The MENA Region Initiative as a Model of NEXUS Approach and Renewable Energy Technologies Project (MINARET)

Introduction to Water, Food and Energy Nexus

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Food, Water and Energy

Food security:

- 925 million people go hungry
- Around 1 billion people suffer from the ‘hidden hunger’
- World population is increasing by 6 million per month
- An extra billion tonnes of cereals will be needed by 2030 (FAO)

Water security:

- 1.2 billion people live in areas affected by physical water scarcity
- 1.6 billion people live in areas affected by economic water scarcity
- 884 million people lack access to clean water
- Poor quality water in Middle East and North Africa costs from 0.5% to 2.5% of GDP.

Energy security:

- Currently, 1.4bn people do not have sufficient electricity.
- It is estimated that in 2030 1.2bn people will still lack access to electricity

Source: FAO (2010) / WEO 2010/UNICEF 2010

2050 – The Challenge

9
Billion
People

60%
More
Food

55%
More
Water

80%
More
Energy

www.waternexussolutions.org

NEXUS ???

- It may not be immediately obvious, but water and energy are deeply intertwined. Tremendous amounts of water are used in the generation of both electricity and liquid fuel – even oil requires 40 lt of water for every liter of oil produced.
- Water-free sources of energy like photovoltaics and wind power still require large amounts of water in their manufacturing phase.

Simply

- Saving water saves energy, and vice versa.
- In most cases, finding ways to use **water** more efficiently will also result in a savings of **Energy**.
- Also, finding ways to use **Energy** more efficiently will also result in a savings of **water**.
- Maintaining awareness of this relationship can help nations and industry prioritize efficient use of both water and energy.

Water Consumption for Power Generation in the USA

Power Provider	Gallons Evaporated per kWh at Thermoelectric Plants	Gallons Evaporated per kWh at Hydroelectric Plants
Western Interconnect	0.38 (1.4 L)	12.4 (47.0 L)
Eastern Interconnect	0.49 (1.9 L)	55.1 (208.5 L)
Texas Interconnect	0.44 (1.7 L)	0.0 (0.0 L)
U.S. Aggregate	0.47 (1.8 L)	18.0 (68.0 L)

Source: National Renewable Energy Laboratory/USA
http://www.nrel.gov/docs/fy04osti/33905.pdf

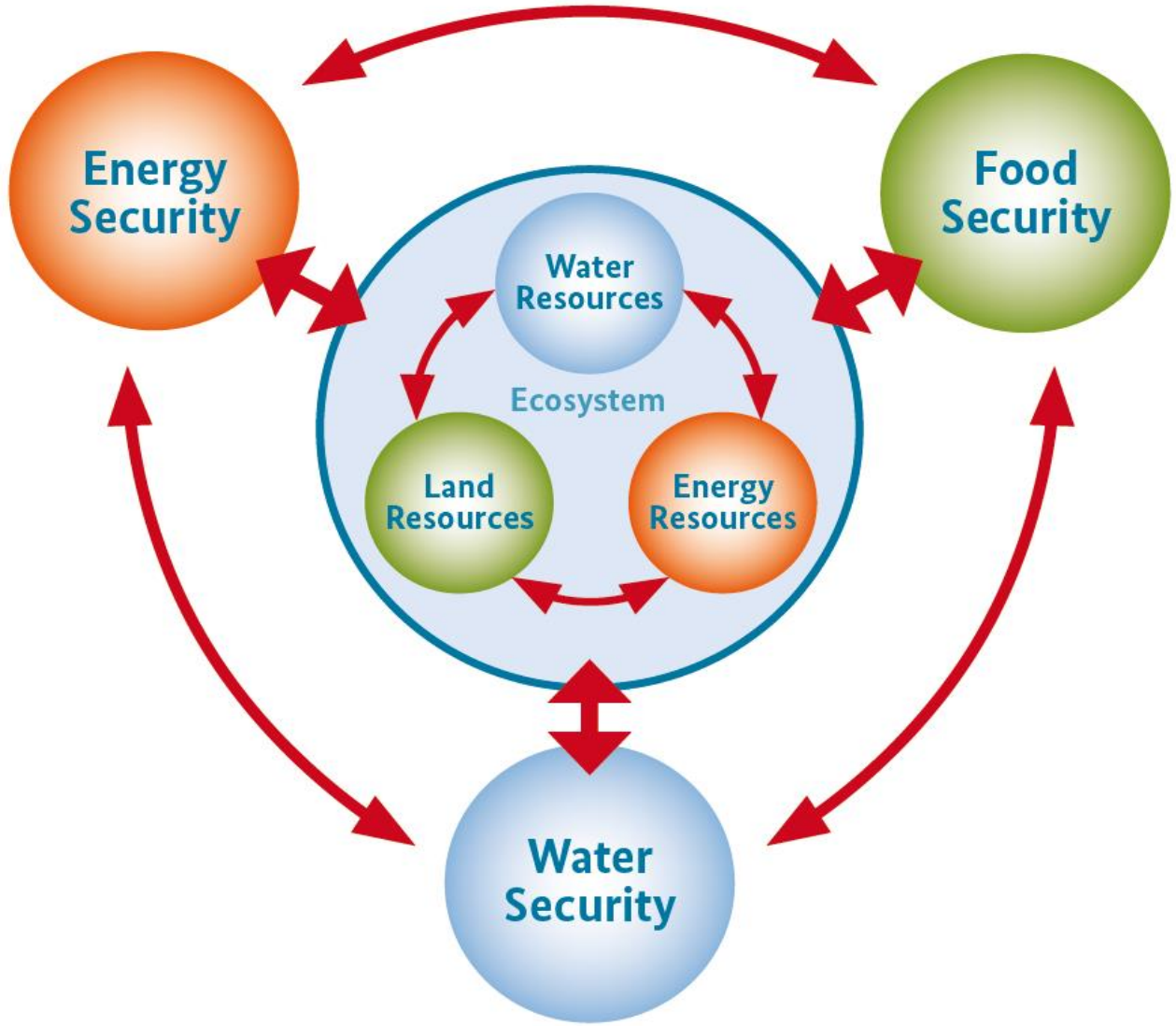
Why Nexus?

