



ESCWA

United Nations Economic and Social Commission for Western Asia

Development & Resource Management

Multi-sectoral Development, Resources and Economic Development, Water Sector Development and the Arab context of Water and Energy, Integrated Water Resources Management

George J. Nasr, Dr. Eng.,
ESCWA Consultant





George J. Nasr, Dr. Eng.
ESCWA Consultant

Objective

1. Multi-sectoral Development

2. Resources and Economic Development in the Arab Region
3. Water Sector Development and the Arab context of Water and Energy
4. Integrated Water Resources Management

Impact across sectors



1. Impact on agriculture: higher in developing countries. By 2080:
 - Agricultural potential: increase by 8% in developed countries;
 - As a result of longer growing seasons,
 - Agricultural potential: Fall by 9%, in the developing world;
 - Lower water availability
 - Higher temperatures.
2. Energy sector:
 - increased demand for cooling,
 - Effect of higher temperatures on industry and housing.
3. Infrastructure, to account for:
 - Higher risk of flooding
 - Sea level rise.
4. The Water sector, particularly supply and treatment.



George J. Nasr, Dr. Eng.
ESCWA Consultant

2

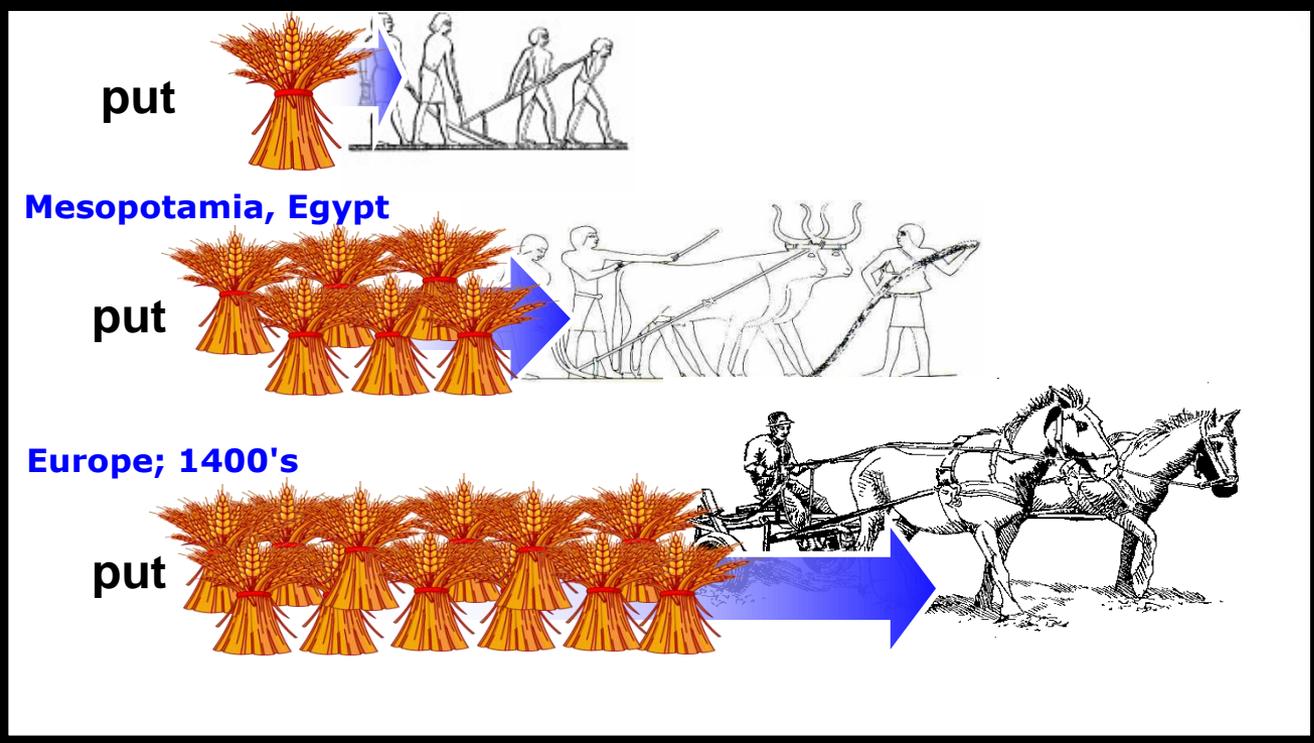
Objective

1. Multi-sectoral Development
- 2. Resources and Economic Development in the Arab Region**
3. Water Sector Development and the Arab context of Water and Energy
4. Integrated Water Resources Management

