



WASTEWATER RECYCLING AND REUSE PRACTICES IN THE ARAB REGION: *SITUATIONS AND PERSPECTIVES*

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Treated waster and reuse in the Arab countries in 106 m3/year

Countries	Volume of Treated Wastewater (10 ⁶ m ³ /year)	Volume of Treated Wastewater Reused (10 ⁹ m ³ /year)	Percentage
Algeria	700	51	7.3
Saudi Arabie	1,334	219	16.4
Bahrein	153.3	43	28.0
Comores	-		
Djibouti	0		
Egypte	2,971	700	23,6
United Arab Emirat	983	308	31,3
Irak	749.5	55	7.3
Lybie	40	40	100
Jordan	151.1	136	90,0
Kuwait	156	96	61,5
Libanon	4	2	50.0
Morocco	705.5	36.7	5.2
Mauritania	1	0.35	35,0
Oman	91.2	60.5	66.3
Qatar	195.7	101	51,6
Syria	435	220	50.6
Somalia	0		
Sudan	-		
Palestine	78.5	8.9	11.3
Tunisia	240	68	28.3
Yemen	84.5	60.2	71.3
TOTAL	9073.7	2205.7	24.3



Wastewater Reuse in the Arab region

- **Egypt, by far, largest user with over 30% of region**
- **Syria, UAE and Saudi Arabia are other top users**
- **Four countries account for 65% of the region**
- **GCC Countries account for 37.5%**



Recycling in the GCC countries

- Municipal water Consumption 4,796
- Treated wastewater **2,256 MCM/year**
- Treatment level Tertiary
- Reused treated WW **875 MCM/year**
- % of Reused to Treated **39%**
- The rest discharged to the sea
- Water demand for agriculture **20,060 MCM/ year**

Benefits of Wastewater Reuse

- Narrow the gap between supply and demand in the Arab region ;
- Alternative water for alleviate the Impact of Climate change;
- Reduce the emission of pollutants and their discharge into receiving water bodies;
- Reduce the need for chemical fertilizers to grow more food;
- Wastewater reuse is attractive in several areas.





Constraints

- problems related to the cost of reuse,
- problems associated with low demand for reclaimed wastewater in certain states,
- lack of effective price signals and cost recovery in the water sector,
- challenges in structuring the financing of reuse,
- Private sector involvement lacking
- Lack of organism responsible for the reuse
- Lack of the enforcement of regulations

Constraints in treated wastewater reuse

Unbalance between seasonal **water needs** for irrigation and **constant availability of TWW** (no long term storage utility is currently available).

Shortage of available agricultural lands (45% of treated wastewater is produced around the capital Tunis)

TWW quality : Many treatment plants are overloaded
→ TWW quality do not comply with the Norms
Farmers lose confidence

Cropping restriction prevents high incomes

Extensive Technologies Applied to Medium & Small Settlements to treat wastewater



Advanced Technologies



Abu Dhabi
Mafraq WWTP activ.- sludge
+ denitrif.+ chlor.
(300 000 m³/d.)



Treated Wastewater Reuse in Arab region



- Agricultural irrigation
- Golf course irrigation
- Landscape irrigation in urban areas
- Ground water recharge
- Industries

WASTEWATER REUSE GUIDELINES

TABLE 2

WASTEWATER REUSE GUIDELINES FOR SOME ARAB COUNTRIES

	E. Coli Or Fecal Coli /100ml	Nematode eggs/l	Other ¹ parameters	Crops eaten uncooked is allowed	Code of practice
WHO	1000	<1	No	Yes	Yes
Jordan	100	<=1	Yes	No	Yes
Morocco	1000	Absence	Yes	Yes	No
Palestine	1000	<1	Yes	No	Yes
Syria	1000	<1	Yes	No	Yes
Tunisia	-	<1	Yes	No	Yes
Kuwait	20	<1	Yes	No	Yes
Oman	200	<1	Yes	Yes	
Saudi Arabia	2.2	<1	Yes	No	Yes
Yemen	No specific standard				
Egypt	Decree 44/2000, but no specific standard				

1. BOD₅, COD, NO₃, TSS, EC
Source: Xanthoulis, 2010

GLOBALGAP recommendations

CB. 5.3	Water Quality		
CB. 5.3.1	Is the use of treated sewage water in pre-harvest activities justified according to a risk assessment?	<p>Untreated sewage is not used for irrigation/fertigation or other pre-harvest activities.</p> <p>Where treated sewage water or reclaimed water is used, water quality shall comply with the WHO published Guidelines for the Safe Use of Wastewater and Excreta in Agriculture and Aquaculture 2006. Also, when there is reason to believe that the water may be coming from a possibly polluted source (i.e. because of a village upstream, etc.) the farmer shall demonstrate through analysis that the water complies with the WHO guideline requirements or the local legislation for irrigation water. No N/A.</p>	Major Must

Success Stories of the Reuse in Arab Countries

Case of Jordan

Jordan reuse over 90% of the treated wastewater
Direct reuse at Aqaba, Wadi Musa, Irbid in Jordan

Case of Tunisia

recycled water accounted for 5% of available water resources in 2010 and may reach 11% in 2030 (~ 25% of the treated effluent is being reused) 8065 ha are irrigated with TWW to grow several crops

Case of GCC countries

recycled water has been reused successfully for landscaping and District cooling

Sulaibiya project in Kuwait will contribute to 26% of Kuwait's overall water demand, reducing the annual demand from non-potable sources from 142 million m³ to 26 million m³.

Actually it does produce 124 million m³ per year



Learning from experiences overseas

- Cyprus: 85% of the treated effluent is being reused
- California: Wastewater reuse has been practiced since 1890
Historically, agricultural reuse has been practiced (vegetables, fruit trees, forage, in urban areas and groundwater recharge)
- Singapore : New Water



Microfiltration /
Ultrafiltration



Reverse
Osmosis



Ultraviolet
Disinfection

Way Forward for Water Reuse Solutions in the Arab Region by 2020

SHORT TERM

- ❑ Move from restricted treated wastewater to non restricted wastewater Reuse by Implementing policies and regulation that encourage the treatment and the reuse of wastewaters ;
- ❑ Need to implement these Regulations , to enforce their application by Enhancing stakeholder's participation and awareness for the reuse of treated wastewater;
- ❑ Help mobilize financial resources for adequate wastewater treatment and encourage public-private partnerships in wastewater treatment and reuse.



Way Forward for Water Reuse Solutions in the Arab Region by 2020

LONG TERM

- Enhancing the Monitoring system and implementation of standards and guidelines
- Developing skilled human resources and supportive institutions by developing training programs and clarifying the organizational aspect
- Encourage a regional cooperation and exchange of information and establish a platform of dissemination of the lessons learned from existing facilities in the Arab region



Actions to improve the prospects of reusing treated wastewater.

- Improving cost recovery
- National policies
- economic incentives and
- Resolving the financing constraints



recommendations to promote Recycled water

- Good communication and awareness campaigns
- Demonstrating the benefit of plant nutrients
- Assuring the availability and the sustainability of this alternative water resource
- Assuring the health issues of recycling

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