MACs of the MADFORWATER project: Egypt and Tunisia. However, Morocco rejoined the AU in January 2017 so it may be expected that Morocco will also be included within the monitoring system.

To facilitate the clear relation between targets reviewed and indicators proposed, an indicator number has been given to each of the indicators presented in Table 7 (Indicator ID). The number of this identification matches with the number of the target ID to which the indicator belongs to. For those cases in which there is more than a single indicator proposed, the identification number is followed by a letter.

Table 7. Proposed indicators for the assessment of progress in the water sector (to be discussed with MAC partners of MADFORWATER).

Indicator ID	Proposed indicator	Source
1	% of population using improved drinking water sources	SDG 6.1.1
2	% of population using improved sanitation services	SDG 6.2.1
3.a	% of wastewater safely treated	SDG 6.3.1
3.b	% of water bodies with good water quality	SDG 6.3.2
4	% of change in water-related ecosystems extent over time	SDG 6.6.1
5.a	%change in water use efficiency over time	SDG 6.4.1
5.b	Level of water stress: freshwater withdrawal as a % of available freshwater resources	SDG 6.4.2
6.a	Degree of IWRM implementation (0-100)	SDG 6.5.1
6.b	Proportion of transboundary basin area with an operational arrangement for water cooperation	SDG 6.5.2
6.c	% implementation of establishment and reform of institutions at all levels	AMCOW Monitoring 5.2
6.d	% implementation of education and research on water resources management at all levels	AMCOW Monitoring 7.2
7.a	Amount of water and sanitation related Official Development Assistance that is part of a government coordinated spending plan	SDG 6.a.1
7.b	Degree of implementation of institutional and human resources capacity development programs at all levels	AMCOW Monitoring 7.2
8	% local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	SDG 6.b.1
9	Proportion of African monitoring and reporting system reported on by country	AMCOW Monitoring 7.1
10	Degree of implementation of national monitoring and reporting system	AMCOW Monitoring 7.1
11		
12.a	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030	SDG 11.b.1
12.b	Number of countries with national and local disaster risk reduction strategies	SDG 11.b.2

Indicator ID	Proposed indicator	Source
12.c	Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)	SDG 13.2.1
13	Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	SDG 15.1.2
14		
15		
16	% of countries with secured mobilization of finance from national and international sources	AWV 4.3
17		
18	% of potential development of water for agriculture, hydropower industry, tourism and transportation at national level	AWV 3.3
19	% of countries with operational implementation of pricing and full cost recovery	AWV 4.3

Source: own elaboration based on specific sources indicated.

3.2 Analysis of the current state and progress in the selected countries

According to the approach and methodology already defined, those of the indicators that can be quantified, and of which information is available at international databases, have been reviewed for the three target MACs of the MADFORWATER project in order to assess the progress made to date in the water sector.

Table 8 shows the set of key indicators proposed, building upon the SDG indicators and complemented with the aforementioned additional data sources. In some cases although there is an SDG indicator defined for some targets, due to its recent nature, data for such SDG indicators are still not available in the SDG UN database (grey colored cells in Table 8). Therefore, some of the water-related targets are proposed to be measured through other similar indicators selected from external sources (see explanation in section 3.1), until the SDGs database is further developed. These indicators are identified within Table 8 with the original indicator ID plus an asterisk.

Table 8. Quantification of proposed indicators for Egypt, Morocco and Tunisia.

Indicator ID	INDICATOR	Year	Observation			Units	Source of indicator	Source of data
			Egypt	Morocco	Tunisia			
1	% of population using improved drinking water sources	2015	99,43	85,42	97,75	%	SDG 6.1.1	UN - SDG Indicators Global Database
2	% of population using improved sanitation services	2015	94,72	76,71	91,59	%	SDG 6.2.1	UN - SDG Indicators Global Database
3.a	% of wastewater safely treated						SDG 6.3.1	data still not available
3.a*	Treated industrial and municipal wastewater	2012	3,37	0,04	0,25	BCM/year	2nd Arab State of Water Report	2nd Arab State of Water Report
3.b	% of water bodies with good water quality						SDG 6.3.2	data still not available
4	% of change in water-related ecosystems extent over time						SDG 6.6.1	data still not available
5.a	%change in water use efficiency over time						SDG 6.4.1	data still not available
5.a*	Overall water use efficiency (defined as: $[100 * (\text{withdrawals from original sources} - \text{wastewater and drainage outflows}) / \text{withdrawals from original sources}]$)	2012	89,9	73,36	83,78	%	2nd Arab State of Water Report	2nd Arab State of Water Report
5.b	Level of water stress: freshwater withdrawal as a % of available freshwater resources	2012	126,6	35,70	69,70	%	SDG 6.4.2	UN - SDG Indicators Global Database
6.a	Degree of IWRM implementation (0-100)						SDG 6.5.1	data still not available
6.a*	IWRM plan in place	2012	Yes	-	-	Yes/No	2nd Arab State of Water Report	2nd Arab State of Water Report

Indicator ID	INDICATOR	Year	Observation			Units	Source of indicator	Source of data
			Egypt	Morocco	Tunisia			
6.b	Proportion of transboundary basin area with an operational arrangement for water cooperation						SDG 6.5.2	data still not available
6.b*	Transboundary Water Bodies Dependency Ratio	2012	97	0	8	%	2nd Arab State of Water Report	2nd Arab State of Water Report
6.c	Degree of implementation of establishment and reform of institutions at all levels	2016	-	-	72,70	%	AMCOW Monitoring 5.2.a	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
6.d	Degree of implementation of education and research on water resources management at all levels	2016	-	-	80	%	AMCOW Monitoring 7.2.b	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
7.a	Amount of water and sanitation related Official Development Assistance that is part of a government coordinated spending plan						SDG 6.a.1	data still not available
7.a* I	Total official flows for water supply and sanitation, by recipient	2014	69,75	266,94	87,96	Constant USD (Millions)	SDG 6.a.1	UN - SDG Indicators Global Database
7.a* II	Proportion of water- and sanitation-related official development assistance that is part of a government coordinated spending plan	2016	-	-	83,30	%	AMCOW Monitoring 6.4	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
7.b	Degree of implementation of institutional and human resources capacity development programs at all levels	2016	-	-	77,50	%	AMCOW Monitoring 7.2.a	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting

Indicator ID	INDICATOR	Year	Observation			Units	Source of indicator	Source of data
			Egypt	Morocco	Tunisia			
8	% local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management						SDG 6.b.1	data still not available
9	Proportion of African monitoring and reporting system reported on by country	2016	51,20	-	95,20	%	AMCOW Monitoring 7.1.b	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
10	Degree of implementation of national monitoring and reporting system	2016	100	-	74,50	%	AMCOW Monitoring 7.1.a	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
12.a	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030						SDG 6.11.b.1	data still not available
12.b	Number of national and local disaster risk reduction strategies	2015	-	1	1	No.	SDG 11.b.2	UN - SDG Indicators Global Database
12.c	Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)						SDG 13.2.1	data still not available
12.c*	National CC Adaptation Plan	2012	Yes	-	-	Yes/No	2nd Arab State of Water Report	2nd Arab State of Water Report

Indicator ID	INDICATOR	Year	Observation			Units	Source of indicator	Source of data
			Egypt	Morocco	Tunisia			
13	Proportion of important sites for freshwater biodiversity that are covered by protected areas, by ecosystem type	2016	28,60	64,30	0	%	SDG 15.1.2	UN - SDG Indicators Global Database
16	% of countries with secured mobilization of finance from national and international sources						AWV 4.3	
18	% of potential development of water for agriculture, hydropower industry, tourism and transportation at national level						AWV 3.3	No database found
19	% of countries with operational implementation of pricing and full cost recovery						AWV 4.3	No database found
19* I	Degree of implementation of equitable and efficient water supply and wastewater tariffs	2016	100	-	58	%	AMCOW Monitoring 6.2	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting
19* II	Degree of implementation of financing for water supply, sanitation and hygiene	2016	-	-	3,50	%	AMCOW Monitoring 6.1.c	AMCOW Africa Water Sector and Sanitation Monitoring and Reporting

UN - SDG Indicators Global Database: <https://unstats.un.org/sdgs/indicators/database/>

AMCOW Africa Water Sector and Sanitation Monitoring and Reporting: <http://www.africawat-sanreports.org>

2nd Arab State of Water Report (AbuZeid, K. et al., 2014)

Source: own elaboration based on specified data sources.

3.2.1 Egypt

Water management is a complex issue in Egypt. The Nile River is the main water supplier of Egypt. This river is mainly controlled through the Higher Aswan Dam, although control over the Nile has been performed since the 19th century. Regarding international issues, Egypt has signed over the years several agreements in relation to the Nile basin that have been joined by more than 10 Nile countries. The most important of these agreements are the 1959 agreement with Sudan (Box 1) and the 1993 agreement with Ethiopia.

Box 1. Bilateral Agreements on the Nile River.

International Issues: Bilateral Agreements on the Nile River (Egypt/Sudan)

- **Official name of the agreement**

1959 Nile Water Agreement

- **Countries Involved**

- Egypt
- Sudan

- **Concerned Water bodies**

- Nile River
- Expected to be formed High Aswan Dam Lake (Nasser Lake)

- **General description** and overview of the conflict (or points of conflict)

Egypt wanted to develop its agriculture areas through the construction of the High Aswan Dam, which meant the formation of Lake Nasser reservoir. The reservoir would have caused the over flooding of several areas in Egypt and Sudan.

- **Time frame**

Year of adoption: 1959

- **Institution(s) in charge of coordination & monitoring**

The Permanent Joint Technical Commission for Nile Waters

- **Objective of the agreement and main commitments** of countries involved

- It was agreed that the average quantity of the Nile waters' flow was 84 billion cubic meters at Aswan, Egypt.
- Both countries agreed that the evaporated water of the Nile would be 10 billion cubic meters.
- Both countries agreed to share this quantity as 18.5 billion cubic meters for Sudan and 55.5 billion cubic meters for Egypt.
- Both countries agreed that it would be Egypt the one building the High Aswan Dam and Sudan would be in charge of the construction of the Rosaries Dam on the Blue Nile.

International Issues: Bilateral Agreements on the Nile River (Egypt/Sudan)

- **Main drivers and barriers** found during the implementation of the agreement (please highlight main obstacles that are still to overcome)

N/A

- **Progress achieved and progress indicators** (monitoring outcomes)

The agreement is still in place

- **Most affected areas and/or sectors**

- The villages on the border area between the two countries

Many public institutions participate in the water management of Egypt and therefore, coordination is needed. It is the National Water Council (NWC) who is in charge of inter-ministerial coordination and also it is responsible for the integration of policies at national and local level. The NWC is assisted by several institutions at national and regional level, such as a Technical Secretariat, the Water & Environment Units of coordinated Ministries, and a Regional Management Committee (RMC) (FAO-AQUASTAT, 2016).