Development & Energy



Energy "growing"

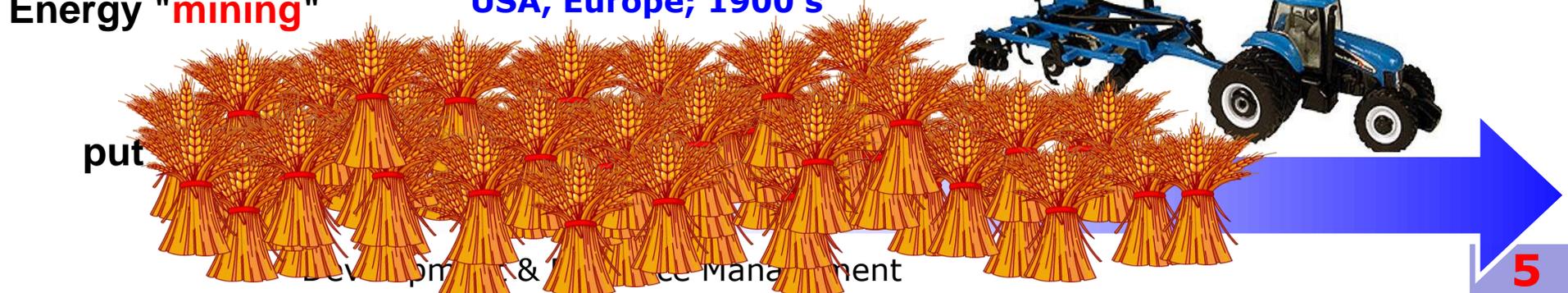


1 Barrel of Oil
~
25,000 Hrs
Human Labour



Energy "mining"

