

The Water-Energy-Food Nexus in the Arab Countries

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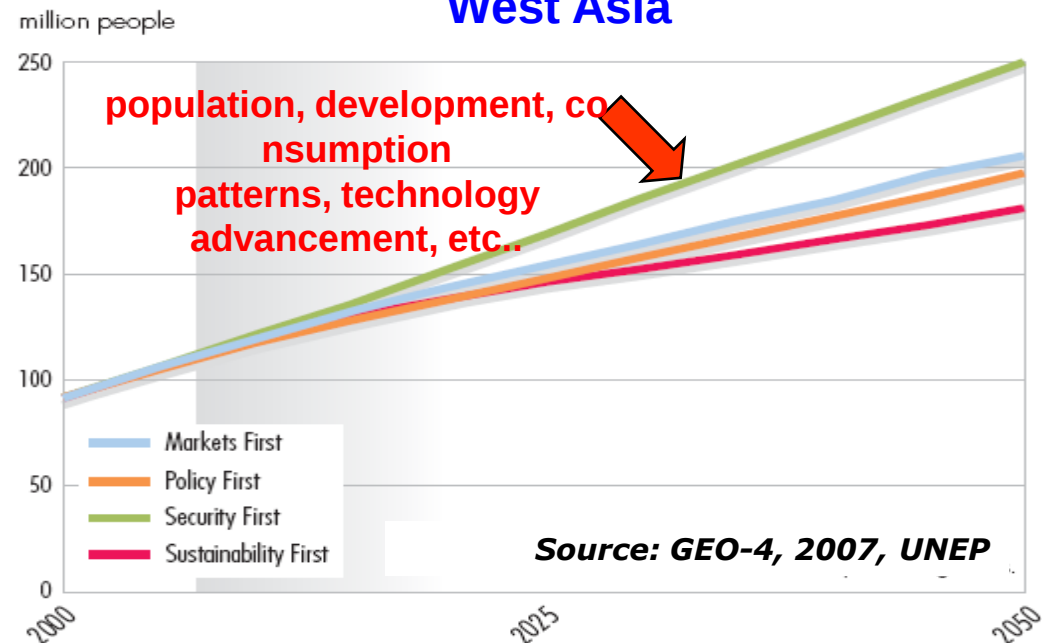
Overview

- Introduction
- The Water-Energy Nexus
- The Water-Energy-Food Nexus
- Awareness and Policies related to the Nexus
- Conclusion & Recommendations