Historically, it was the Department of Public Works which was in charge of irrigation management. This Department has changed its name over time and finally, in 1999, it was named as the Ministry of Water Resources and Irrigation (MWRI). This is the main institution dealing with water resources research, development and distribution. It is also responsible for the construction and O&M of irrigation and drainage networks, as well as for granting drilling and groundwater permits (FAO-AQUASTAT, 2016). In 2012, a new Ministry was created specifically to undertake drinking water and wastewater sectors: the Ministry of Water and Wastewater Utilities (MWWU). Further, there are several agencies and companies reporting to this Ministry concerning drinking water and wastewater. Concerning water quality, the Ministry of State for Environmental Affairs (MSEA) and the Egyptian Environmental Affairs Agency (EEAA) are the public institutions working on such issues.

Regarding the water-related legal framework, Egypt has made great progress in recent years concerning drinking water supply, sanitation and water resources protection. The main national initiatives performed recently have been the “Water for the future: National Water Resources Plan 2017” (Ministry of Water Resources and Irrigation, 2005), which provides a general framework to sectorial strategies, and the “Sustainable Development Strategy: Egypt Vision 2030” (Ministry of Planning, Monitoring and Administrative Reform, 2015), which includes several water-related topics within its environmental pillar particularly focusing on the rationalization of water consumption ensuring water security and water quality for all sectors. The impact of such policies can be noted in the Table 8, with more than 90% of population accessing improved sources of drinking water and sanitation services.

Despite all the significant advances made, there is still room for improvement on some relevant aspects in the Egyptian water sector. As shown in Table 8, the international water goals that Egypt should reinforce in future strategies include actions aimed at decreasing the level of water stress (freshwater withdrawals can be quantified as 126% of available renewable freshwater resources, see Table 8), enhancing integrated information and monitoring systems,

improving the management of transboundary water bodies (97% dependency ratio, see Table 8) and developing wastewater treatment management strategies and technologies. This is in line with that suggested by Soulie, M. (2013), which cites as the main weaknesses of the Egyptian water sector the wastewater treatment and reuse, the participatory management approaches, monitoring and data collection, or the development of economic instruments to enable the participation of the private sector in the water sector, among others. In this regard, and according to Soulie, M. (2013), the “2050 National Strategy for the Development and Management of Water Resources” acknowledges wastewater treatment as a possible solution to increase water resources in Egypt, while several national programs and action plans address water resources protection and availability without particular focus on wastewater management.

3.2.2 Morocco

Although Morocco is affected by an increasing water scarcity, it could be said that among the three MACs of MADFORWATER project, it is the best placed country due to its geographical location and characteristics. However, water resources are unevenly distributed along its territory and high climatic disparities can be found. In addition, availability of such water resources varies over time, resulting in severe drought periods.

In this context, Moroccan water-related policies have progressively focused on development and use of non-conventional water resources. The basic water regulation in Morocco is Law 10-45 (1995), commonly known as the “water act”, which provides the general framework for the development of the water sector and that is currently under revision (SWIM-SM, 2013a). The latest strategies and national plans undertaken show a clear political commitment towards IWRM approach (SWIM-SM, 2013a). Some of these recent regulations affecting the water sector are: the Morocco Green Plan - PMV (2008), which included a cross-cutting initiative for the modernization of irrigation systems to localized irrigation (2007, National Programme for saving water in irrigation – PNEEI); or the National Water Strategy (2009), which was structured around three pillars further developing the PNEEI, water pricing and localized irrigation as well as taking into account water resources protection and the development and management of water supply. This approach is aligned with the accomplishment of the goals pursued in the international agreements that Morocco has been joining. Furthermore, concerning water treatment and reuse, in recent years Morocco has launched two National Plans aimed to develop and promote the use of treated wastewater: 2014 National Water Plan – PNE, and 2015 Plan national de réutilisation des eaux usées – PNREU, (Plan Bleu - GWP, 2012). As shown in Table 8, the volumes of treated wastewater have been very limited and thus such national initiatives and strategies are believed to have a great impact in the development of new water treatment technologies and the reuse of wastewater.

From the 90s, decentralization and participation of users in the water management has been increasing. In this regard, relevant actors involved in the development and management of irrigation perimeters include the AUEAs (Agricultural Water Users Associations), the River Basin Agencies (ABH, under the Ministry of Energy , Mining , Water and the Environment - MEMEE), and the Regional Offices for Agriculture Development (ORMVAs, under the Ministry of Agriculture and Fishery - MAPM). In Morocco, there are many organizations in charge of other specific areas of the water sector such as the National Agency for Sanitary Safety of food

products (ONSSA), which ensures the quality of products of wastewater reuse, the Superior Council for Water and Climate (CSEC), which has an advisory role regarding the planning of water resources management, or the National Agency for Energy and the Water (ONEE) (SWIM-SM, 2013a).

Despite the great performance shown by Morocco, a number of issues should be reinforced in the coming years in order to achieve an effective IWRM. Although stakeholder's participation in the water sector has been well developed through the regulatory framework, the institutional framework should be enhanced as there can be found differences in the level of decentralization and implementation among regions. In general, capacity building is needed, and insufficient technical expertise is noted in the wastewater treatment and reuse (particularly industrial waste management and agricultural wastewater reuse), which has been acknowledged as a priority for Morocco (SWIM-SM, 2013a). Further, and in line with the international water goals presented in Table 8, the absence of a national water database hinders monitoring and management processes, which highlights that the effectiveness of regulatory and institutional frameworks highly depends on practical implementation and enabling tools.

3.2.3 Tunisia

Tunisia is severely affected by water stress and uneven distribution of water resources among the regions of the country. The Ministry of Agriculture (MARHP), and its General Directorate of Water Resources (Direction Générale des Ressources en Eau, DGRE), has been leading water-related policies and strategies. In recent years, Tunisia has shown interest in the adoption of integrated water resources management, in the development of efficient irrigation systems and in the use of non-conventional water resources (SWIM-SM, 2013b. CEDARE, 2014). Furthermore, policies related to the protection of water resources have been implemented by the Ministry of Environment, and other relevant national key actors involved in the development of water strategies are: the Regional Commissariat for rural development at Governorate level; and the Agricultural Development Groups (GDAs) at local level (network operation).