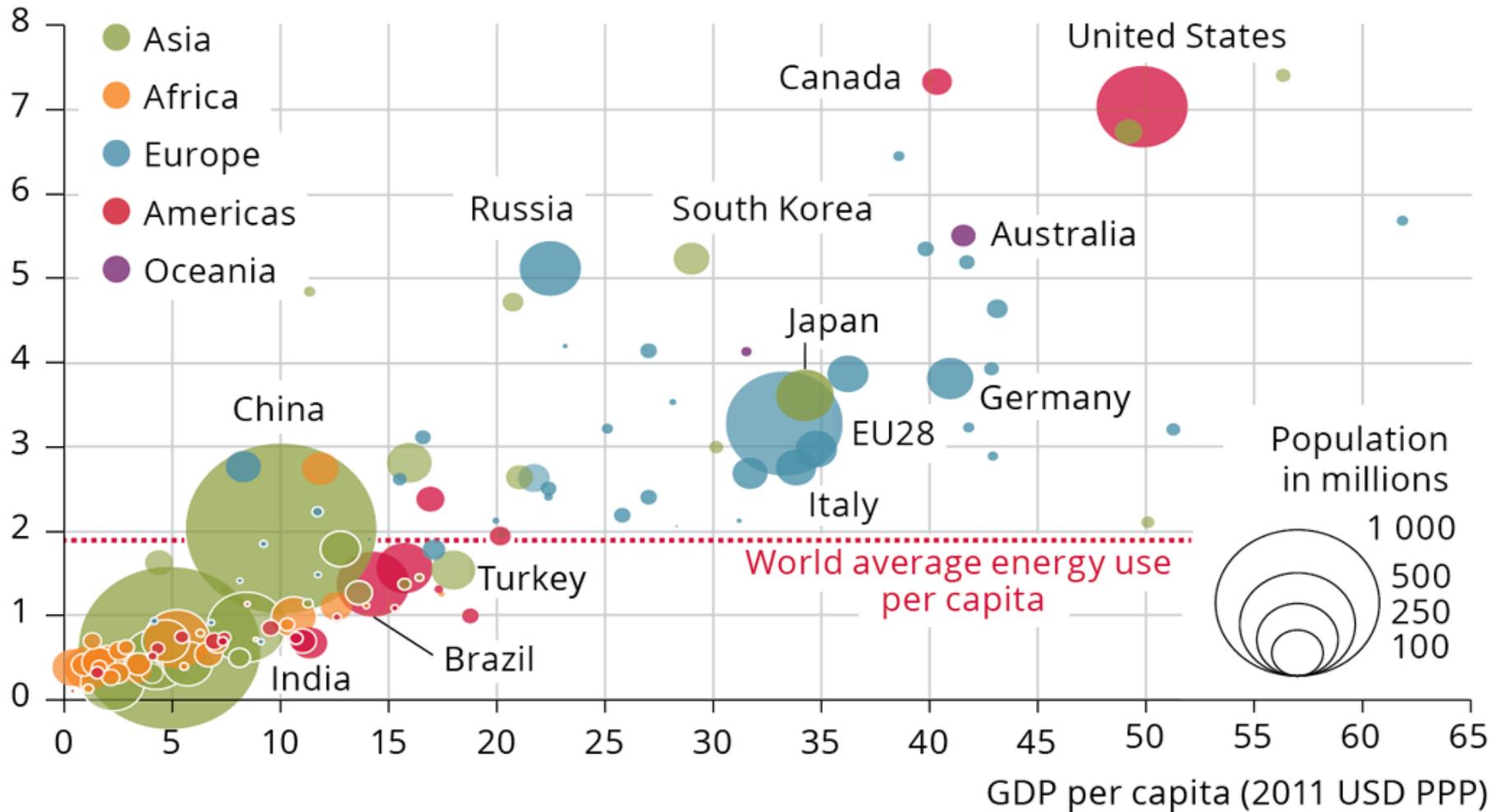
USA, Europe; 1900's



Development & Energy



Energy use in tonnes of oil equivalent per capita

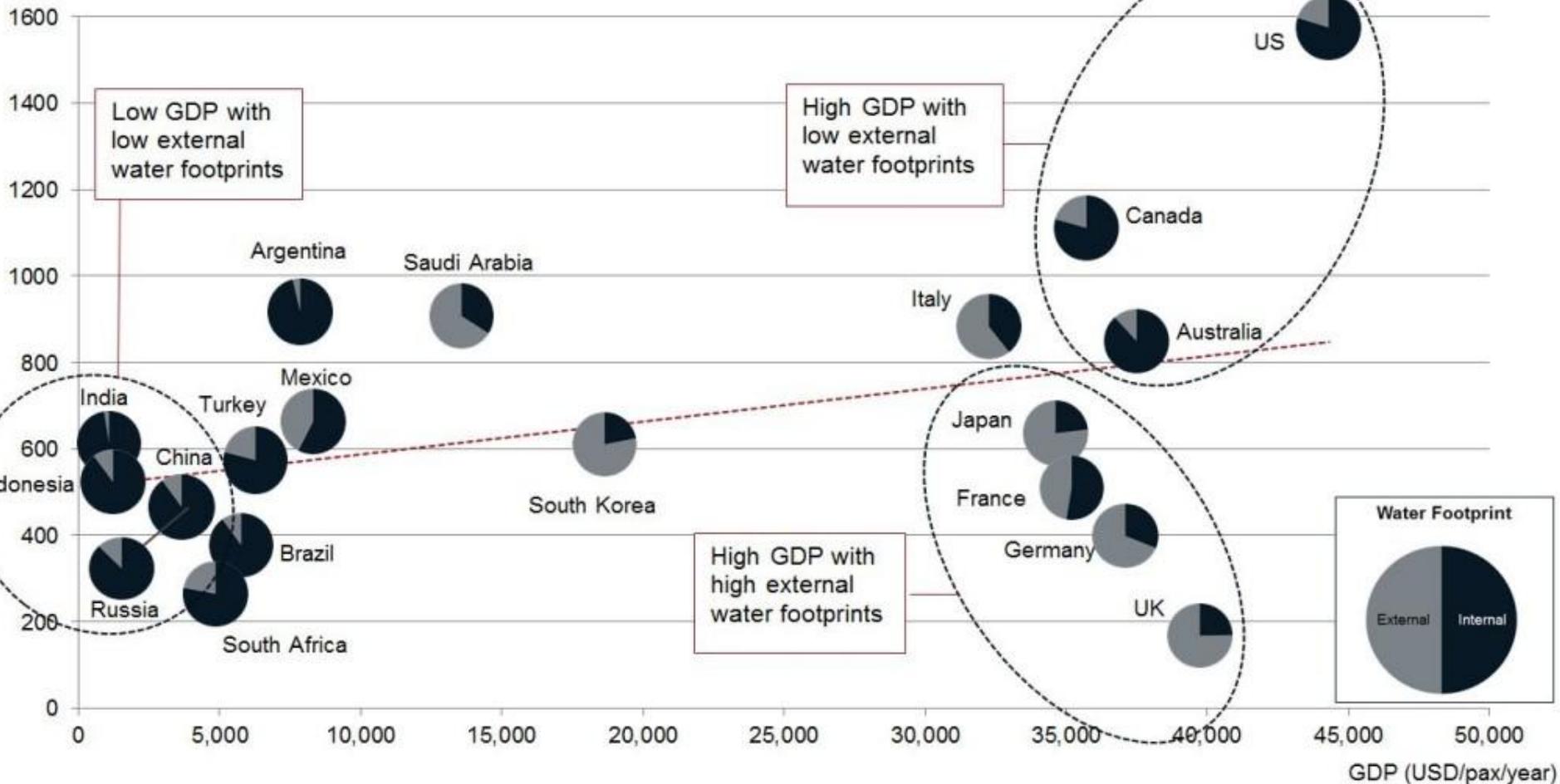


Development & Water Use



Outsourcing water - imports can help reduce domestic water use (G20 Per Capita Water Use vs. GDP)

Water use (m³/pax/year)



Source: China Water Risk based on FAO Aquastat, World Bank, NBSC, Water Footprint Network

Note: For each country, the latest available data for water use is considered (ranging from 2000 to 2014). GDP at that year is expressed in Constant 2005\$