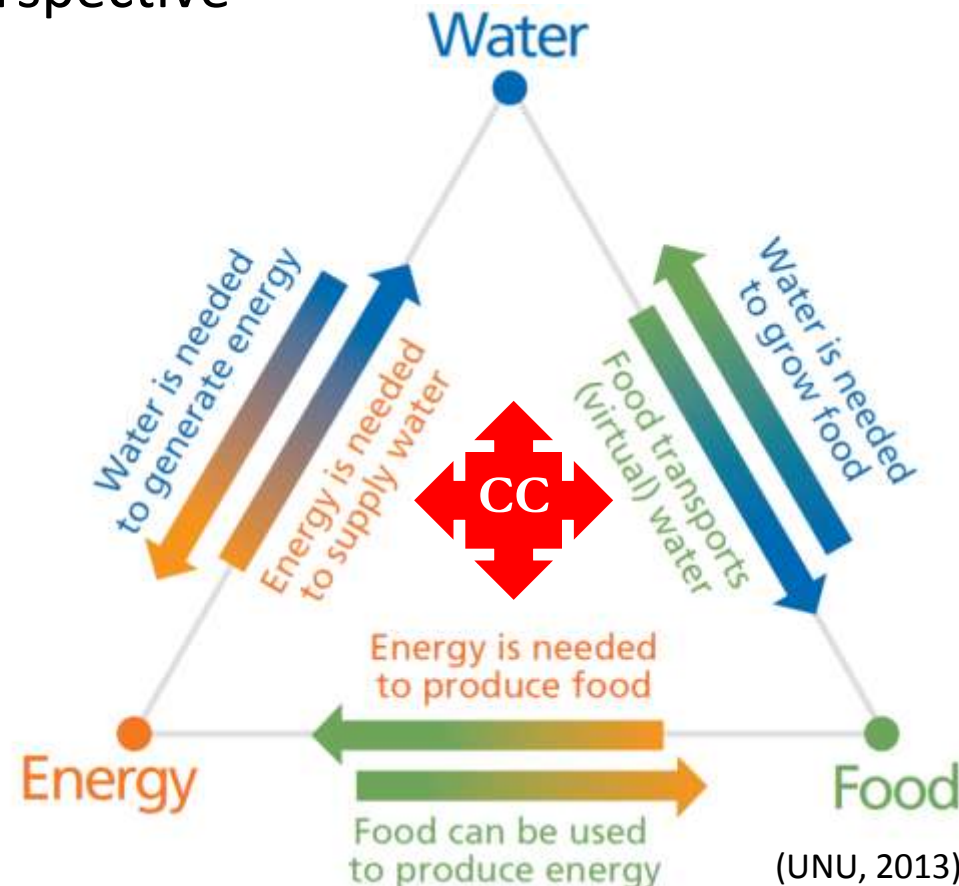
Introduction

- Severe water scarcity in most of the Arab countries
- Scarcity increasing due to many pressing driving forces: population growth and their associated domestic and food demands, unsettled and politicized shared water resources, climate change, ...
- Scarcity is compounded by multiple nexuses
 - ❑ Water-Energy
 - ❑ Water-Food
 - ❑ Water-Health
 - ❑ Water-Environment
 - ❑ ...
- Many cross-cutting issues
 - ❑ Human rights, social, ical,

Percentage of population living in areas with severe water stress in West Asia



- Water, Energy, and food in the Arab region (more than any other region) are strongly inter-linked and are highly inter-dependent
- W-E-F Interactions are numerous and substantial
- Importance of the nexus is not always recognized from a planning and management perspective
- There is an urgent need for a “**Nexus Approach**” that integrates management and governance across the three sectors
- Supports the transition to a Green Economy, which aims at resource use efficiency and greater policy coherence



