

CURRENT AND FUTURE PERSPECTIVES ON SUSTAINABLE WATER REUSE PRACTICES IN THE ARAB REGION

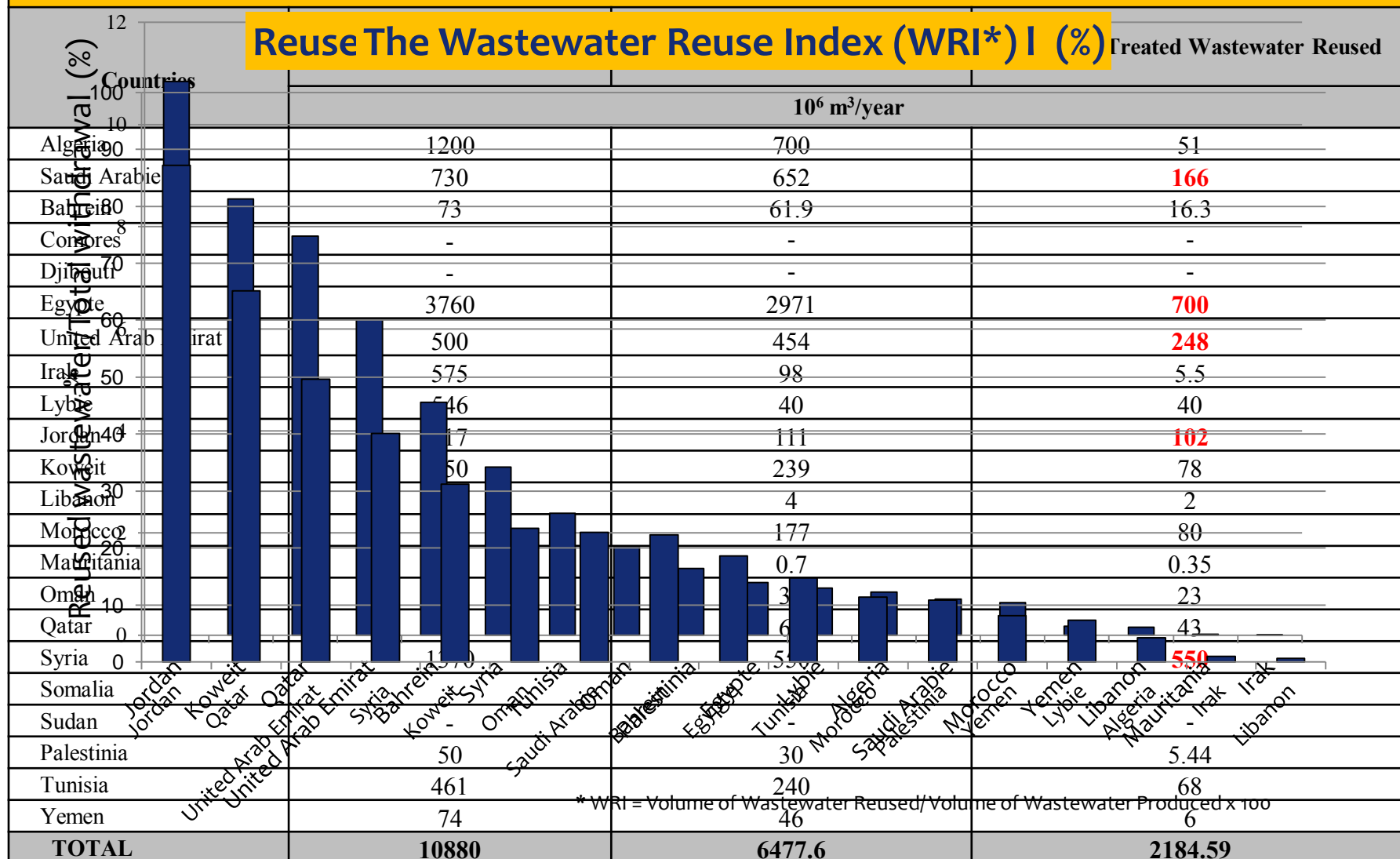
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Drivers for the reuse

1. **Environmental sustainability – reduction of emission of pollutants and their discharge into receiving water bodies, and the improvement of the quantitative and qualitative status of those water bodies (surface-water, groundwater and coastal waters) and the soils.**
2. **Economic efficiency – alleviating scarcity by promoting water efficiency, improving conservation, reducing wastage and balancing long term water demand and water supply.**
3. **For some countries, contribution to food security – growing more food and reducing the need for chemical fertilizers through treated wastewater reuse.**

Total water withdrawal , raw and treated wastewater in the different Arab countries

Wastewater production , treatment and reuse in the Arab countries



WASTEWATER REUSE IN THE ARAB REGION

- The annual volume of wastewater discharged in untreated form in Arab countries is 4.4 km³, which is 40% of the total wastewater produced in the region.
- 60% of the wastewater generated in MENA region is treated, which is higher than Asia (35%), Latin American/Caribbean (14%) and Africa (1%) (WHO/UNICEF2000)
- 83% of treated wastewater used in agriculture,
- most of the partly treated, diluted or untreated wastewater is used by urban and peri-urban farmers to grow a range of crops.

Main Challenges and constraints

- ❖ Lack of Urban Water Demand Management
- ❖ Institutional and Legal Constraints
- ❖ Unclear policies on wastewater reuse
- ❖ Environmental risks (soil salinization, excess of nitrogen)
- ❖ Inefficient monitoring of WW reuse system
- ❖ Limited Private Sector Role
- ❖ Social acceptance, reluctance (lack of awareness)

Questions?