Already water is a scarce resource in many places.
It is estimated that by 2025 two-thirds of the global population will be living in areas experiencing water stress.

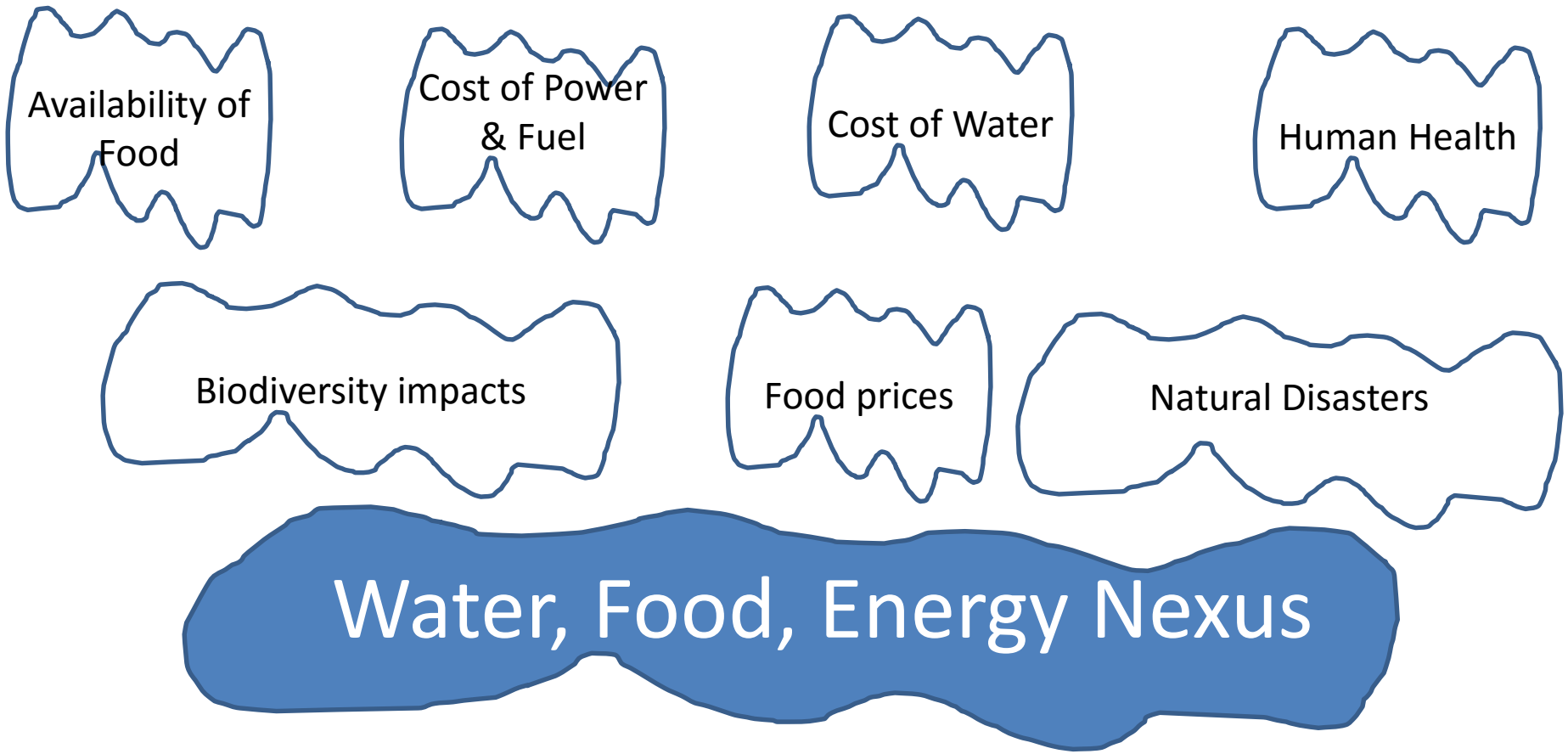
Agriculture is already the biggest user of freshwater resources; expanding and intensifying bio-energy production could add to existing pressures.

