DRAFT CONCEPT NOTE (FOR DISCUSSION)
The Non- Conventional Water Resources Initiative

I. Introduction

Water scarcity in the Southern Mediterranean Region, comprising the SWIM Partner Countries[1] (PCs) Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, the Palestinian National Authority,, Syria and Tunisia, is among the highest in the world. As of today, only Lebanon and Syria have renewable freshwater above the annual threshold of 1000 cubic meters per capita which is considered the demarcation line for water scarcity. Water consumption in the PCs is expected to increase from an average of 136.1 billion m3/year in 2010 to 158.0 billion m3/year in 2020, while the water deficit will rise from 33.8 Bm3/year in 2010 to 49.6 Bm3 in 2020[2]. Waste water reuse accounts for 6.7 Bm3/year, and groundwater overuse in 2010 was estimated at 31.5 Bm3/year. Fossil water desalination was estimated to be 2.1 Bm3/year. Waste water reuse as well as desalination will narrow the deficit gap to 25 Bm3/year. Table 1 summarizes the water resources situation in the PCs.

Table 1:Information on Water Resources in SWIM countries (projection in 2010)

		Morocco	Algeria	Tunisia	Egypt	Israel	Jordan	Lebanon	Syria	Palestine	Total
Economic Growth Rate	%/y	5.98	5.43	4.55	6.38	3.57	6.34	5.26	6.99	7.00	
Demand Growth Rate	%/y	1.04	1.47	1.03	1.78	1.22	2.08	1.37	1.85	2.64	
Population MP	Mp	33.8	35.4	10.6	81.1	7.3	6.30	3.8	21.4	4.3	204.0
Exploitable Water	Bm³/y	20	7.9	3.6	49.7	1.64	0.88	2.2	20.6	0.056	106.576
Sustainable Water	Bm³/y	13.67	6.24	2.39	54.40	2.02	0.99	1.57	21.30	0.10	102.68
Irrigation Efficiency	%	40.30	40.30	55.60	54.70	61.00	42.00	43.60	47.50	34.00	
Agricultural Use	Bm³/y	11.7	4.2	2.3	68.8	1.5	0.9	1.0	22.8	0.2	113.4
Municipal Efficiency	%	68.50	53.70	76.30	54.60	71.10	53.00	67.60	53.00	37.30	
Municipal Use	Bm³/y	1.79	1.73	0.47	7.59	0.73	0.30	0.61	0.98	0.26	14.47
Industrial Use	Bm³/y	0.52	1.04	0.14	5.73	0.16	0.06	0.01	0.54	0.04	8.24
Total Demand	Bm³/y	14.0	7.0	2.9	82.2	2.4	1.2	1.6	24.3	0.516	136.1
per capita Consumption	m³/cap/y	414	197	276	1013	329	198	414	1137	120	
Wastewater reused	Bm³/y	0.3	0.3	0.1	4.7	0.4	0.1	0.1	0.7	0.040	6.7
Non-sustainable Water	Bm³/y	0.4	0.9	0.7	27.6	0.4	0.3	0.0	3.0	0.4	
Deficit	Bm³/y	0.4	0.9	0.7	27.8	0.4	0.3	0.0	3.0	0.4	33.8
Fossil Fuel Desalination	Bm³/a	0.0	0.5	0.1	0.2	0.4	0.2	0.0	0.5	0.2	2.1
Groundwater Over-Use	Bm³/y	0.3	0.3	0.6	27.4	0.0	0.1	0.0	2.5	0.2	31.5
Natural Water Used	Bm³/y	13.32	5.75	2.19	49.70	1.64	0.88	1.52	20.60	0.06	95.66

ref http://www.dlr.de/tt/aqua-csp , AQUA CSP

The water deficit is also expected to increase over the next century due to effects of climate change. According to the International Panel for Climate Change (IPCC),rainfall will decrease by 10-25%, runoff will decline by 10-40 % and

[1] hereinafter abbreviated and being referred to as „PC“

[2] AQUA-Concentrated Solar Power Report, 2007, http://www.dlr.de/tt/aqua-csp

evaporation will increase by 5-20%[3]. However, most of this impact is expected to be felt after 2025.