In this regard Tunisia has shown great performance in the drinking water and sanitation sectors, with more than 90% of population using improved sources of drinking water and sanitation services (see Table 8). However, according to SWIM-SM (2013b), Tunisia continues to implement such policies through a number of strategies and sectoral programs, which may hinder the development of an integrated approach of the water resources management.

The Tunisia's Water Code (Law 75-16, 1975) is the basis for every water-related regulation in the country and is currently under revision (2016 references state that a draft was being discussed with the Prime Minister), given that in 2013 the National Water Council (created in 2010) established to review current policies and strategies in order to prioritize update the national legal framework (CEDARE, 2014). The new text of the Water Code foresees to incorporate many innovations in the water management of Tunisia, including the concept of public water domain, the support and strengthening of the science-policy link (scientific information to support the decision-making process), the development and promotion of non-conventional water resources, and the engagement of civil society and local councils in the water management decision-making processes (BPEH-MARHP, 2015). In addition to the Water

Code, there are other recent strategies and programs addressing main water-related challenges such as the “12th National Development Plan 2010-2014” which acknowledged sanitation and wastewater treatment as priority issues, or the “National program for water-saving in irrigation” (Programme national d’économie d’eau d’irrigation -PNEE), which was launched in 2005 and later extended to the drinking water sector, and that developed the Tunisian water tariff policy. According to CEDARE 2014, the main sources of financing for IWRM framework are cost recovery and external funding by development partners.

Regarding the goals related to transboundary water management issues (Target ID 6), boxes 2 and 3 summarize the main aspects of bilateral cooperation regarding transboundary water bodies in Tunisia.

Box 2. Bilateral Agreements on the Medjerda Basin.

International Issues: Bilateral Agreements on the Medjerda Basin (Tunisia / Algeria)

- **Official name of the agreement**

There is not an official agreement between Tunisia and Algeria about the Medjerda Basin. In 1978 (29/01/1978), both countries signed a Memorandum of Understanding for the protection from pollution of the Medjerda and the Wadi El-Kebir (Oued Barbara).

- **Countries Involved**

- Tunisia
- Algeria

- **Concerned Water bodies**

- Medjerda river

- **General description** and overview of the conflict (or points of conflict)

For the moment, there is no conflict between countries in the Medjerda basin. However, due to the climate change impact and decreasing rainfall, a political agreement between countries is needed. It already exists technical collaboration between countries, but there is not permanent data exchange. Further, there is not a specific entity in charge of controlling the exploitation of water between countries. There is no agreement for a fixed water allocation. Therefore, the concept of sustainability needs to be considered by countries while allocating water between sectors.

- **Time frame** (year of adoption of agreement or first negotiations, end year, major milestones, already performed and next foreseen revisions of the agreement...)

The Memorandum of Understanding was signed by Tunisia and Algeria in 1978, without any specific time frame or revision foreseen.

- **Institution(s) in charge of coordination & monitoring**

- Tunisia: Water Resources Department (Direction Générale des Ressources en Eau; DGRE)
- Algeria: National Agency for Water Resources (ANRH)

- **Objective of the agreement and main commitments** of countries involved

Protection of the Medjerda and the Wadi El-Kebir (Oued Barbara) against pollution.

Box 3. Bilateral Agreements on the North-Western Sahara Aquifer System.

International Issues: Bilateral Agreements on the North-Western Sahara Aquifer System (Tunisia / Libya)

- **Official name of the agreement**

For the Northern Sahara Aquifer System (SASS) there is only a consultation mechanism created in 2002, with a rotating presidency among Tunisia, Algeria and Libya. However, the mechanism did not become formally operational until 2008. Its main mission is to harmonize data collection and methodology for the analysis and update of the SASS database that has been developed in the framework of the “SASS program” implemented by the Sahara and Sahel Observatory (OSS). The strengthening of this mechanism and the expansion of its mission have been identified as priorities throughout the stakeholders consultations performed during different meetings.

- **Countries Involved**

- Tunisia
- Libya
- Algeria

- **Concerned Water bodies**

- Northern Sahara Aquifer System (SASS)

- **General description** and overview of the conflict (or points of conflict)

For the moment, there is no conflict between countries in the Northern Sahara Aquifer System. However, due to the overexploitation of resources, climate change impact and decreasing rainfall, a political agreement among countries is needed. It already exists technical collaboration and a yearly data exchange, but this is not enough for a good management of the aquifer. Further, there is not a specific entity in charge of controlling the exploitation of water among countries. There is no agreement for a fixed water allocation. Therefore, the concept of sustainability needs to be considered by countries while allocating water between sectors.

- **Time frame** (year of adoption of agreement or first negotiations, end year, major milestones, already performed and next foreseen revisions of the agreement...)

- Consultation mechanism created in 2002
- Consultation mechanism fully operational in 2008

- **Institution(s) in charge of coordination & monitoring**

For the Northern Sahara Aquifer System (SASS), the institution in charge of coordination & monitoring is the OSS (Sahara and Sahel Observatory). Other important institutions involved are:

- Tunisia: Water Resources Department (Direction Générale des Ressources en Eau; DGRE)
- Libya: General Water Authority (GWA)
- Algeria: National Agency for Water Resources (ANRH)

International Issues: Bilateral Agreements on the North-Western Sahara Aquifer System (Tunisia / Libya)

- **Objective of the agreement and main commitments** of countries involved

The main mission of the mechanism is to harmonize data collection and methodology for the analysis and update of the SASS database that has been developed in the framework of the “SASS program” implemented by the Sahara and Sahel Observatory (OSS).

