

تكنولوجيات الصحراء
desert
technologies

A Renewable Energy Company



Clean Water Scarcity and
Solar energy opportunities
in African and Middle East

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Facts on water

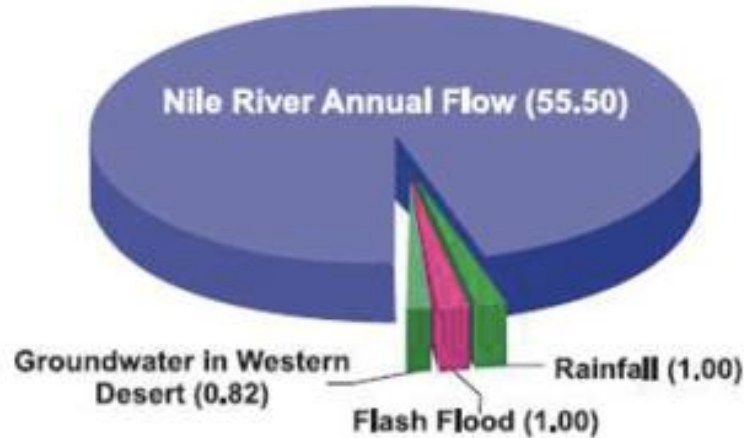
Africa appears blessed with abundant water resources: large rivers include the Congo, Nile, Zambezi and Niger and Lake Victoria is the world's second largest.



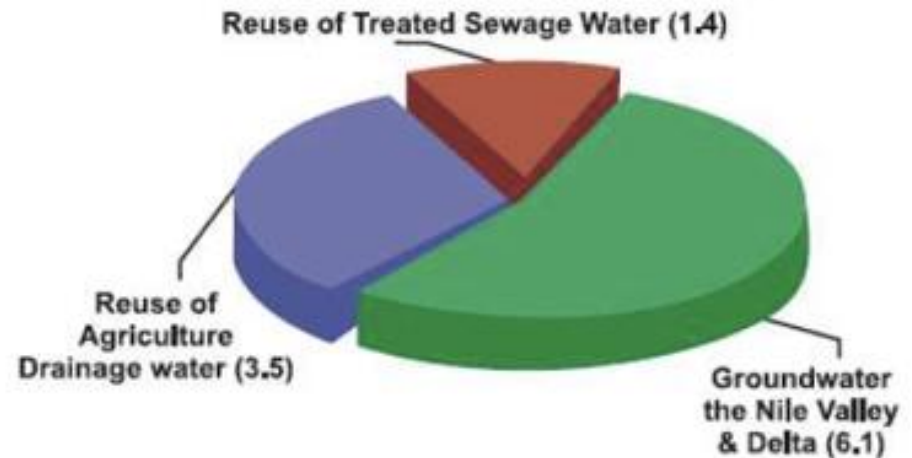
But Africa is the second driest continent in the world, after Australia, and millions of Africans still suffer from water shortages throughout the year. Shortages are often due to problems of uneven distribution - sometimes there is much water where there are fewer people - and also to management of existing supplies that could be improved. One example of the disparity in water availability lies in the Congo basin where 30 per cent of the continent's water drains land inhabited by only 10 per cent of Africa's population.

Egypt water resources

Conventional Water Resources (BCM)



Non-Conventional Water Resources (BCM)



Per capita fresh water availability in Egypt dropped from 1893 m³ in 1959 to 900-950 m³ in 2000 and tends to decline further to the values of 536 m³ by 2025 (Abd-El-Hai, 2002). The main reason behind this rapid fall is the fixed water resources and the rising pressure from population growth

The most critical constraint facing Egypt is the growing shortage of water resources accompanied by the deterioration of water quality.



Women & children are the primary water retrieval labor force

In many poor African countries women and children walk up to four hours to retrieve often polluted water from rivers, lakes and water points.....



Girls under the age of 15 are twice as likely as boys to be the family member responsible for fetching water.



Statistics of the water crisis



- Worldwide, 1 out of every 5 deaths of children under 5 is due to a water-related disease
- In developing countries, as much as 80% of illnesses are linked to poor water and sanitation conditions.
- 1 in 9 people worldwide do not have access to safe and clean drinking water.
- 84% of the people who don't have access to improved water, live in rural areas.



Statistics of the water crisis



- **443 million** school days are lost each year due to water-related diseases
- The United Nations estimates that Sub-Saharan Africa alone loses **40 billion hours** per year collecting water; the same as an entire year's labor in all of France!
- Globally we use **70%** of our water sources for agriculture and irrigation, and only **10%** on domestic uses.
- According to the World Health Organization, for every **\$1** invested in water and sanitation, there is an economic return of between **\$3** and **\$34**!

