CONSIDERING A SECTOR OR NEXUS APPROACH TO THE WATER-RELATED SDGs IN THE ARAB REGIONAL CONTEXT

UN Economic And Social Commission For Western Asia

Ziad Khayat
First Economic Affairs Officer
Water Resources Section
Sustainable Development Policies Division (SDPD)

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40 YEARS

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The Sector or Nexus Approach

- **Sector approach**: Independent management of water, energy and food sectors with minimal considerations for interactions and interdependencies → Independent approach to each SDG

- **Nexus approach**: is a systems based approach that aims to reduce trade-offs and build synergies across sectors by considering interactions and dependencies between sectors at all stages

- The Nexus approach aims at **enhancing the efficiency** of the entire system rather than increasing the productivity of specific sectors often at the expense of other sectors

- Nexus approach to SDGs would identify potential trade-offs and synergies among Goals and Targets → Consider systemic not only sectoral progress

Elaborating a WEF security nexus within the context of sustainable development

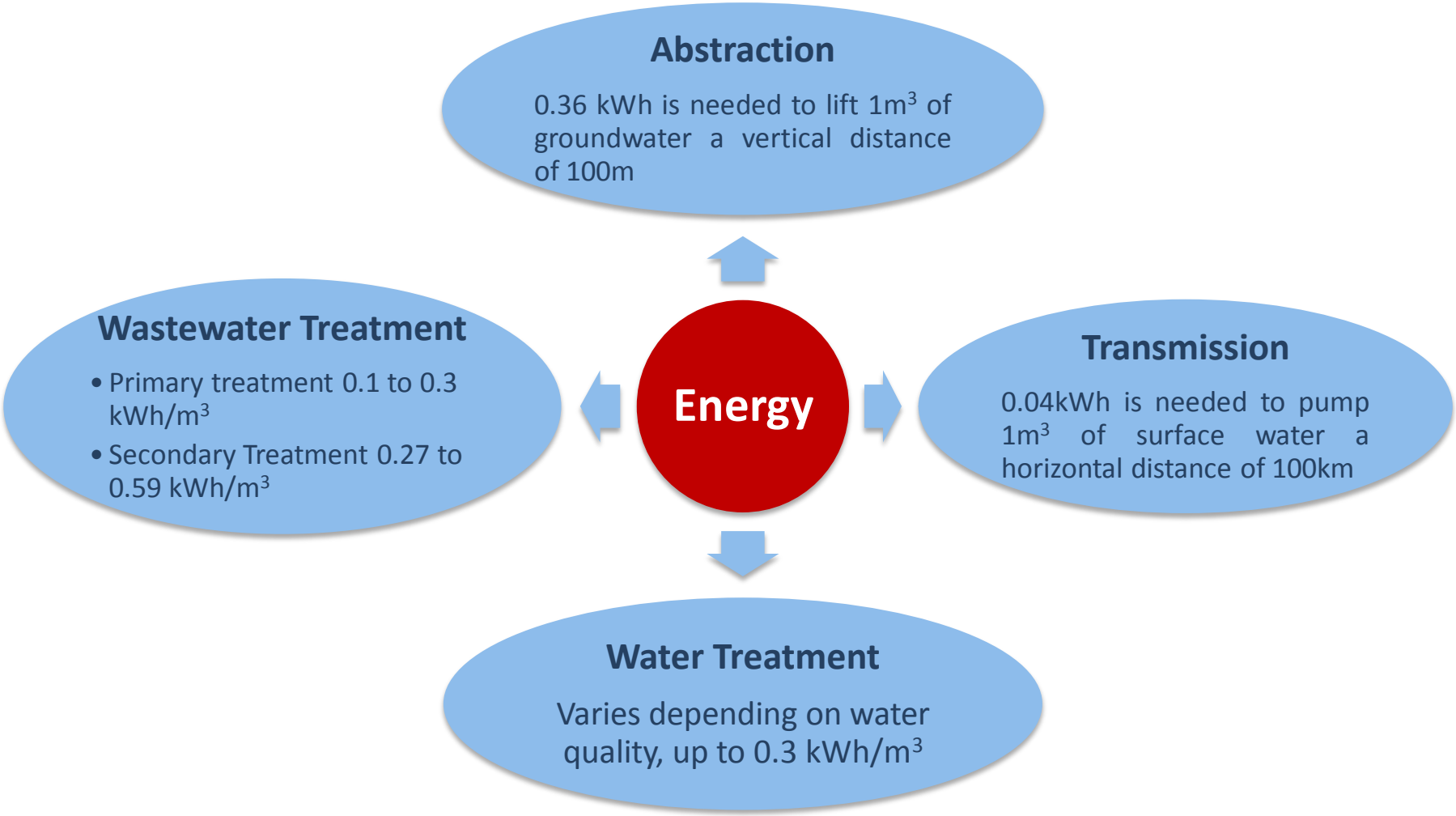
The WEF security nexus within the context of SDGs

End hunger, achieve **food security** and improved nutrition and promote **sustainable agriculture**

Ensure availability and **sustainable management** of water and sanitation **for all**

Ensure access to **affordable, reliable, sustainable** and **modern energy for all**