II. Supply side Approach to Integrated Water Resources Management in the SWIM PCs

All PCs are in principle committed to Integrated Water Resources Management (IWRM), and have taken measures towards both the supply and demand side of water resources though tangible results are missing in many cases. From the demand side, there are four major reforms that should be considered; namely water reallocation from agriculture and irrigation to municipal and industrial sectors, capping on the utilization of conventional water resources, water pricing and water consciousness among the population These reforms are slow in their implementation as they are largely influenced by the particularities of each socio-political economy.

From the supply side, two major measures are considered namely (a) leak and loss minimization through the rehabilitation of the water, waste water and irrigation networks, and (b) **enhancing the use of non- conventional water resources, namely recycling of agricultural runoff, treated waste water re-use and storage, and desalination using renewable energy**. Other non-conventional water resources contemplated by SMCs include inter-basin transfer, rainwater harvesting, cloud seeding, grey-water reuse, etc.) Network rehabilitation in the PCs has been slow and ineffective because of past neglect in the networks' operation and maintenance and the rapid and unplanned urbanization and agricultural expansion. The potential of non-conventional water resources has not been fully explored by the PCs although it can assist with bridging the gap between supply and demand within an integrated water resources management framework. Within the supply side approach and after careful examination of the economical, social and environmental impacts, development of treated waste water , aquifer recharge and as a last resort desalinated –with renewable energy- water would be considered as a major instrument for increasing the supply of water resources in the PCs. It should be however noted that given the environmental and financial aspects of desalination, desalination would be considered as a last alternative after exhausting all other means of water conservation, reuse, recycling, reallocation, etc.

The use of non-conventional water resources is not new in the PCs; Egypt, Syria, Israel, Jordan and Tunisia are among the twenty countries in the world with the largest volume of wastewater used for irrigation, treated and untreated as shown in table 2[4]:

[3] In *Water in the Arab World: ManagementPerspectives and Innovations*, ed. V.J. Jaganathan, A.S. Mohamed, and A. Kremer, 447-77.Washington, DC: Middle East and North Africa Region, World Bank.

[4] Scheierling, SM, Bartone C, Mara D, and Dreschel P, "Improving Waste Water Use in Agriculture, an Emerging Priority, Policy Reserach Working Paper # 5412,, The World Bank, September 2010.,

Countries	Mm3/day	Approximate Irrigated Areas [5]with treated and untreated waste water in ha
Egypt	1.92	38,000-45,000
Syria	1.18	36,000-38,000
Israel	0.767	41,000
Jordan	0.225	9,000
Tunisia	0.118	5,000-7000

Groundwater overuse in the PCs, estimated at 31.5 Bm3/year in 2010, will increase to 38.5 Bm3/year in 2020[6]. Overuse of groundwater has an impact on the GDP of many PCs as shown in table 3, with Algeria, Egypt, Jordan and Tunisia experiencing a loss of about four billion$/year The cost of water withdrawal, including production and loss of GDP, ranges between $ 1.86/m3 and $ 0.58/m3, which is comparable to the cost of sea water desalination[7]. Aquifer recharge has important benefits such as little evaporation. It is also less expensive than conventional water storage and could prevent seawater intrusion in coastal areas and thus the salinization of coastal aquifers. Nevertheless, adequate quality of treated water should be guaranteed in order to avoid contamination and pollution risks. Tunisia, Algeria and Morocco are undertaking artificial recharge of the over exploited aquifers with surface and rain water and to a lesser extent with treated waste water.