George J. Nasr, Dr. Eng.
ESCWA Consultant

3

Objective

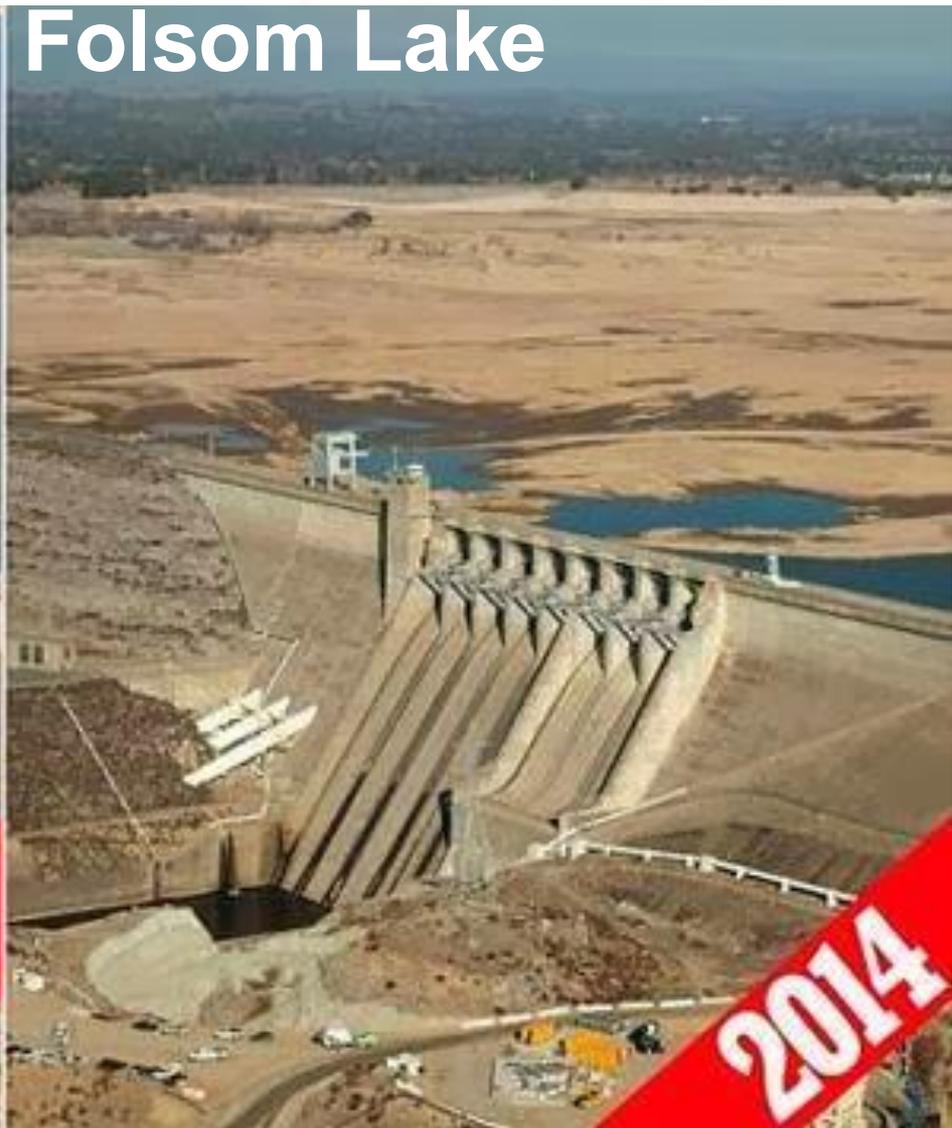
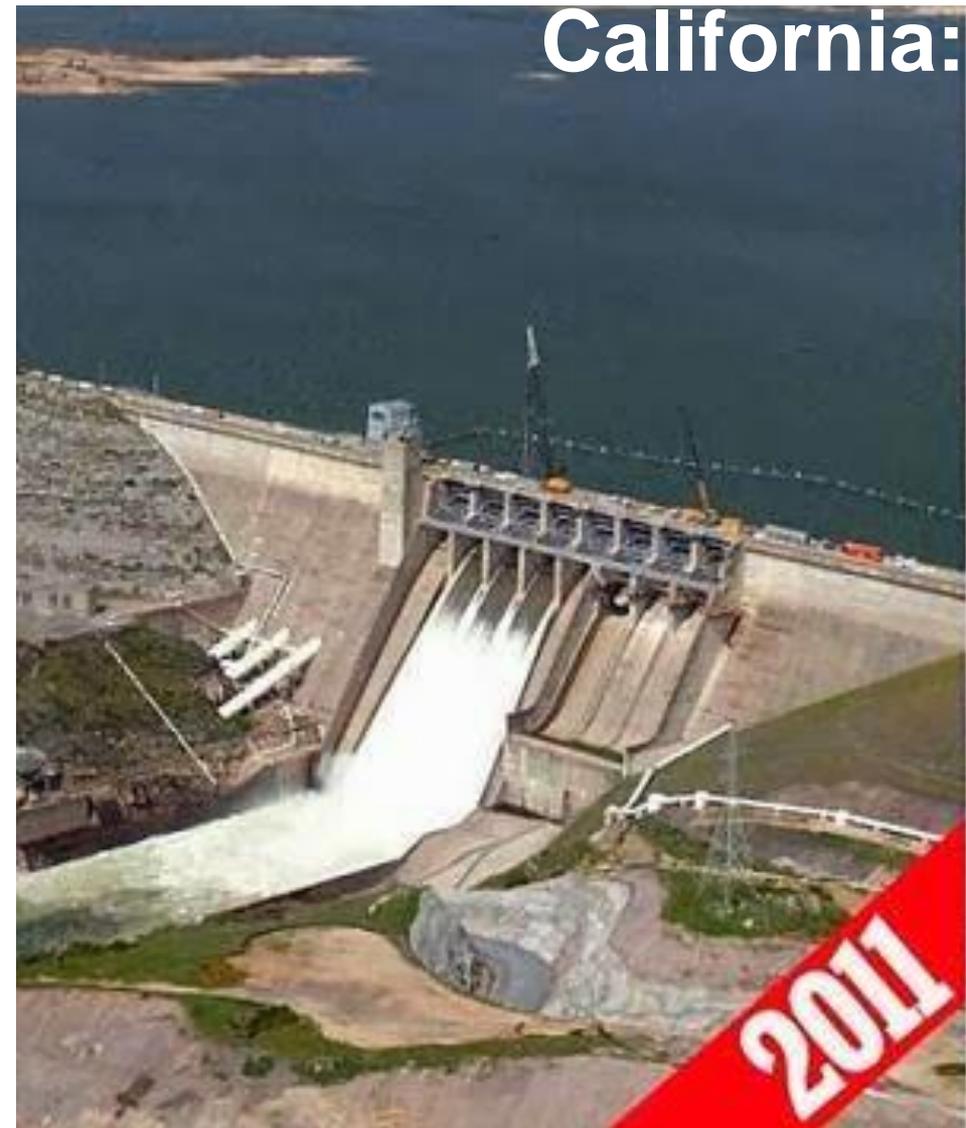
1. Multi-sectoral Development
2. Resources and Economic Development in the Arab Region
- 3. Water Sector Development and the Arab context of Water and Energy**
4. Integrated Water Resources Management

Water & Energy



- Increasing pressure on: water and energy.
 - Water-dependent sectors need energy for pumping, food production, heating and cooling, desalination, and treatment.
 - Energy-dependent sectors are also dependent on water for power generation and extraction.