Energy for Water

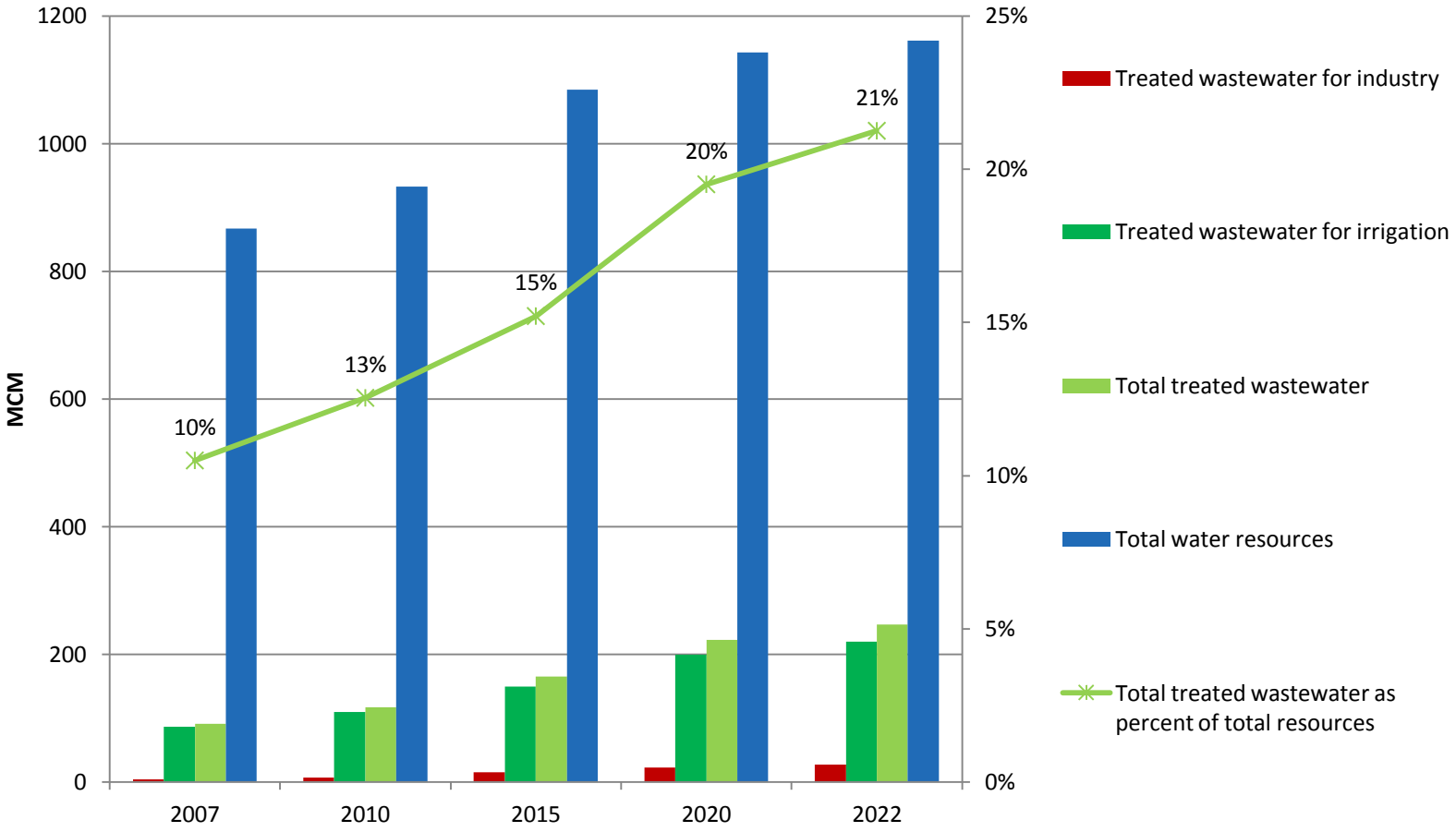


Energy for Water: Desalination

Seawater Desalination Technology	Electrical energy use (KWh/m^3)	Thermal energy – stand-alone (MJ/m^3)	Thermal energy – cogeneration (MJ/m^3)
RO (brackish)	0.5-2.5	None	None
RO (sea)	5-9	None	None
Multi-effect distillation (MED)	1.5-2.5	150-220	100
Multi-stage Flash (MSF)	3.5-5	250-300	160-170

Source: ESCWA (2009b). *Water Development Report 3: Role of Desalination in Addressing Water Scarcity*. New York: United Nations. E/ESCWA/SDPD/2009/4.

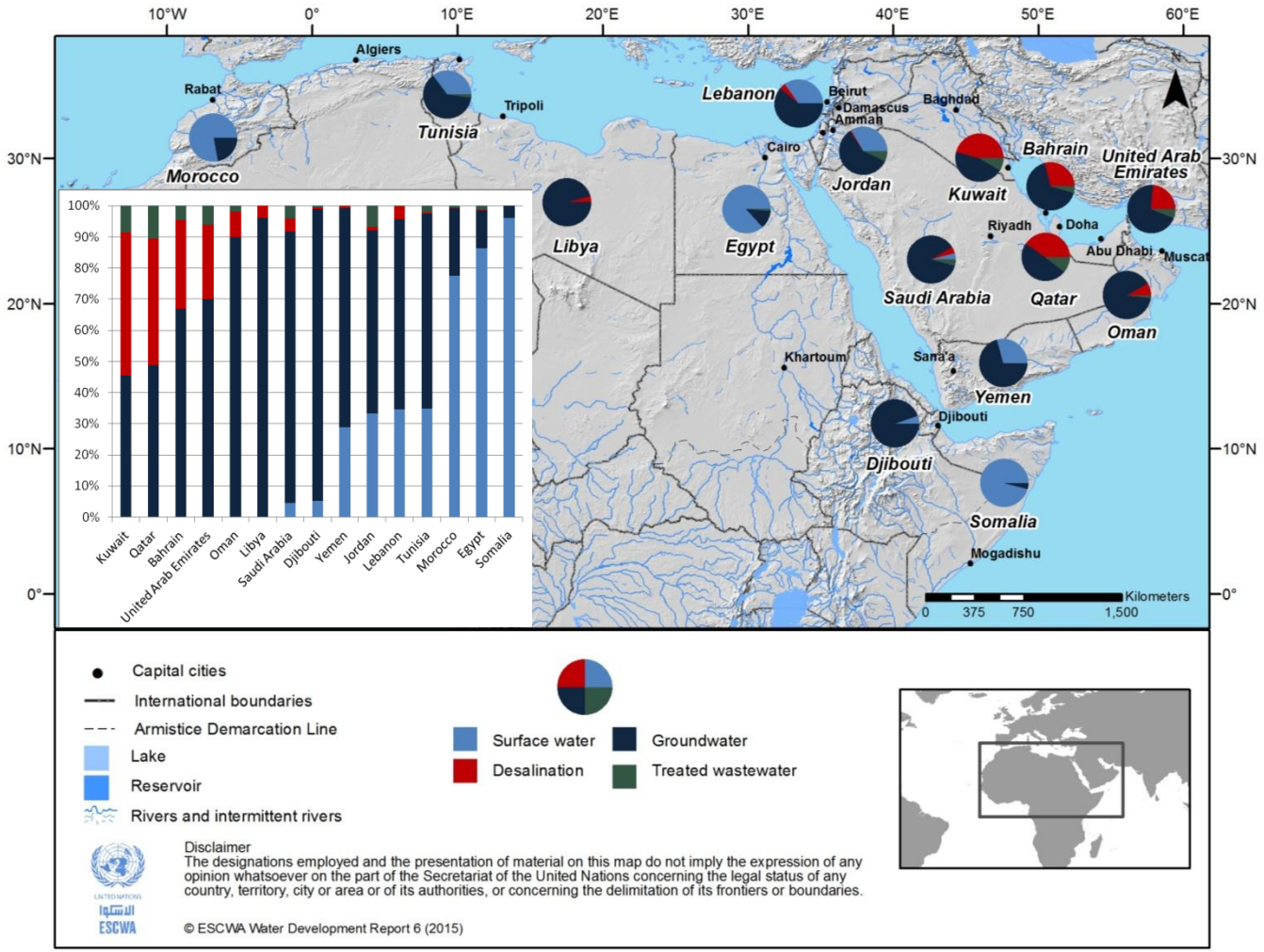
Energy for Water: Treated Wastewater Reuse