Table 3: **Cost of groundwater depletion in selected SWIM countries**

	Cost of Groundwater Depletion % GDP	GDP 2005 B$/y	GDP Lost M$/y	Overuse Bm³/y	Cost of Groundwater Depletion $/m³	Cost of Production $/m³	Total Cost $/m³
Algeria	1.2	90	1080	0.7	1.54	0.32	1.86
Egypt	1.3	85	1105	4.0	0.28	0.30	0.58
Jordan	2.1	12.5	263	0.2	1.31	0.25	1.56
Tunisia	1.2	33	396	0.6	0.66	0.30	0.96
Total		190.5	3924	5.5			4.96

In order to bridge the water deficit, especially in the urban and peri- urban areas, many PCs have also installed desalination plants for drinking water. Desalination is used in Algeria, Israel, Tunisia, Egypt, and Jordan, and Morocco is planning desalination plants in Tangier for domestic water and irrigation water. (At the current cost of production – average $1.2/m3 and if we include environmental externalities and societal cost, desalination for agricultural purpose will be very expensive) .All these plants are powered by fossil fuel and consume large amounts of energy. Fossil

[5] Estimation from the following *sources:* Scott *et al*., 2010; Jiménez and Asano, 2008; Xianjun *et al*., 2003; Xie *et al*., 2009.

[6] http://www.dlr.de/tt/aqua-csp

[7] **Concentrating Solar Power for Sea Water Desalination, German Aerospace Center**, http://www.dlr.de/tt/aqua-csp

fuel is the primary sources of greenhouse gases, as well as SO2 emissions in case high sulfur fossil fuel is used. Desalination has both positive and negative impacts. Desalinated water could contribute to surface water conservation, preserve the ecosystem and prevent groundwater depletion and saline intrusion. On the other hand, desalination is linked with CO2 emissions, with thermal pollution, brine discharge and chemicals for pretreatment purposes, alteration of nearby marine ecosystems, noise and visual pollution. Feasibility studies on the techno-economical potential for desalination with Concentrating Solar Power (CSP) are underway in Morocco, Egypt and the Palestinian National Authority under the MED-CSD[8] project funded by the European Commission – DG Research under the 7th Framework Program (FP7). The results of this project can be incorporated into the proposed SWIM Initiative as described below.

III. Constraints to Non- Conventional Water Resources.

SWIM PCs face the following constraints for the use of non- conventional water resources:

a) Policy constraints: Non- conventional water resources are usually not part of national water policies for addressing water scarcity in the PCs. Instead, waste water reuse is associated primarily with waste water treatment and desalination with potable water supply. There are no clear national strategies and action plans to consider the non- conventional water resources as part of the national water allocations. A policy decision framework needs to be developed that will act as the clearing house for the supply and demand alternatives in order to optimize water balance decisions.

b) Institutional constraints: There is a multiplicity of ministries and agencies (irrigation and agriculture, energy, environment, interior and municipal affairs, health) involved in treated wastewater use, desalination and artificial recharge sometimes with conflicting objectives and overlapping responsibilities. Stakeholder involvement, particularly of farmers on waste water re-uses and artificial recharge, is largely absent. Furthermore, no agency or ministry has the capacity to carry out cost/benefit and opportunity cost analyses for all water uses (domestic, industrial, energy, agriculture in conjunction with climate change and ecologic systems) to derive the alternative interventions that will bring the highest return on investment in both the demand and supply sides of water resources development options and therefore help prioritize and sequence interventions over the next 20 years.

c) Legal constraints: There is lack of an appropriate legal framework to institutionalize the use of non-conventional water resources in a comprehensive manner. Some PCs have a regulatory framework and guidelines for waste water reuse such as in Tunisia, however there is a need to develop guidelines for artificial recharge, for mitigation of the negative impacts of desalination, and for strengthening the enforcement capacity for controlling the misuse and the pollution due to the mismanagement of treated

[8] Combined Solar Power and Desalination plants (MED-CSD Project Grant Agreement 213824

waste water and the sludge and potential pollution of the aquifers. Furthermore the legal framework can be enhanced and improved by adapting/transposing several EU directives such as the Water Framework Directive (WFD) (2000/60/EC - WFD) , the Groundwater Directive; 2006/118/EC , Sewage Sludge Directive; 86/278/EEC , Drinking Water Directive 80/778/EC revised with 98/83/EC , Nitrates directive (91/676/EEC) and the Urban Waste Water Treatment Directive (UWWTD) in order to fill the regulatory gaps in the national legislation. This will require examination of the relevant EU Directives' elements to ensure their adaptability to the PCs, a careful assessment of national legislation and substantial training in the application of the different EC directives.