California: Folsom Lake



Challenges to the Water Sector



1. Enhancing people's access to water and sanitation;
 - Arab Region's urban population: 57% now to 75% by 2050.
 - Current focus:
 - Expand water storage and conveyance networks,
 - Increasing dam capacity.
 - Most of the dams are already below full capacity, with high evapotranspiration rates.
 - Desalination: expected to expand five-fold by 2025.
 - Expensive, energy-hungry solution;
 - Brine pollution: Coastal pollution
 - Treated wastewater:
 - 40% of treated wastewater is reused in Gulf;
 - 20% of irrigation water needs in Jordan.
2. Ensuring a secure water supply;
3. Maintaining the protection of vital ecosystems.

Challenges to the Energy Sector



1. Cooling and air conditioning:
 - Demand alone would increase:
 - 20% by 2050; 40% to 50% by 2100.
 - Efficiency of many cooling systems decreases in warmer weather.
 - Negative effect on the efficiency of electrical transmission lines, powerplants...
- Industry need for cooling: competition for water;
- Hydrocarbon extraction:
 - Water hungry,
 - Reliance on treated seawater
 - Main issue in Arab Region: water generated as part of the extraction process



George J. Nasr, Dr. Eng.
ESCWA Consultant

4

Objective

1. Multi-sectoral Development
2. Resources and Economic Development in the Arab Region
3. Water Sector Development and the Arab context of Water and Energy
- 4. Integrated Water Resources Management**

Single Sector/Issue Focus



Agriculture in the Arab Region is the largest user of water in Arab States:

1. An exclusive focus on Economic Efficiency:
 - Inefficient: the region remains a net importer of food.

2. Social equity perspective:
 - Agriculture is a key livelihood issue, especially in rural areas (42% of the population)

3. Ecological sustainability:
 - Need to manage water differently
 - Climate change: decreased water availability, while population continues to grow.

1. **Social Equity:** Water management emphasis:

- Capacity building amongst the users of the resource,
- Interests of women, men and vulnerable groups, such as children and the elderly, who depend on freshwater resources;

2. Need of **Economic Efficiency** :

- Encourages inter-disciplinary management of water resources across sectors.

3. **Ecological Sustainability**

- Wider perspective



1. Cross-Cutting Issues
2. Watershed-centered
3. Participatory Approach

Cross-Cutting Issues (1/2)



Development Challenge	Sectoral Challenge	Climate Change Challenge			
		Precipitation Decrease	Temperature Increase	Sea Level Rise	Extreme Events
Households: water and sanitation	Regular provision of safe water; Desalination & Water Storage; Wastewater collection, treatment and reuse	Freshwater	Cooling; greater demand	Coastal Settlements; Desalination plant intakes	Livelihoods
Human Health	Vector-borne diseases; pests; Vulnerable groups	Vector-borne diseases and pests	Heat stress Vector-borne diseases		Floods
Transport and Trade	Air traffic; Ports/storage/testing facilities; Road/Bridges	Dust storms	Warming of Seas & Wind Currents	Storm surges; Coastal installations	Winds, Floods
Agriculture: Irrigation	Improvements in Irrigation Water-saving technologies	Freshwater	Wilting points	Salinity of coastal aquifers	Floods Drought
Agriculture: Livestock	Water & feed supply; Grazing land availability	Freshwater Desertification	Heat stress		Drought
Agriculture: Crops	Rainfed agriculture productivity losses; Food security	Freshwater Land degradation	Wilting points	Salinity	Floods, Droughts

Cross-Cutting Issues (2/2)



Development Challenge	Sectoral Challenge	Climate Change Challenge			
		Precipitation Decrease	Temperature Increase	Sea Level Rise	Extreme Events
Industry: Various Processes	Regular supply of water; Water treatment at source	Water	Cooling	Coastal Businesses	Business Uncertainty
Electricity: Power Plant	Cooling efficiency	Water Availability	Retrofit for Cooling	Coastal Power plants	Demand Uncertainty
Electricity: Hydropower	Balancing needs for power & irrigation	Freshwater; Energy Generation	Evaporation Losses		Demand Uncertainty
Electricity: Renewables	Use in dusty & hot environments; Water saving systems	Water Availability	Diminished Efficiency		Demand Uncertainty
Electricity: Power Transmission	Expansion of power grid, Enhanced power supply and delivery		Diminished Efficiency		



Thank You

1. Multi-sectoral Development
2. Resources and Economic Development in the Arab Region
3. Water Sector Development and the Arab context of Water and Energy
4. Integrated Water Resources Management