Source: Ministry of Water and Irrigation (2009). *Water for Life: Jordan's Water strategy, 2008-2022*. Rev. 10.270309 Available from http://www.mwi.gov.jo/sites/en-us/Documents/Jordan_Water_Strategy_English.pdf. Total resources for the year 2022 are without the Red-Dead Sea conveyance project

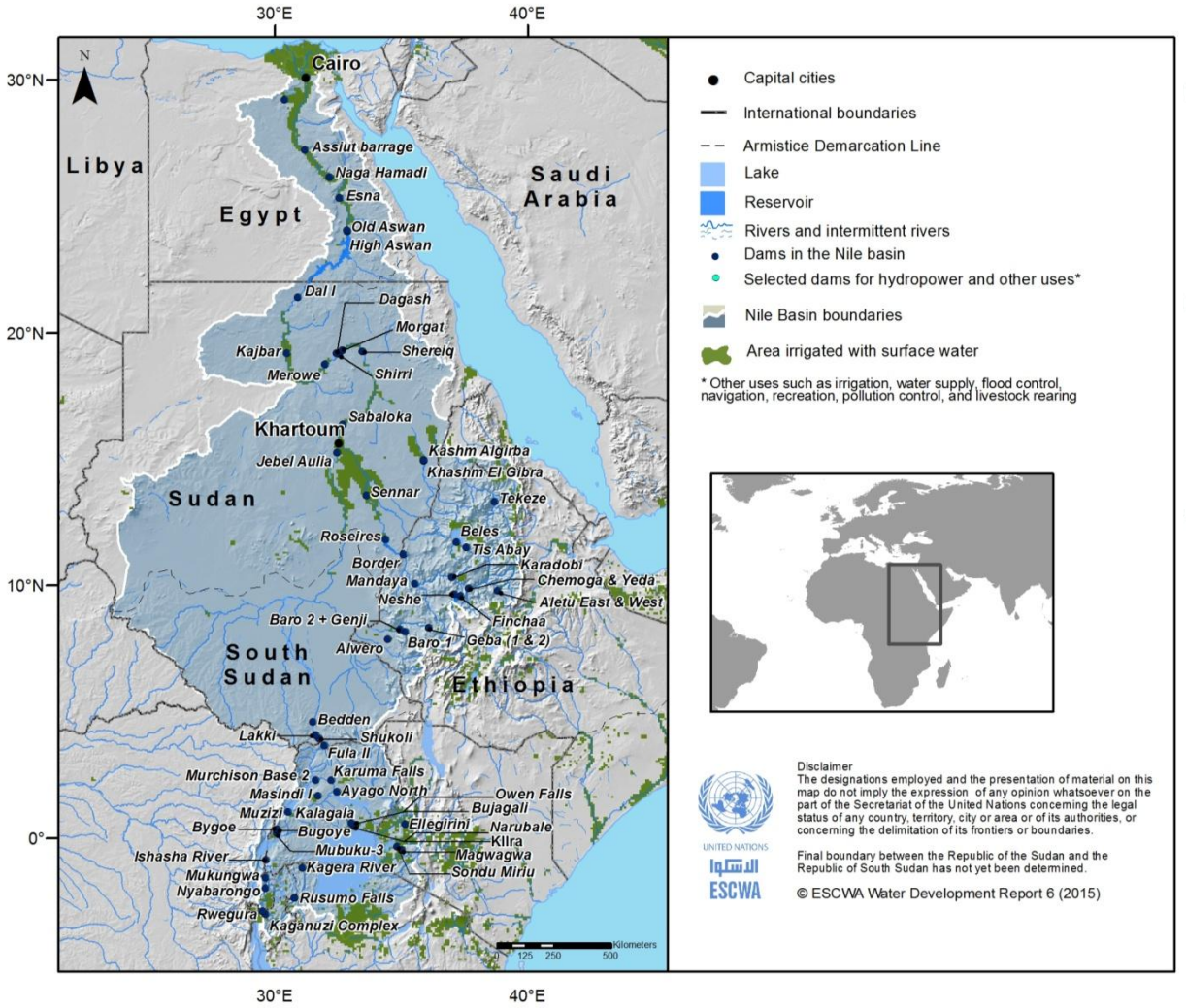
Energy Demand of Water in the Arab Region

- Jordanian water sector accounts for ~**15%** of total annual electricity generated
- Saudi Arabia: Groundwater pumping accounts for **10%** of total fuel consumption
- Libya: Groundwater pumping accounts for **14%** of total fuel consumption
- Bahrain: **30%** of total energy use is for desalination



Water for Energy: Hydropower

- On the Euphrates River Basin 8,580MW installed capacity
- On the Nile River Basin, hydropower potential is ~20GW, only 26% is currently used



Water for Energy: Cooling Systems

- Cooling systems advantages and disadvantages

Cooling Type	Water Withdrawal	Water Consumption	Capital Cost	Plant Efficiency	Ecological Impact
Once-Through	Intense	Moderate	Low	Most efficient	Intense
Wet Cooling	Moderate	Intense	Moderate	Efficient	Moderate
Dry Cooling	None	None	High	Less efficient	Low

- Comparison of consumptive water use of various power plant technologies using various cooling methods.