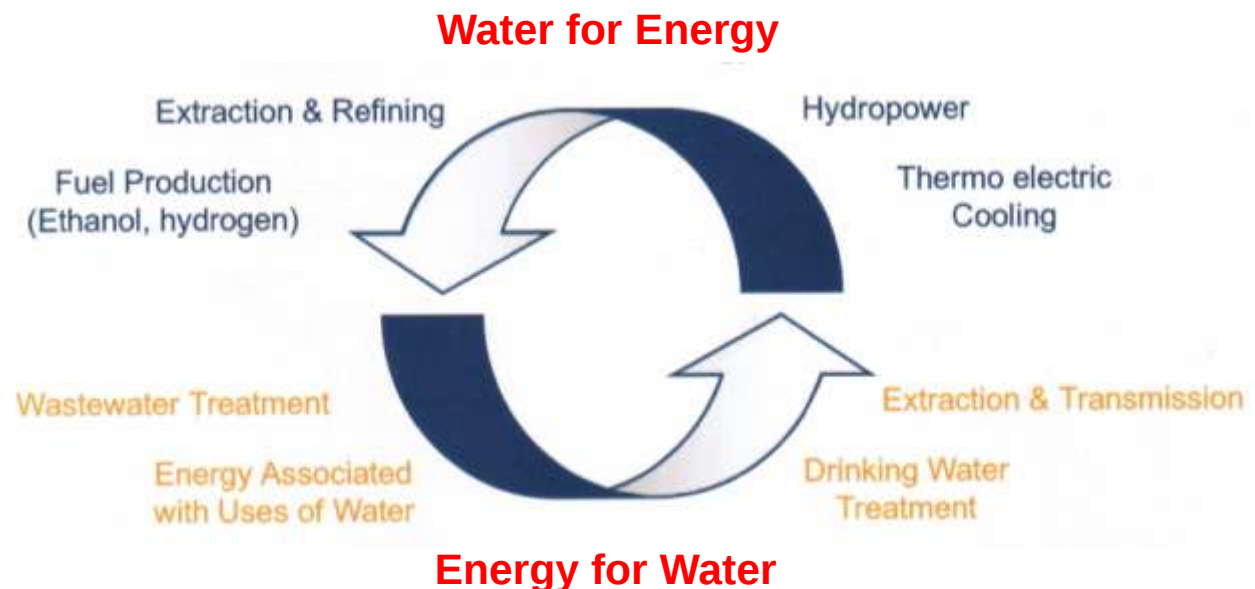
The Water-Energy Nexus

■ Energy Use in Water

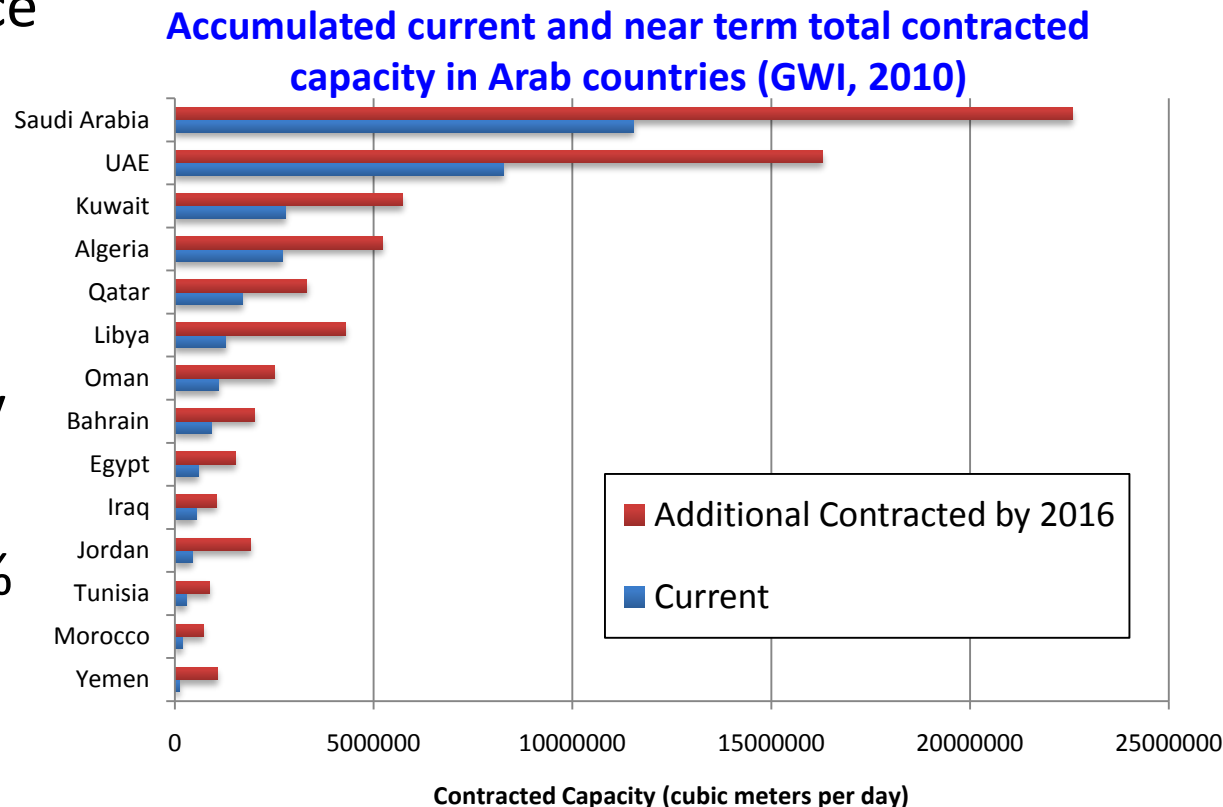
- Energy is used in every stage of the water cycle: freshwater extraction, production, conveying, distribution, wastewater collection, treatment and reuse
- water cycle demands at least 15% of national electricity consumption, and is continuously increasing

■ Water Use in Energy: production (CPDPs), cooling, energy exploration & production, refining, and EOR

Schematic of the Water-Energy Relationships (WCSBD, 2009)

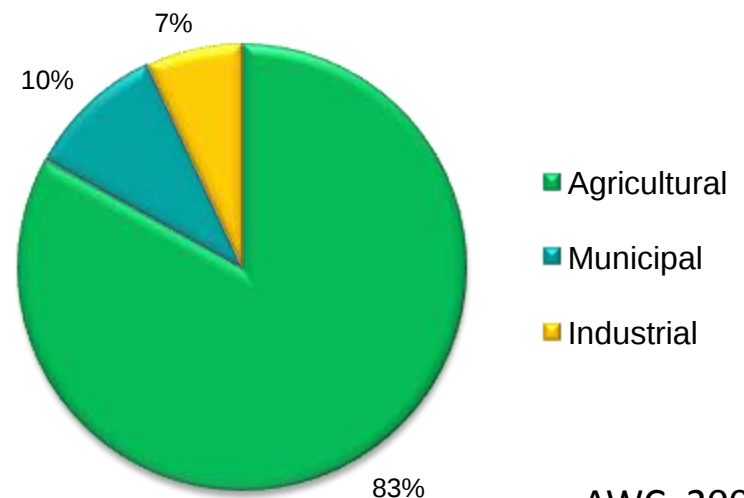
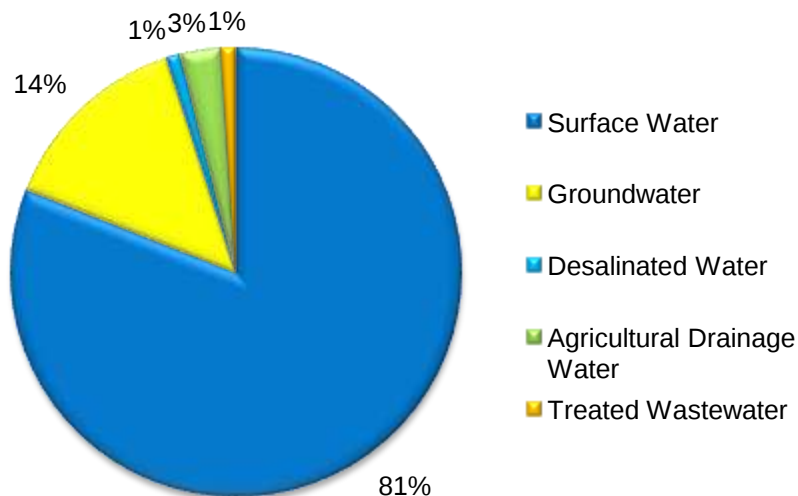