Despite Tunisia’s advances towards the adoption of an integrated approach of water management and wastewater reuse, the improvement of enabling institutional frameworks and human capacity is still needed. According to SWIM-SM (2013b) and aligned with the revision of international goals in Table 8, high costs considered of wastewater treatment, the difficulties to maintain the conformity of treated wastewater quality with Tunisian standards (NT 106.03), and insufficient information and awareness of potential users, are the main constraints for the development of the water sector in Tunisia. Further, the use of economic instruments in the water sector, participatory water management processes and better coordination for a higher decentralization of water management administration to basin level, are expected to be increased after the revision of the cited national Water Code.

4 Concluding remarks. Gaps, needs and priorities

Northern-African countries (particularly Egypt, Morocco and Tunisia) have demonstrated considerable advances in recent years in improving the internationally agreed water related goals. In particular, relevant improvements have been made in the drinking water and sanitation sectors and infrastructure. Despite these advances, sanitation in rural areas still remains considerable behind the infrastructure of urban area, and therefore should be a point of reflection within these countries.

National Governments of the three MACs have joined several international and regional initiatives that acknowledge the relevance and need for policy and institutional reforms within the water sector in order to effectively achieve IWRM. In response to this need for reform, national policies are being developed, demonstrating the governmental willingness, awareness and commitment across these countries for the sustainable development of the water sector.

However, and despite these important institutional and policy steps in the right direction, there still remain considerable limitations hindering the development of different areas of the water sector. In general, management of the water sector is still limited in its participatory inclusivity and is still inhibited by ineffective coordination among institutions, which limit effective decentralization of water management. This participatory inclusion should include not only institutions, but also the private sector and all other relevant stakeholders, which in many cases is lacking. This inclusivity may facilitate capacity building and enable the development of regulatory and institutional frameworks.

Further, these countries are still limited in their adoption of efficient water-saving technologies for irrigation, mobilization of financing for the development of affordable wastewater treatment schemes, and the support to wastewater reuse. This keeps Egypt,

Morocco and Tunisia away from achieving the international goals related to these issues. However, recent policies and approaches adopted by the three countries show awareness and commitment to tackle this situation. Accesses to these factors will likely enable the development of non-conventional water resources, thus reducing the pressure on natural resources in the case study countries, as well as reducing sanitation issues related to the use of non-treated domestic wastewater. However, these suggested advances may well be limited without sound and accurate economic instruments (water pricing, full cost recovery) to enable this transition and the creation of a wastewater reuse demand.

The identified water issues and the clear need for coordination, communication, and training, rely on effective, integrated and regular data collection and monitoring systems that will enable the assessment of progress achieved and the identification and further development of weak links within the chain. This therefore places heavy emphasis on the needs and priorities of the development and maintenance of such monitoring and data systems, to offer MAC countries with accurate and up-to-date information with which to tailor their management options.

In summary, the conclusions from this analysis underscore the potential role and contribution of the MADFORWATER project. This project can substantially contribute to enhance wastewater treatment and reuse, improve water efficiency and contribute to the development of IWRM policies that support the adoption of the technologies developed within the project. This way the MADFORWATER project can importantly contribute to the sustainable management of water resources in agriculture to reduce water vulnerability in the case study countries.

5 Abbreviations

ABH	River Basin Agencies (Morocco)
ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands
AfDB	African Development Bank
AIDS	Acquired immune deficiency syndrome
AMWC	Arab Ministerial Water Council
AMCOW	African Ministers' Council on Water
ASWS	Arab Strategy for Water Security in the Arab Region
AU	African Union
AUEAs	Agricultural Water Users Associations (Morocco)
AWC	Arab Water Council
AWF	African Water Facility
AWV	Africa Water Vision 2025
BCM	Billion Cubic Meters
BPEH	Bureau de Planification et des Equilibres Hydrauliques
CC	Climate change
CEDARE	Center for Environment and Development for the Arab Region and Europe
CRDA	Regional Commissariat for rural development
CSEC	Superior Council for Water and Climate (Morocco)
DGRE	Direction Générale des Ressources en Eau (Tunisia)
EEAA	Egyptian Environmental Affairs Agency
FAORN	Food and Agriculture Organization of the UN – Regional Office for Near East and North Africa
FAPA	Support Fund for African Private Sector Assistance
GDA	Groupement de développement agricole (Tunisia – Agricultural Development Group)
HIV	Human immunodeficiency virus
IWLMS	Integrated water & land management strategies
IWRM	Integrated Water Resources Management
MACs	Mediterranean African Countries
MADFORWATER	DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries
MAP	Mediterranean Action Plan
MAPM	Ministere de l'Agriculture et de la Peche Maritime (Morocco)