Technology	Cooling Technology	Consumptive Water Use (m^3/MWh)	Performance Penalty	Cost Penalty
Coal / Nuclear	Once-Through	87 – 102		
	Recirculating	1.5 – 2.8		
	Dry cooling	0.19 – 0.25		
Natural Gas	Recirculating	0.76		
Power Tower	Recirculating	1.9 – 2.8		
	Combination Hybrid Parallel	0.34 – 0.95	1 – 3 %	5 %
	Dry cooling	0.34	1.3 %	
Parabolic Trough	Recirculating	3		
	Combination Hybrid Parallel	0.38 – 1.7	1 – 4 %	8 %
	Dry cooling	0.3	4.5 – 5 %	2 – 9 %
Dish / Engine	Mirror Washing	0.08		
Fresnel	Recirculating	3.8		

Source: United States Department of Energy (2009). *Concentrating Solar Power Commercial Application Study: Reducing Water Consumption of CSP Electricity Generation*. Report to Congress. Washington, USA.

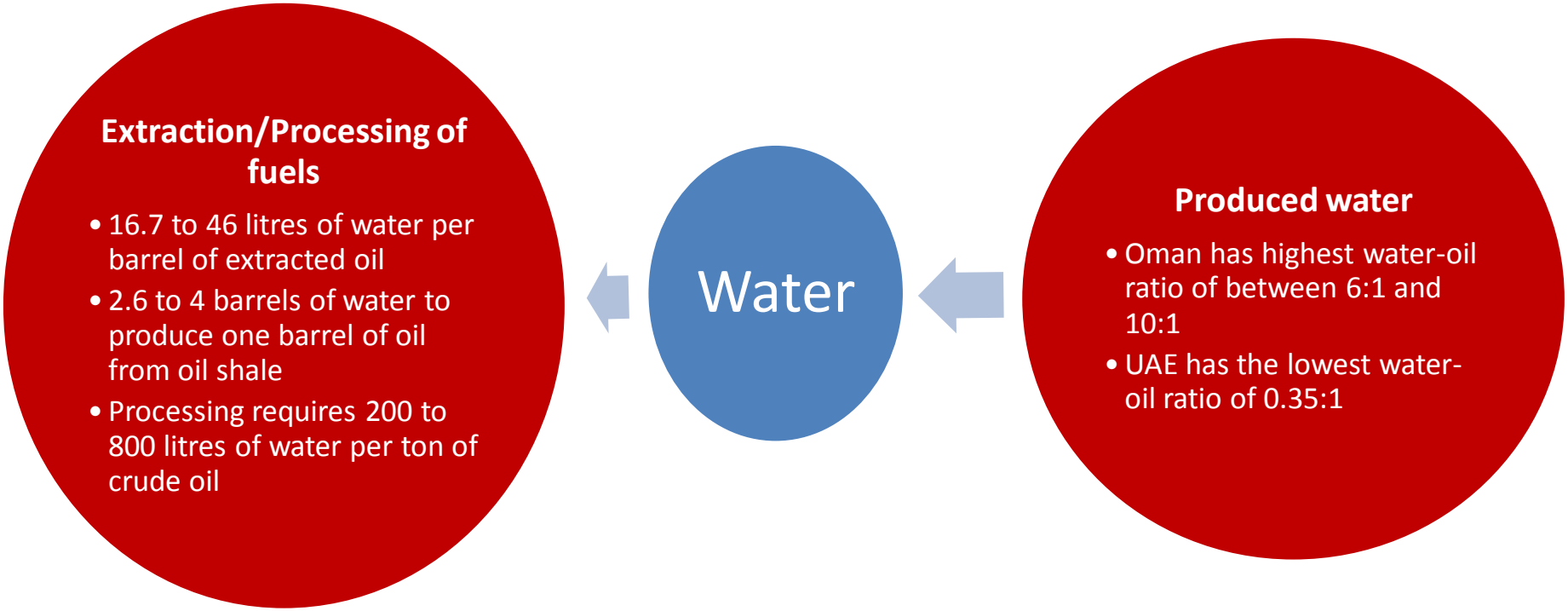
Water for Energy:

Selected examples for water-induced cuts in hydro, coal and nuclear power generation

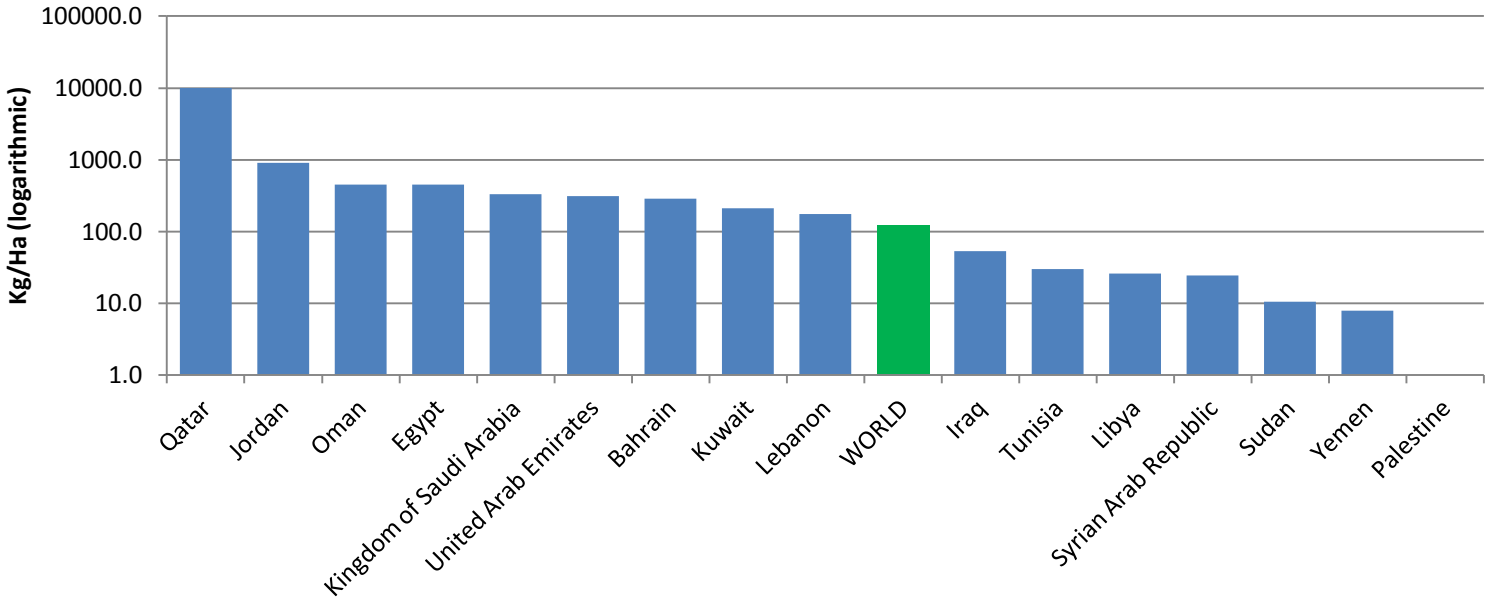
Country	Fuel	Year	Impact
Brazil	Hydro	2015	Electricity rationing and rolling power cuts
USA, California		2015, 2014	Hydro generation in 2014 at 50% of its value in 2013
India		2012	Blackouts lasting two days and affecting over 600 million people
China		2011	Strict energy efficiency measures, electricity rationing
Vietnam, Philippines		2010	Reduced generation, electricity shortages
Ecuador		2009	Electricity crises, blackouts across Ecuador
Uganda		2006, 2004	Reduced generation, supply stress, price increases
Kenya		2002, 1999	Reduced generation by 25%
Poland	Coal	2015	Restrictions on industrial demand due to reduced coal power generation
Germany		2015	Reduced generation from two coal power plants
Australia		2009, 2007	Reduced generation and electricity price peaks
USA, Connecticut	Nuclear	2012	One of two reactors shut down due to high sea-water temperatures
USA, Illinois		2012	Operation beyond cooling pond temperature limits
USA, Alabama		2011, 2010, 2007	Reduced generation
France, Germany, Spain		2006	Reduced generation due to high river water temperatures
France		2003	Reduced generation equivalent to the load of 4 to 5 reactors; operation beyond temperature limits