- As water scarcity increase more Arab countries are forced into desalination and wastewater treatment/reuse, to augment their limited fresh water supplies
- In 2009: desalination cost in Arab region 4BUS\$; 2.5BUS\$ energy
- Desalination is energy-intensive, and causes fast depletion of oil reserves (main source of income in many countries)
- In some countries CPDPs consumes >50% of total energy consumption
- Cost of energy = 87% of the running cost



The Water-Energy-Food Nexus

- The majority of water in the Arab region is used in the agricultural sector (83%), a major cause of water resources over-exploitation and quality degradation in the region
- The full food and supply chain consumes about 30% of total energy demand (global figures)
- In recent years, increases in the price of oil lead very quickly to increases in the prices of food
- Biofuels (energy) impact negatively on food production and water



The Water-Energy-Food Security Nexus

- **Water Security (MDGs)**: “access to safe drinking and sanitation”; both of which have recently become a human right.
- **Energy Security** (UN, 2010): "access to clean, reliable and affordable energy services for cooking and heating, lighting, communications and productive uses”, and as "uninterrupted physical availability [of energy] at a price which is affordable, while respecting environment concerns”
- **Food Security** (FAO, 1996): "availability and access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life”; adequate food has also been defined as a human right
- Any actions in one area have impacts and dependence in one or both of the others; **a nexus perspective is required to achieve the security of the three sectors**

Awareness and Policies in the Arab Region

GCC Abu Dhabi Declaration 2010

- Water, Energy, and Food as the most important issues in the region, and called for a long-term comprehensive strategy for water resources in the GCC to take into account the inter-dependencies between water, energy and agriculture, impacts of climate change, and environmental impacts of desalination
- Linked water security with energy security, both as a crucial strategic priority for the future of the GCC

First Amman Cologne Symposium 2011 (Water-Energy Nexus)

- Called for more integrated approaches between water and energy and the need for research to understand the nexus
- Efficiency measures in both water and energy promise to have multiple advantages
- Understanding the governance options

WSTA 10th Gulf Water Conference (Water-Energy-Food Nexus)

- An integrated planning and management approach for water, energy, and agriculture sectors is required for the sustainable provision of water, energy, and food
- A knowledge gap on the water-energy nexus in the GCC need to be bridged by concentrated research and directing universities and research institutes towards the nexus

IGCM on the Water-Energy Nexus in ESCWA 2012

- Determination and Prioritizing the Water-Energy Nexus issues in the region and for future work program
 - Increasing Knowledge and Awareness Raising; Increasing Water and Energy Policy Coherence; Examining the Water-Energy Security Nexus; Increasing Water and Energy Use Efficiency; Informing Technology Choices; Promoting Renewable Energy; Climate Change and Natural Disasters (Driver)

Conclusion & Recommendations

- Placing the Water-Energy-Food Nexus as a priority for the region (Sustainable Development Initiative in the Arab Region)
- Bridging the knowledge gap in the W-E-F nexus in the Arab region by concentrated active research to
 - Identify inter-dependencies to influence policies, strategies, investments, and management (e.g., energy use in the water value chain, efficiency relationship in three resources)
 - Exploit synergies and identify and mitigate trade-offs among the development goals related to the security of the three
 - Identify opportunities in both demand side and supply side management (e.g., resources use efficiency, potential of energy capture from wastewater treatment plants, ...)
 - Appropriate and effective governance, institutional, and organizational frameworks for the nexus approach