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d) Technical Constraints: The technical functions related to programming, planning, financing, implementation and operation of non-conventional water resources projects - particularly for waste water reuse and desalination - need strengthening. Management of Aquifer recharge is poorly understood. New technologies related to waste water re-use (30 technologies)[9] and desalination using renewable energy[10] have been introduced in the market, and need to be technically and economically assessed by trained staff from ministries and universities. Guidelines should be designed to support the involved ministries and local governments in carrying out technology assessments, and selecting the most appropriate technologies in terms of adaptation to local conditions, sustainability and affordability.

e) Social Constraints: The social dimension has been neglected. Too often, decisions on investments in wastewater reuse or recharge of groundwater are taken by the central government and water sector institutions without a social assessment and appropriate consultation with the farmers and water users. Furthermore, weak communication with the users on the socially acceptable and sanitary practices, particularly for treated waste water reuse has fuelled lack of trust, social tension and non- acceptance. There is an urgent need to carry out a social survey and social assessment taking into consideration religious beliefs, and to involve the community of users from the conception to the implementation stages of any investment related to the use of non-conventional water resources. Currently, farmers in Egypt, Lebanon, Syria, are using untreated wastewater for irrigating their crops including vegetables.

f) Environmental Constraints: The environmental and health impacts and associated risks have not been carefully studied and mitigated in many of the PCs. Sector guidelines and standards, terms of references for the environmental impact assessment and health risk assessments of waste water reuse, recharge of aquifers and desalination have not been prepared. The revised WHO guidelines on the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture in 2006 consider wastewater use as one

[9] Holt,P, and James, E Wastewater reuse in the Urban Environment: Selection of technologies, Ecological Engineering, February 2006

[10] http://www.dlr.de/tt/aqua-csp

component of an integrated risk management strategy[11]. The 2006 Guidelines now require health-based targets expressed in Disability-Adjusted Life Years (DALYs)[12] for measuring the 'tolerable' burden of disease that would result from agricultural wastewater use and the capacity to carry out a DALY analysis is practically non-existent. Monitoring and enforcement of environmental and health regulations are weak because of limited financial and human resources. In addition, there are no guidelines on how to monitor and ensure compliance with these regulations.

g) Economic Constraints: Water pricing in the PCs does not reflect true economical values and opportunity costs. Waste water treatment and reuse are subsidized and in countries like Lebanon, there is no cost recovery yet. Furthermore, there are no economic or financial incentives in place to encourage waste water reuse and aquifer recharge. Financing models based on a combination of users' fees and government subsidies have not been considered and cost of environmental and health mitigation, as well as sludge treatment (for waste water) or brine disposal (for desalination), have not been included in the financial and economic analysis of investment projects.

IV. A New Paradigm: A Regional Non- Conventional Water Resources Initiative for the SWIM Partners Countries

Given the scarcity of water resources, a new paradigm is required that will consider non-conventional water resources as an asset to be managed as part of the country's integrated water resources management framework. This asset would not only increase the water availability for specific purposes that are hygienically safe, ecologically sustainable and beneficial for the society as a whole, but will also contribute to adaptation to climate change and mitigation of its impacts through the reduction in greenhouse gases.

A Proposed Regional Technical Assistance Initiative in selected SWIM countries will focus on:

1. The development of the elements of national policies/strategies or actions plans for the planning, production, and monitoring of the use non-conventional water resources within the IWRM framework.

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[11] WHO. 2006. WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Vol. I: Policy
and Regulatory Aspects. Vol. II: Wastewater Use in Agriculture. Vol. III: Watewater and
Excreta Use in Aquaculture. Vol. IV: Excreta and Greywater Use in Agriculture. Geneva: World Health Organization.

[12] DALYs are a measure of the health of a population or burden of disease due to a specific disease or risk factor.
DALYs attempt to measure the time lost because of disability or death from the disease compared with a long
life free of disability in the absence of the disease,

2. Planning procedures and regulations, pricing structures, technology applications, and institutional capacity for promoting the use of non-conventional water resources;

3. Promoting stakeholders' awareness and social involvement on the use of non- conventional water resources also by strengthening the creation of a related water culture

4. Capacity building and dissemination of best practices

A. Objective of the Initiative:

The objective of this Initiative is to assist the SWIM Partners Countries in (a) enhancing the policy, institutional and legal framework for the management of non-conventional water resources, within the IWRM context, and (b) strengthening the institutional capacity and public participation for the planning and management of these resources.