Source: **IASS-Potsdam** (2016). Secure and sustainable energy in a Water-Constrained World. IASS Policy Brief 1/2016. Potsdam, Germany.

Water for Energy



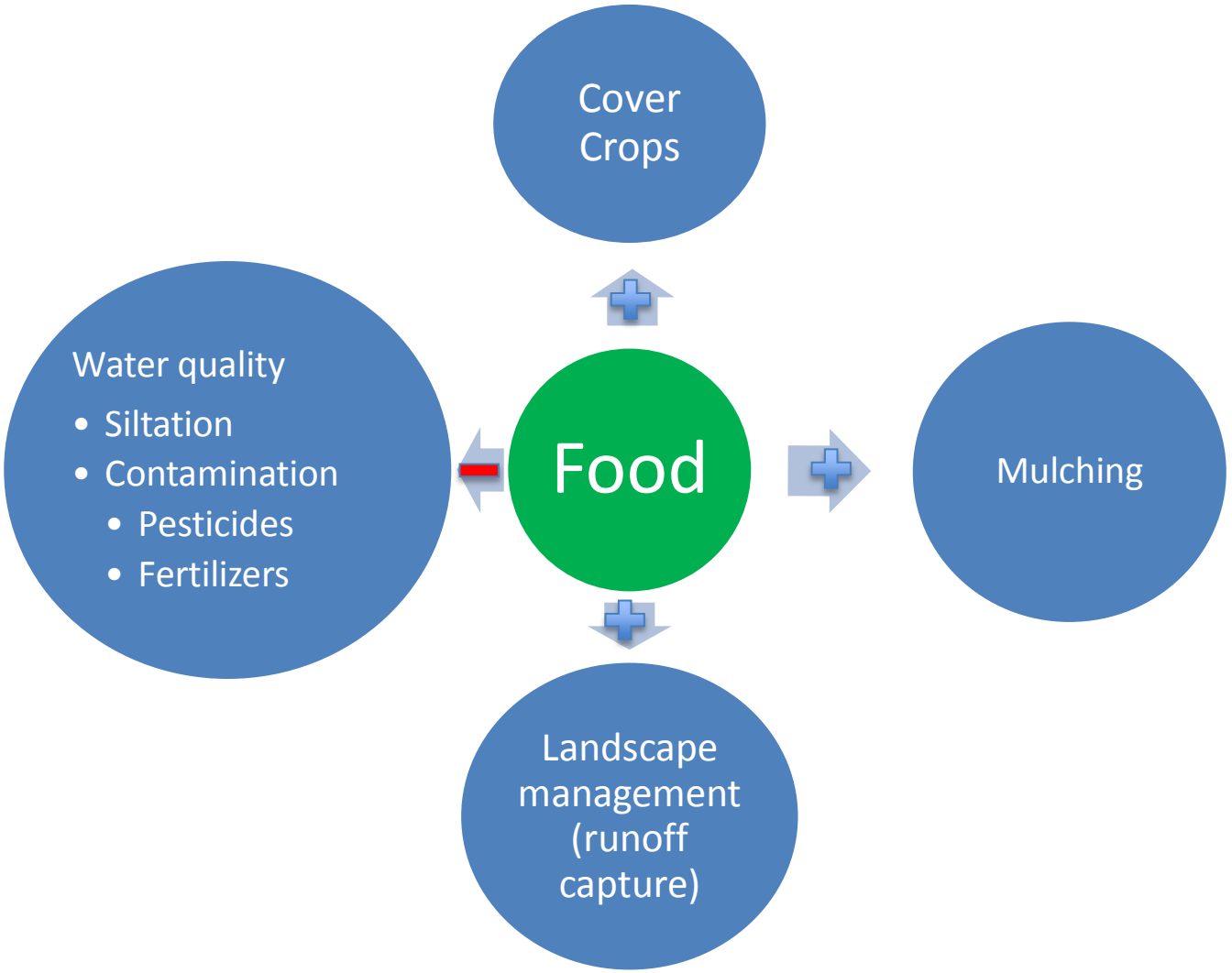
Water and Energy for Food



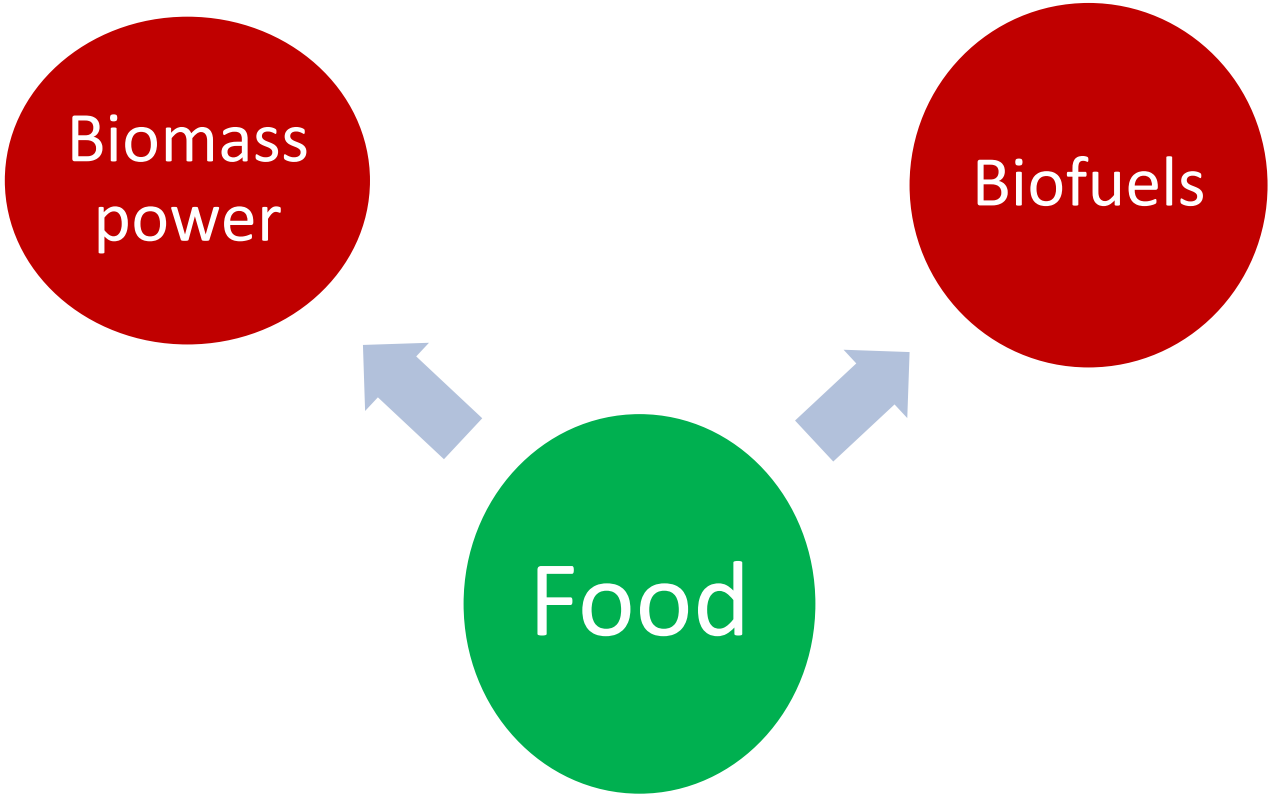
Source: Computed from FAO, FAOSTAT, Accessed February 2015 (http://faostat3.fao.org/home/E). Note: Data for the State of Palestine is not available.

- Indirect
  - Fertilizers (W+E)
  - Pesticides (W)
- Energy embedded in global **annual food loses** can reach up to 38% of the total energy used in the entire food value chain.

Food for Water



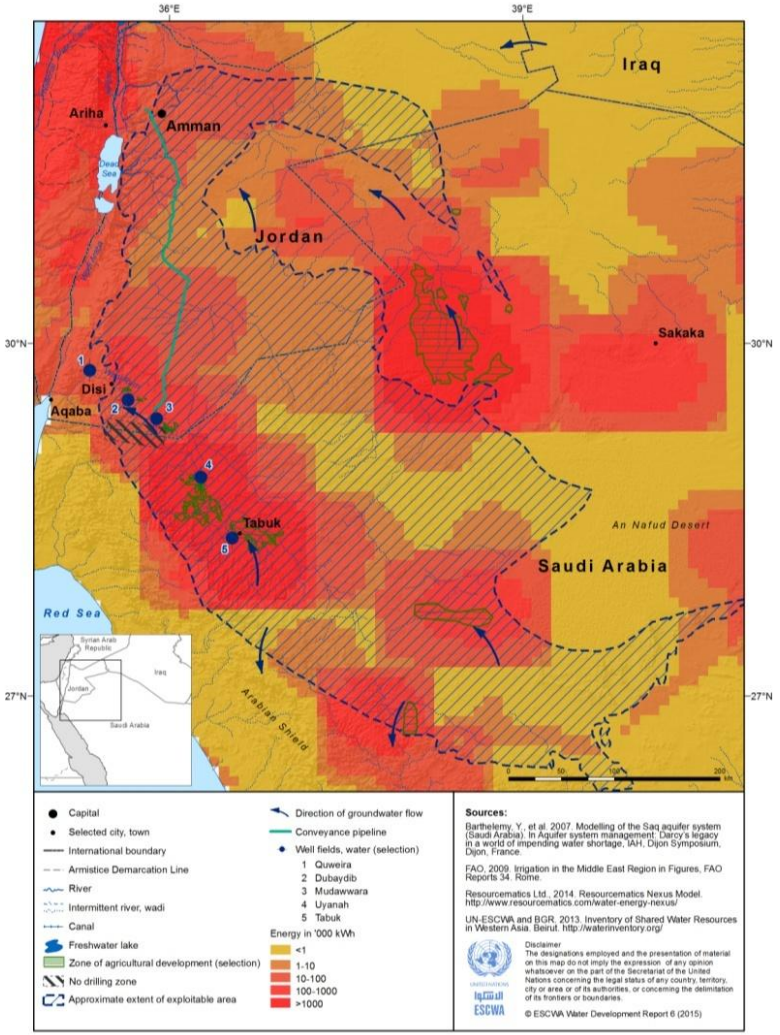
Food for Energy



Case Study From the Disi Aquifer System

Water-Energy-Food Security Nexus

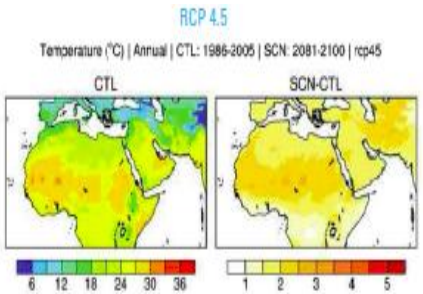
- Disi Aquifer is non-renewable
- High energy cost of pumping and transferring of water
- **Disi water conveyance project pumps water over 325km with a total energy requirement of 2% of Jordan's annual energy consumption**
- Competition between end users, Agricultural-Domestic
- Technical MoU signed between the two countries which included a no drill zone
- Future agreements in light of the Water-Energy-Food Security Nexus



Climate change and the WEF security nexus

- ESCWA is coordinating the **Regional Initiative for the Assessment of the Impact of Climate Change on Water Resources and Socio-Economic Vulnerability in the Arab Region (RICCAR)** which is being implemented in partnership with the League of Arab States and 11 regional and international organization and three climate research institutes.