MARHP	Ministry of Agriculture, water resources and fishery (Tunisia)
MDGs	Millennium Development Goals
MEMEE	Ministry of Energy , Mining , Water and the Environment (Morocco)
MEWINA	Monitoring and Evaluation for Water in North Africa
MPMAR	Ministry of Planning, Monitoring and Administrative Reform (Egypt)
MSEA	Ministry of State for Environmental Affairs (Egypt)
MSSD	Mediterranean Strategy for Sustainable Development
MWRI	Ministry of Water Resources and Irrigation (Egypt)
MWWU	Ministry of Water and Wastewater Utilities (Egypt)
NWC	National Water Council (Egypt)
NWRC	National Water Research Center (Egypt)
PB / RAC	Plan Bleu Regional Activity Centre
PNE	National Water Plan (Morocco)
PNEE	Programme national d'économie d'eau d'irrigation (Tunisia)
PNEEI	National Programme for saving water in irrigation (Morocco)
PNREU	Plan national de réutilisation des eaux usées (Morocco)
RMC	Regional Management Committee (Egypt)
SDGs	Sustainable Development Goals
SDIAR	Sustainable Development Initiative in the Arab Region
ONEE	National Agency for Energy and the Water (Morocco)
ONSSA	National Agency for Sanitary Safety of food products (Morocco)
ORMVAs	Regional Offices for Agriculture Development (Morocco)
OSS	Sahara and Sahel Observatory
O&M	Operation and Maintenance
PMV	Green Morocco Plan
RWSSI	Rural Water Supply and Sanitation Initiative
UN	United Nations
UNEP / MAP	United Nations Environment Programme Mediterranean Action Plan
UNICEF	United Nations International Children's Emergency Fund
UPM	Universidad Politécnica de Madrid
UTM	University of Tunis El Manar, Faculty of Sciences of Tunis, Laboratory of Microorganisms and Active Biomolecules
WER	Wageningen Environmental & Research
WHO	World Health Organization
WP	Work Package

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ANNEX I. Other relevant water-related initiatives reviewed

A. Sustainable Development Initiative in the Arab Region (SDIAR)

This initiative of the League of Arab States provides a framework for implementation of sustainable development programmes across Arab countries and organisations, with the framework concentrating upon a series of key priority areas (e.g. peace and security, population and health, education and research, resource management) among which integrated water management is acknowledged. Water quality and efficiency are main issues highlighted by the initiative, while considering that cooperation on the basis of existing international regulations should be enhanced.

B. African Union's Agenda 2063

This Agenda of the AU (2013) provides a socio-economic framework for continental transformation of Africa, building upon current initiatives for sustainable development and growth. Its guiding vision is *"An integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in international arena"*.

After a participatory consultation process, 7 African Aspirations for the coming 50 years were designed as follows:

- A Prosperous Africa, based on inclusive growth and sustainable development
- An integrated continent, politically united, based on the ideals of Pan Africanism and the vision of Africa's Renaissance
- An Africa of good governance, democracy, respect for human rights, justice and the rule of law
- A Peaceful and Secure Africa
- Africa with a strong cultural identity, common heritage, values and ethics
- An Africa whose development is people driven, relying on the potential offered by people, especially its women and youth and caring for children
- An Africa as a strong, united, resilient and influential global player and partner

C. New Partnership for Africa's Development (NEPAD)

This is a programme of the African Union to build an integrated, prosperous and peaceful Africa driven by local peoples, with an implementing agency (2010) that facilitates and coordinates continental scale projects, whilst managing funds and engaging with the international community. Egypt and Tunisia take part in this programme and, given that Morocco recently re-joined the AU (January 2017), it is expected that NEPAD activities may be also extended to the country.

NEPAD activities and projects are focused on four actions areas organized as four programmes:

- Natural resources governance and food security

- Regional Integration, Infrastructure (Energy, Water, ICT, Transport) and Trade Industrialisation, science, technology and innovation
- Human Capital Development (Skills, Youth, Employment and Women Empowerment)

D. African Water Facility (AWF)

Context and description

This is an initiative of the African Ministers Council on Water (AMCOW), managed by the African Development Bank (AfDB). It was started in 2004 as a multilateral fund with the main objective of supporting African countries in achieving the targets committed in the Africa Water Vision 2025 and the MDGs declaration. The AWF is not only intended to contribute by providing financial assistance, but also the technical knowledge to ensure a successful implementation of projects related with water resources management and development.

Objectives and implementation

The main focus areas of the AWF are the following:

- Water resources governance
- Water wisdom
- Urgent water-related needs
- Financial base for an optimal future situation

The strategic focus of the initiative seeks to address such action areas by improving water knowledge (capacity building, water information systems, etc.) and providing an enabling financial framework. Depending on the proposal characteristics and impact, grants may range from €50,000 to €5,000,000.

The potential beneficiaries of such actions are the member countries of the AfDB, through its agencies or institutions working in water resource development topics in Africa.

The projects granted through this initiative are classified under 22 topics related to water supply, environmental protection, disaster management (floods and drought), water knowledge, CC mitigation and adaptation, social and gender equity, etc. Table 9, shows those topics within the AWF portfolio most related with the MADFORWATER approach that are addressed by the projects carried out in the target countries of the MADFORWATER (Egypt, Morocco, Tunisia).

Table 9. Relevant AWF topics related to projects carried out in the three MADFORWATER MACs.

AWF project topics	Projects & topics in Egypt	Projects & topics in Morocco	Projects & topics in Tunisia
Agricultural Water Management	x	x	
Drinking Water		x	
Flood/Drought Protection	x		
Information Systems		x	x
IWRM	x		
Monitoring and Evaluation	x	x	x
Strategic Investment		x	

Transboundary Water Resource Management			x
Water Governance	x	x	x
Water Knowledge		x	x
Total number of projects in the country (all topics)	3	3	5

Source: AFW, 2017.

Relevant projects funded and outcomes

To date, the AFW has granted 3 projects in Egypt, 3 projects in Morocco, and 5 in Tunisia. There is one project that the three MACs have in common: the “Monitoring and evaluation for water in North Africa (MEWINA)” project.