- 1. Given the scarcity of water, why have many governments been slow to promote wastewater reuse?**
- 2. How should policymakers adapt the wastewater management agenda to their country's economic context?**

PARADOX OF WATER-SCARCITY AND LOW REUSE OF WW IN THE ARAB REGION IS MULTI-FACETED

- 🔥 *Environment protection not a major concern*
- 🔥 *Unclear policies on wastewater reuse*
- 🔥 *Technology: adaptation and technical capacity*
- 🔥 *O&M costs and management problems*
- 🔥 *Legal aspects: restrictions on TWW use; use of raw WW*
- 🔥 *Institutional conflicts; unclear mandates*
- 🔥 *Lack of awareness programme*

Factors Impeding the Implementation of Water Reuse Strategies In Arab Region

1. Insufficiency of economic analysis
2. Relatively high cost of wastewater treatment and conveyance, coupled with pricing of irrigation water that does not adequately reflect its scarcity value
3. Technical and social issues affecting the demand for reclaimed water
4. Difficulty in creating financial incentives for safe and efficient water reuse.

HEALTH AND ENVIRONMENT RISKS - MONITORING

- **Public health risks when irrigating with inadequately treated WW (e.g. gastro-intestinal infections, heavy metals, trace pollutants)**
- **Environmental risks (mainly soil clogging, soil salinization, excess of nitrogen, GW & SW contamination)**
- **Inefficient monitoring of WW reuse system: lack of trained personnel; lack of monitoring equipment; too high monitoring costs**

WEAKNESSES IN CURRENT WASTEWATER MANAGEMENT PRACTICES

- *Many treatment plants are plagued by poor operation and maintenance (O&M) and are operated well beyond their design capacity.*
- *These conditions are resulting in degraded treatment reliability and diminished reuse possibilities.*

WASTEWATER RECYCLING AND REUSE GUIDELINES IN THE ARAB REGION

- Arab countries have adopted several standards and guidelines that differ from one country to another even at the regional level.
- While most of the Gulf countries have established low risk guidelines or standards based on a high technology/high-cost approach, many Low income countries have adopted an approach based on WHO guidelines that refer to low-cost technologies and focus on health risks.

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

TECHNOLOGIES FOR TREATING WASTEWATER

High Tech Technologies and Energy Consuming



SulaibiyaSTP



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

TECHNOLOGIES FOR TREATING WASTEWATER

Extensive Technologies Applied to Medium & Small Communities



BEST PRACTICES FOR THE REUSE IN THE ARAB REGION

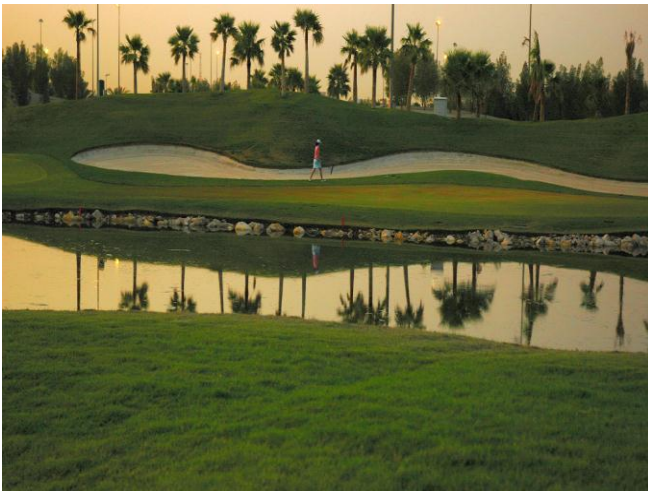
Direct reuse being introduced at Aqaba, Wadi Musa, Irbid in Jordan



REUSE OF RECLAIMED WATER IN TUNISIA



GOLF COURSE IRRIGATION WITH RECLAIMED WATER



BEST PRACTICES FOR THE REUSE IN THE ARAB REGION

MUNICIPAL LANDSCAPING IN ABU DHABI



WATER REUSE IN KUWAIT



BEST PRACTICES FOR THE REUSE IN THE ARAB REGION

FOREST DEVELOPMENT IN EGYPT EL-Alaky, Aswan Castor. Khava. Jatropha, Gogopa 1650 Feddan



BEST PRACTICES FOR THE REUSE IN THE ARAB REGION

INDUSTRY CROP PRODUCTION IN EGYPT

Jatropha: haute rendement par l'utilisation des eaux usées



Ca. 12 tonnes de noix par hectare =
à 4.000 litres d'huile et 8 t de
matière résiduel

GROUNDWATER RECHARGE IN KUWAIT



SPREADING BASINS

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

- **Move from restricted treated wastewater to non restricted wastewater Reuse by Implementing policies and regulation that encourage the treatment and the reuse of wastewaters ;**
- **Help mobilize financial resources for adequate wastewater treatment and encourage public-private partnerships in wastewater treatment and reuse;**
- **Most Arab countries has developed the Regulation frameworks, but need to implement these Regulations , to enforce their application by Enhancing stakeholder's participation and awareness for the reuse of treated wastewater**

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

- **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**
- **Commitment to wastewater reuse should be part of the proclaimed water policy and strategy in all countries of the Arab region. Arab countries should develop a comprehensive plan of action for reusing treated wastewater, with clearly assigned roles.**

“Give water a second chance... re-cycle it!”

Thank You..



The Water-Energy-Food Nexus

22-24 April 2012, Doha - Qatar



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