- The effects of climate change do not hit a particular sector and country, but much rather **resonate across a wide spectrum.**
  - Consistent warming trend with a general increase in the frequency of warms days and longer summer periods across the Arab region



- The WEF security nexus approach has the potential to effectively **harmonize** these interactions **across sectors and countries**.

RICCAR Partnerships

Implementing Partners (11)

ESCWA

UNEP

WMO

ACSAD

LAS

SMHI

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

Cairo Office

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

UNISDR
The United Nations Office for Disaster Risk Reduction

UNITED NATIONS UNIVERSITY
UNU-INWEH

FAO

Donors

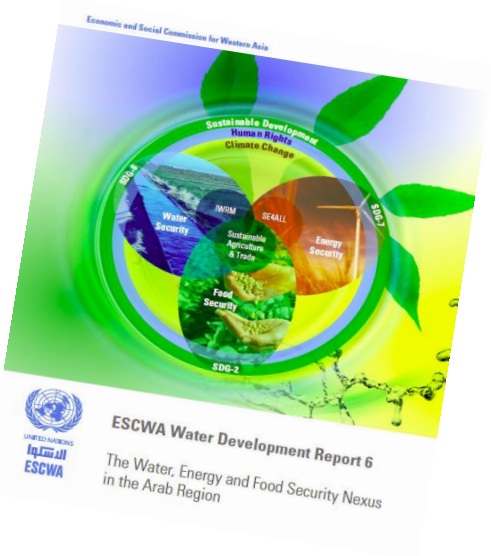
SWEDEN
SWEDISH INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Collaborating Research Institutes

- Center of Excellence for Climate Change Research/ King Abdulaziz University (CECCR/KAU) - *KSA*
- King Abdullah University of Science and Technology *(KAUST) - KSA*
- Climate Services Center 2.0 (CS2.0) - *Germany*

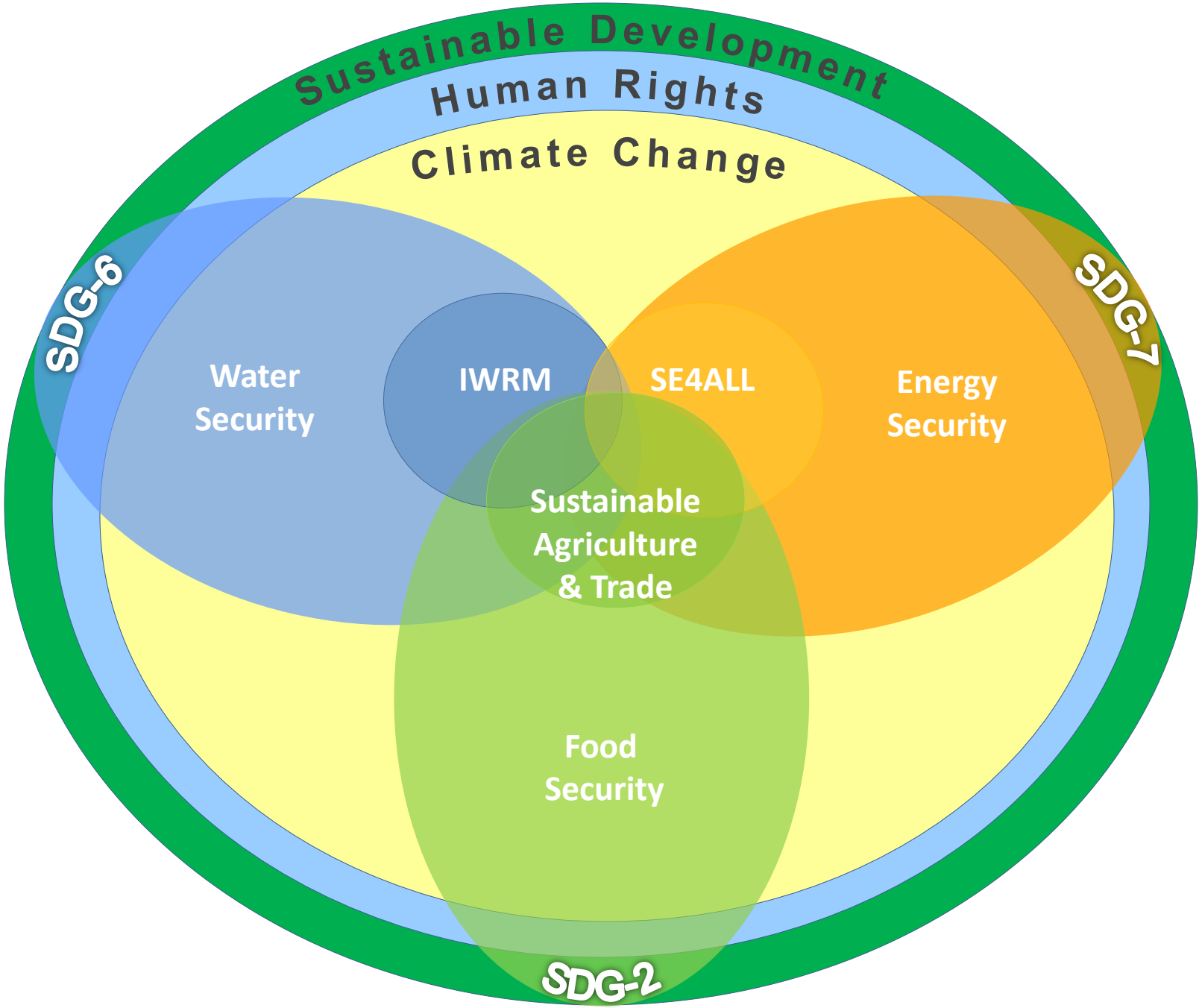
ESCWA Water Development Report 6: The Water-Energy-Food Security Nexus in the Arab region



ESCWA Water Development Report 6 (2015), addresses:

- ESCWA's vision for a water-energy-food security nexus for the Arab region within the context of sustainable development
- The Nexus from a shared basin perspective
- Energy and water interdependencies for improved services
- Water and energy for food security
- Recommendations for improved integrated natural resources management

Available at:
https://www.unescwa.org/our-work/water


Sustainable Development
Human Rights
Climate Change
SDG-6
SDG-7
SDG-2
Water Security
IWRM
SE4ALL
Energy Security
Sustainable Agriculture & Trade
Food Security

Considering a nexus approach to the water-related SDGs in the Arab regional context

- **Participatory** systems based approach that aims to **reduce trade-offs** and build synergies across sectors by considering interactions and dependencies between sectors at all stages and levels

- When goals are the starting point, stakeholders in different sectors have little occasion to interact and coordinate their efforts → Goal-focused approach may lead to often redundant and even conflicting targets.