Table 10. AFW projects by country (Egypt, Morocco, Tunisia)

AWF projects in Egypt	Country	Time frame	Grant	Beneficiary
Monitoring and evaluation for water in North Africa (MEWINA)	All 3	2010 - underway	€2 million	CEDARE
Master plan study for the rehabilitation / replacement of major hydraulic structures on the Nile	Egypt	2009 - underway	€1.4 million	Egyptian Gov.
Comprehensive study for the and project preparation for the rehabilitation of the Nubaria and Ismailia canals	Egypt	2007 - underway	€1.9 million	Egyptian Gov.
Providing drinking water in Morocco’s rural areas	Morocco	2016 - underway	€815,100	Consortium ¹
Artificial recharge of Haouz groundwater aquifer	Morocco	2009 - underway	€1.9 million	Moroccan Gov.
Ensuring long-term water safety in Tunisia	Tunisia	2016 - underway	€ 1.4 million	Tunisian Gov.
Development of Tunisia’s water vision and strategy 2050	Tunisia	2011 - underway	€ 1 million	Tunisian Gov.
Development of a national water information system (SINEAU)	Tunisia	2009 - underway	€2 million	Tunisian Gov.
Geo-aquifer: North-Western Sahara Aquifer system water resources management Improvement	Tunisia	2006 - 2010	€487,000	Sahara and Sahel Observatory (OSS)

¹Main consortium partners: AFW, Rural Water Supply and Sanitation Initiative (RWSSI), support Fund for African Private Sector Assistance (FAPA), Morocco National Electricity and Water Utility Company (ONEE).

It is worth to mention that MEWINA Project is developed under the AMCOW, and is aimed to both to decreasing the information gap and to improving national capacity regarding the monitoring and evaluation of water sector in 6 Northern African countries (Algeria, Egypt, Libya, Mauritania, Morocco, and Tunisia). MEWINA project reports have had a great impact on the water sector knowledge and can be considered as key outcomes of the project since they provide a complete country review on the water sector state, including methodology for monitoring and evaluation and performance indicators for water issues such as availability, quality, uses, governance or international relations.

E. Monitoring and Reporting System for the Water Sector in Africa

Building on the idea of grouping the most important initiatives in the field of water management and selection of common topics and progress indicators, the AMCOW launched in December 2016 the “*Monitoring and Reporting System for the Water Sector in Africa*”². This monitoring system responds to the African Union (AU) demand to the AMCOW for annually reporting the state of the continent’s water resources (AU Summit, July 2008). Further, this demand for developing monitoring and reporting capacity in Africa from the AU echoes the same demand from global institutions to the African countries in relation to global initiatives such as the SDGs. Active involvement and collaboration of stakeholders and Member States will be crucial for the development of such a monitoring system.

In order to cope with this task, the AMCOW started to work towards this web-based monitoring system in 2011 with the collaboration of several institutions such as the AUC, BMZ-GIZ, AWF, or the AfDB and a partnership with UNEP-DHI. The design of this system focuses on the monitoring of progress of the most important and effective water-related political commitments at continental level. Only tangible and relevant commitments for the scenario post-2015 are intended to be reported within this system, and alignment with the SDGs targets and indicators is preferred.

In this context, with such a wide framework to cover, indicators have been organized under 7 general themes and 28 sub-themes, up to a total of 78 indicators (43 core indicators with associated targets to meet + 35 background indicators providing a general overview of the water sector). Table 11 shows a selection of the most relevant themes, indicators and targets related to the MADFORWATER approach.

Table 11. Selected topics, targets and core indicators reported in the Monitoring and Reporting System for the Water Sector in Africa.

THEME	TARGET	INDICATOR
1. Water Infrastructure for growth		
1.2 Water for agriculture	Increase water productivity from irrigation and rainfed agriculture by 60% from 2000 to 2025	Change crop water productivity (Agricultural GDP/(vol. Water withdrawn - vol. Return water) USD/m ³
	Increase size of irrigated areas by 100% from 2000 to 2025	Change in size of irrigated area
	Increase irrigation water productivity	Agr. Water productivity = [Agricultural GVAx(1-%agricultural GVA by rainfed agr.)]/Vol. Water withdrawn for agr. USD/m ³

² The Monitoring and reporting framework only applies for two of the three target MACs for the MADFORWATER project: Egypt and Tunisia. However, Morocco rejoined the AU in January 2017 so it may be expected that Morocco will also be included within the monitoring system.

THEME	TARGET	INDICATOR
1.5 Transboundary	Develop infrastructure of regional importance to the benefit of all riparian states	Regional development of infrastructure to the benefit of all riparian states.
2. Managing and Protecting Water Resources		
2.1 Sustainable withdrawals	By 2030 ensure sustainable freshwater withdrawals	Change in level of water stress = (Total freshwater withdrawal - Total non-conventional water resources)/(Total renewable freshwater resources - Environmental Water requirement)
	By 2030 increase water-use efficiency across all sectors	Water use efficiency across all sectors (WUE)= weighted average of agriculture, industrial and service sector water use efficiencies USD/m3
2.2 Sustainable supply	By 2030 increase safe reuse of water	% of water recycled and reused = vol. Of water recycled and reused / total freshwater withdrawal
	By 2030 increase the share of rainwater use in total water use	% rainwater use = sum of agr., indus. And munic. Rainwater use as fraction of total water withdrawals
2.3 Water Quality	By 2030 improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chems and materials	% bodies of water with good ambient water quality
2.4 Groundwater	By 2030 ensure sustainable groundwater use	Sustainable groundwater abstraction = groundwater abs. / (natural groundwater recharge + additional recharge from irrig. Return flow + artif. Recharge)
3. Water Supply, Sanitation, Hygiene and Wastewater		
3.1 Water Supply	By 2030, achieve equitable access to safe and affordable drinking water for all	% population with access to a basic drinking water service
		% population using safely managed drinking water services
3.2 Sanitation	By 2030, achieve access to adequate and equitable sanitation for all	Percentage of population using safely managed sanitation services
3.4 Wastewater treatment	By 2030, halve the proportion of untreated wastewater	% wastewater not safely treated
5. Governance and institutions		