B. Tentative Components of the Initiative

In order to achieve these objectives, the following five tasks are proposed subject to the inputs of the workshop participants and final approval by the EC. Selected countries will not be required to conduct all the tasks described below. They can develop any of the proposed activities that are necessary to complete the actions they already undertook as part of their national programs

Task A: Strategy Formulation. The purpose of this component is to assist selected SWIM PCs in developing the strategic elements and/or the action plan for the use of non- conventional resources as part of the water balance of the country.

Task B: Improving the legal framework. The purpose of this component is to propose changes and modifications in the regulatory framework in order to anchor the use of non-conventional water resources in the national water and environmental laws and regulations.

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Task C: Developing the institutional framework for non-conventional water resources. The purpose of this component is to develop an institutional mechanism for managing non-conventional water resources with stakeholders' participation.

Task D: Enhancing the environmental and social safeguards for the non-conventional water resources. The purpose of this component is to develop the necessary tools and guidelines for mitigating the adverse environmental and social effects of non- conventional water resources.

Task E: Capacity and Awareness Building. The purpose of this component is to strengthen the capacity of the water, energy and environmental

institutions and other stakeholders in the management of non -conventional water resources and increase the awareness of the stakeholders in order to promote social acceptance.

V. Initiative Outputs:

The outputs will consist of a series of reports and documentations catered for PCs which include:

a) A technology assessment and techno-economic options for the use of non-conventional water resources.
b) Best-practices policy note on developing strategies, tariff for cost recovery and regulations for wastewater reuse and artificial recharge of aquifers.
c) Proposed modifications for incorporating the legal elements and regulations pertaining to waste water reuse and artificial recharge in water and environment related laws.
d) A procedural manual on the role and responsibilities at the national and local levels for the supply and management of treated waste water and artificial recharge
e) A report on the role of private sector participation or private-public partnership in the financing and/or management of waste water treatment plants and water reuse as well in desalination using renewable energy and minimizing environmental impact
f) Terms of reference and sector guidelines for environment, social and health risk assessments
g) Report/ Recommendations of the Regional Symposium.

VI. Initiative Benefits

This is the first regional initiative to tackle holistically the non- conventional water resources in the Southern Mediterranean Countries .This initiative will have several benefits:

a) Providing the necessary strategic and technical tools for the decision makers to make informed decisions on the use of non-conventional water resources based on economic, environmental and social justification.
b) Influencing policies in favor of reducing freshwater withdrawals based on regulated water allocations and demands
c) Providing the necessary rules and regulations for the protection of both surface and groundwater resources and reduce health exposure and hazards as well as environmental impacts
d) Establishing institutional and consultation mechanisms for the management of these resources in a transparent and accountable manner
e) Presenting the appropriate financing and management models for private sector participation and public-private partnership within the non-conventional water resources framework.
f) Sharpening the skills and expertise of water and environment related institutions on the technical and economics of the non-conventional water resources

g) Providing state of the art knowledge and informing the public on the risks and benefits of non- conventional water resources.

VII. Relationship of this activity with the SWIM work packages:

This Initiative is related directly to the five SWIM work packages namely:

- Work package 1: Water Governance and Mainstreaming, using the integration of new water resources in the water, environmental, agricultural and irrigation policies (Task A) and improving governance in the management of these resources (tasks B and C)
- Work package 2: Capacity building in techno-economic evaluation techniques and methodologies (task E)
- Work package 3: Application of water management plans in southern Med countries that integrate non-conventional water resources through the use of related methodologies and mechanism and support exchange of experiences inside and outside the water sector. (Tasks A and D)
- Work Package 4: Identification and dissemination of good practices on water reuse, artificial recharge and desalination (tasks B and E)
- Work package 5**:** Development of a Communication & Awareness Raising Strategy. This initiative will raise awareness of stakeholders and users on the risks and benefits related to non-conventional water resources production and use (task E)