- A key principle of the SDGs is **universality** – that the goals will be relevant to all countries, and all will contribute to achieving them, but with differentiated targets and actions . The nexus approach is entirely compatible with this principle

- Identify potential trade-offs and synergies among **Targets** → Consider systemic not only sectoral progress.

Considering a nexus approach to the water-related SDGs in the Arab regional context

- To be successful, a nexus approach will have to go beyond just clustering related targets and actually **examine the interactions**.
  → Develop methods for monitoring and accountability that will make it possible to recognize trade-offs and act to avoid them

- Targets can be seen as building blocks that each country or region will cluster in its own way, balancing the need for ensuring access to resources, efficiency, and long-term sustainability to fit the local context and capabilities. A nexus approach can facilitate selection of a suitable set of actions for a specific country or region.

- Regional specific indicators that monitor systemic progress and not only sectoral progress?

- **Maintain focus on improving lives**

ESCWA Nexus Related Activities

Developing the capacity of ESCWA Member Countries to address the water and energy nexus for achieving sustainable development goals

ESCWA secured funding from the United Nations Development Account to implement a project on developing the capacity of ESCWA member countries to address the water and energy nexus for achieving sustainable development goals, starting December 2014 and lasting until December 2017

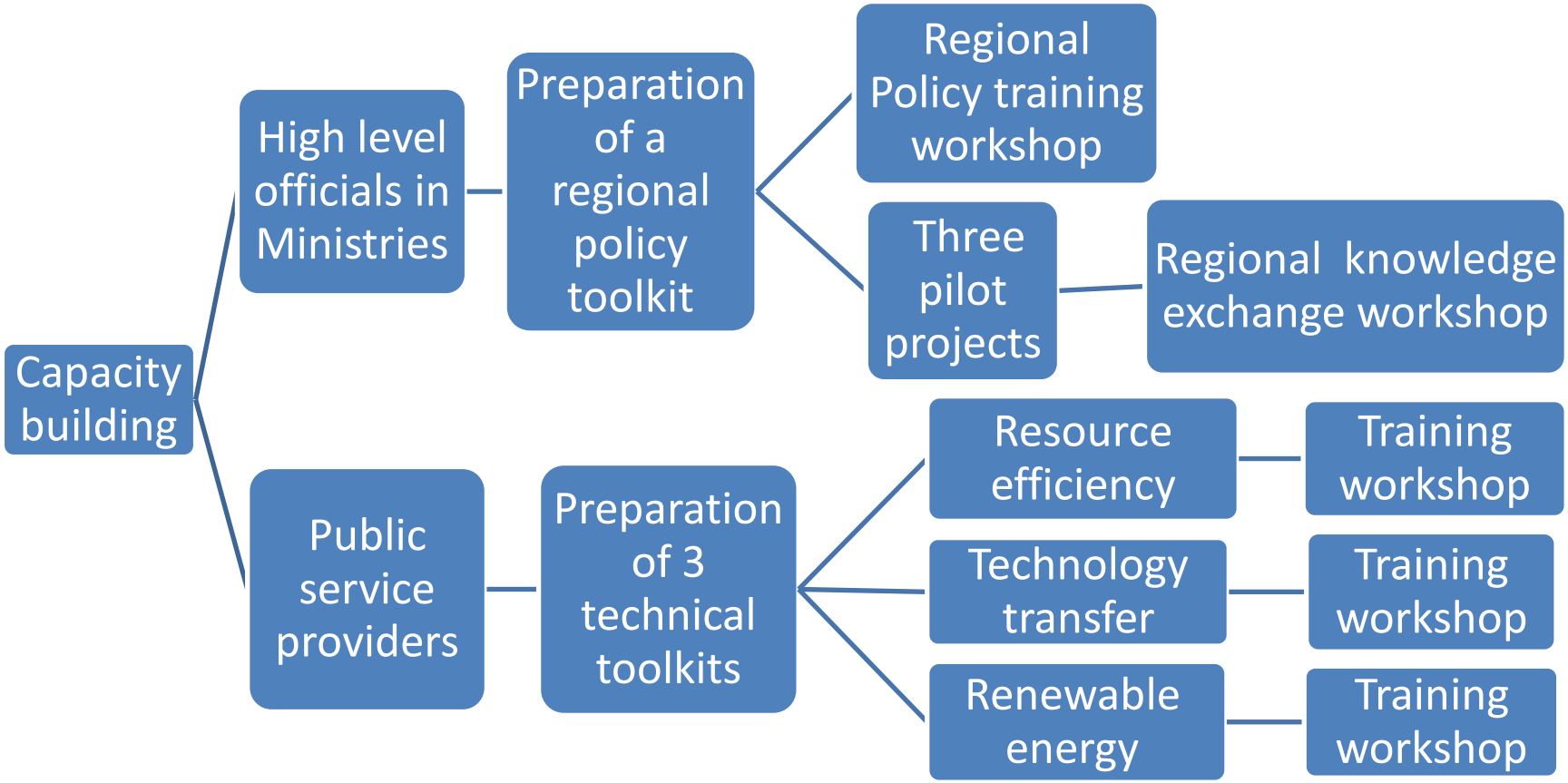
The project aims to:

- Build the capacity of ministries and public service providers who are responsible for water and energy in the region, so that they adopt the nexus approach and address water and energy issues in an integrated manner.
- Assist ESCWA member States in bringing the nexus approach to the sustainable development goals in a post-2015 development framework.

ESCWA Nexus Related Activities

Developing the capacity of ESCWA Member Countries to address the water and energy nexus for achieving sustainable development goals

The project will be pursued through 2 complimentary capacity building interventions



THANK YOU

UN Economic And Social Commission For Western Asia

Ziad Khayat,
FEAO, Water Resources Section
Sustainable Development Policies Division
ESCWA
United Nations House
Beirut, Lebanon
khayat@un.org

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