THEME	TARGET	INDICATOR
5.1 Enabling Environment	By 2030, establish an enabling environment for good water governance at all levels.	% implementation of enabling environment at all levels
5.2 Institutions and participation	By 2030, establish institutions with the capacity to implement good water governance at all levels.	% implementation of establishment and reform of institutions at all levels.
	Support and strengthen the participation of local communities in improving water and sanitation management.	% local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management
5.3 Management instruments	By 2030, establish management instruments to implement good water governance at all levels.	Degree of implementation of management instruments
5.4 Transboundary cooperation	By 2030, establish operational arrangements for transboundary water cooperation, covering 100% of transboundary waters.	National proportion of transboundary basin area with an operational arrangement for water cooperation
6. Financing		
6.2 Equitable tariff strategies	By 2030, implement water supply and wastewater tariffs that address cross subsidy and the needs of the poor.	%implementation of equitable and efficient water supply and wastewater tariffs
7. Information Management and Capacity Development		
7.1 Information management	By 2025, fully implement an effective African monitoring and reporting system	% implementation of national monitoring and reporting system
		% African monitoring and reporting system reported on by country
7.2 Capacity development	By 2030, establish ongoing and effective capacity development programs for water resources management and development.	% implementation of institutional and human resources capacity development programs at all levels
		% implementation of education and research on water resources management at all levels

Source: adapted from AMCOW 2016.

F. “UN-Water Task Force on Indicators, Monitoring and Reporting”

The “UN-Water Task Force on Indicators, Monitoring and Reporting” was created in 2009 as a new UN mechanisms for monitoring water-related issues related with the MDGs, and

particularly for setting an integrated, uniform and consistent system for the assessment the impacts of water-related initiatives in the African countries.

As detailed in the final report of such Task Force (UN-WATER 2009a), its final output was a short list of 15 key indicators selected from existing data sets (e.g. OECD, Eurostat, etc.) and aimed to establish a starting point to build an integrated water information system.

The UN-Water key indicators were categorized under four main thematic groups as follows, considering also the geographical dimension within its measurement:

- Context: indicators related to natural context, infrastructure or human and economic capital (e.g. availability, pressures, impact, regional/national adaptation capacity).
- Functioning: indicators related to water balance (inputs, outputs and outcomes) (e.g. water uses, sustainability, users, wastewater treatment).
- Governance: indicators related to water management (e.g. water policies, objectives, IWRM).
- Performance: indicators linking objectives and efficiency/productivity (e.g. access to water & sanitation, value added, environmental sustainability, water quality).

However, the task force highlights that this is not a final nor closed list, since it would evolve as knowledge and data availability improve (UN-WATER, 2009a). The core set of indicators proposed by this UN-Water Task Force under the aforementioned categories is presented in Table 12 together with main data sources.

Table 12. UN-WATER Task Force set of key indicators.

UN-Water Task Force proposed "key water sector indicators"		Source
Context		
1. Total water renewable resources per capita (m3/cap)		FAO / AQUASTAT
2. Storage capacity per person (m3/cap)		FAO / AQUASTAT; IGRAC
3. National expenditure for water supply and sanitation (% total budget)		UNSD; OECD; GLAAS
Functioning		
4. Intensity of use of actual water resources (% TARWR)		FAO / AQUASTAT
5. Water use by abstraction from TARWR by main sector (% of total withdrawals)		FAO / AQUASTAT; IGRAC
6. Change in inland fish production		FAO / FishStat
Performance		
Social	7. % people using improved drinking water sources (%)	JMP - MDG 7C
	8. % population using improved sanitation facilities (%)	JMP - MDG 7C
Economic	9. Importance of external water footprint over total water footprint (m3/cap/year)	UNESCO - IHE
	10. Change in water productivity in agriculture (US \$/cap/m3)	World Bank; AQUASTAT
	11. Change in water productivity in industrial sector (US \$/cap/m3)	UNESCO - IHE
	12. Change in hydropower productivity (%)	IEA; WEO

Environment	13· Change in aquifers quality status (quality/salinity) (%)	IGRAC
	14· Wastewater treatment connection rates (%)	Regional datasets; OECD; Plan Bleu; FAO/AQUASTAT
	15· Trends in freshwater species (%)	WWF; UNEP-WMCC
Governance		
Governance indicators should be obtained by the assessment of each national governance system, from the IWRM approach. In a preliminary phase, UN-Water looked at country-level information at three levels of governance (global, regional, national).		
Global governance	International conventions and commitments relevant to water issues: <ul style="list-style-type: none"> · Ramsar convention · Convention on Biological Diversity (CBD) · UN Convention to Combat Desertification (UNCCD) · UN Framework Convention on Climate Change (UNFCCC) · UN Convention on the Law of the Non-navigational Uses of International Watercourses 	
Regional governance	Transboundary regional agreements relevant to the water sector: <ul style="list-style-type: none"> · UNECE convention (protection and use of transboundary water course) · The eThekweni Declaration (Arica, water supply and sanitation) · Agreements signed by three or more countries sharing transboundary basins 	
National governance	<ul style="list-style-type: none"> · Existence of instruments in place that support "3Es" objective: Equity - Economy - Environment · IWRM concepts integrated · Level of implementation of the 13th Session of the Commission on Sustainable Development (CSD 13) three policy blocks: water supply, sanitation, IWRM · Existence of IWRM Plans (1-inplace; 2-in preparation; 3-only initial steps) 	

Source: Adapted from UN-WATER, 2009b.