As the integrity of water systems declines, they are **less able to provide fundamental ecosystem services** such as the provision of clean water, natural filtration services, natural habitat for fisheries etc.

Global challenges such as climate change, population growth, change in living standards and energy demand will further impact the world's water supplies.


Energy Security
Food Security
Water Resources
Ecosystem
Land Resources
Energy Resources
Water Security

Impacts



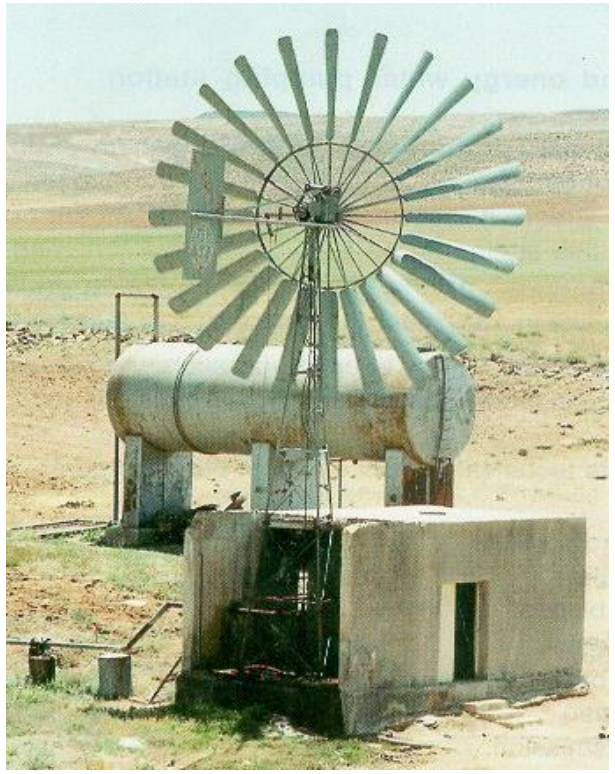
Availability, distribution, access and sustainability of Water
Food, energy and their resilience in the face of climate change.

Confronting Nexus Challenges

التحديات

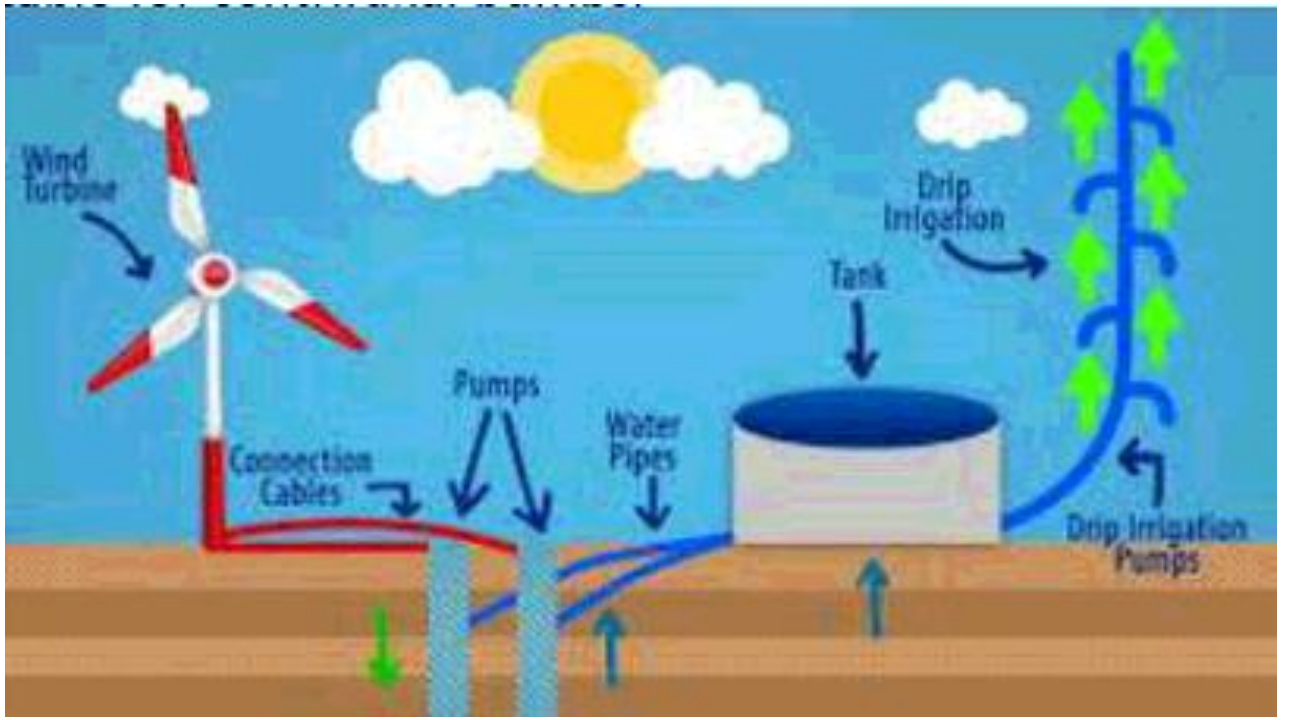

NO POVERTY
2 NO HUNGER
3 GOOD HEALTH
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 CLEAN ENERGY
8 GOOD JOBS AND ECONOMIC GROWTH
9 INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION
13 PROTECT THE PLANET
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE
17 PARTNERSHIPS FOR THE GOALS
THE GLOBAL GOALS

Examples of Proposed Interventions



Mechanical Wind Energy for Water Pumping

Electrical Wind Turbines for Powering Water Pumps



Implemented RE Projects by NERC/RSS in Rural Areas

AL- HAZEEM PVP-SYSTEM

- Location: 150 km east of Amman.
- Installed in 1987
- 110 m3/day
- System1: peak power of **1.759** kW
- System 2: peak power of **1.656** kW
- Two water storage tanks each 55 m^3 capacity.

Implemented RE Projects by NERC/RSS in Rural Areas

SOLAR WATER DESALINATION

The first applied research project in solar desalination field (16 kW_p) was started in 2002. A conventional reverse osmosis water desalination system was installed in Qatar village south of Jordan. It was operated by a diesel generator to serve the village with a daily potable water of around 50 m3

Performance Specifications :

- Feed Water TDS (mg/L): 4000
- Feed Water Temperature(°C) :25
- Production (GPM): 15
- Permeate TDS(mg/L): 100
- Recovery(%):60
- Feed Water Max. Silt Density: 5.0
- Feed Water Max. Turbidity (NTU): 1.0
- Feed Water chlorine Tolerance(mg/l): 0.1
- Concentrate LSI: 1.5
- Min. LinePressure Required: 20
- 3rd Year R.O. Feed Pressure (psi): 230
- 3rd year concentrate pressure(psi): 185

Let us Think together for a Change

نفكر معاً من أجل التغيير نحو تنمية مستدامة

Thank you

MINARET

Team