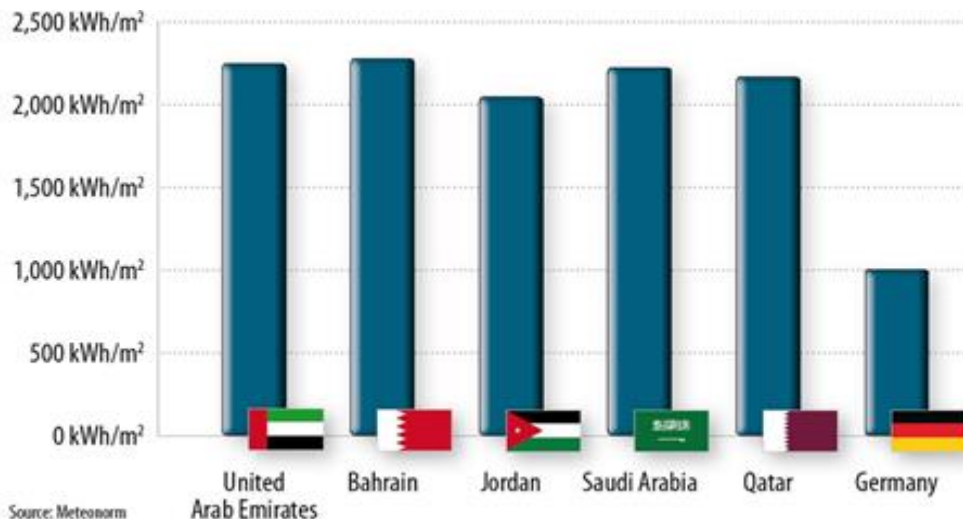
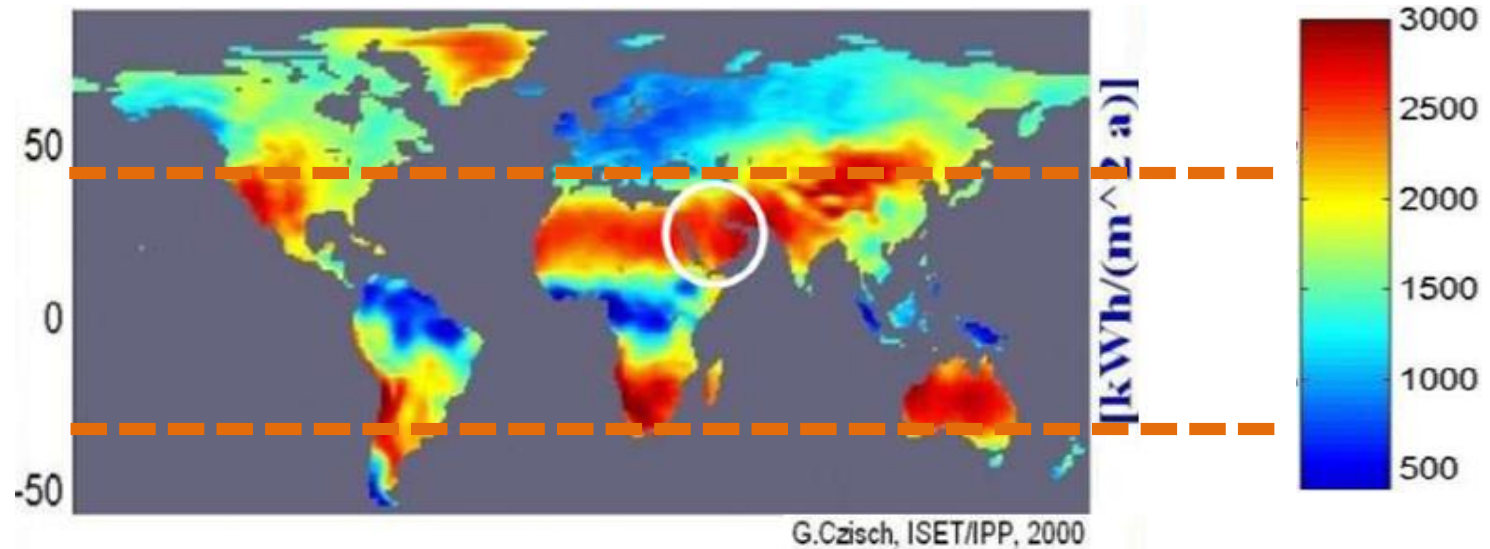


Important considerations

- Water issues will be a major global concern in the 21st century
- An important part of addressing water issues is having the energy needed to transport, treat or desalinate water resources
- A systems approach (e.g., addressing water needs on a regional basis) can produce optimal solutions
- Water and energy are key components of sustainable economic development, and are inextricably linked
- Optimal solutions can be obtained through a system approach that integrates consideration of various end-uses: their energy requirements and their associated economic and environmental costs



The Sun belt countries are the prime candidates for renewables



Africa and Gulf have abundant renewable resources. They benefit from strong regular sunshine, and the space to develop large solar power plants. The region also has significant wind resources, geothermal and biomass from urban waste

Gulf countries are as richly endowed with renewable resources as they are with hydrocarbons.

Renewable energy is not new in the Middle East



US inventor Frank Shuman commissioned the world's first CSP plant in Maadi, Cairo, in **1913**. The **55 kW** station was set up to drive irrigation pumps and provided the first tangible evidence of the suitability of renewable energy in the region.

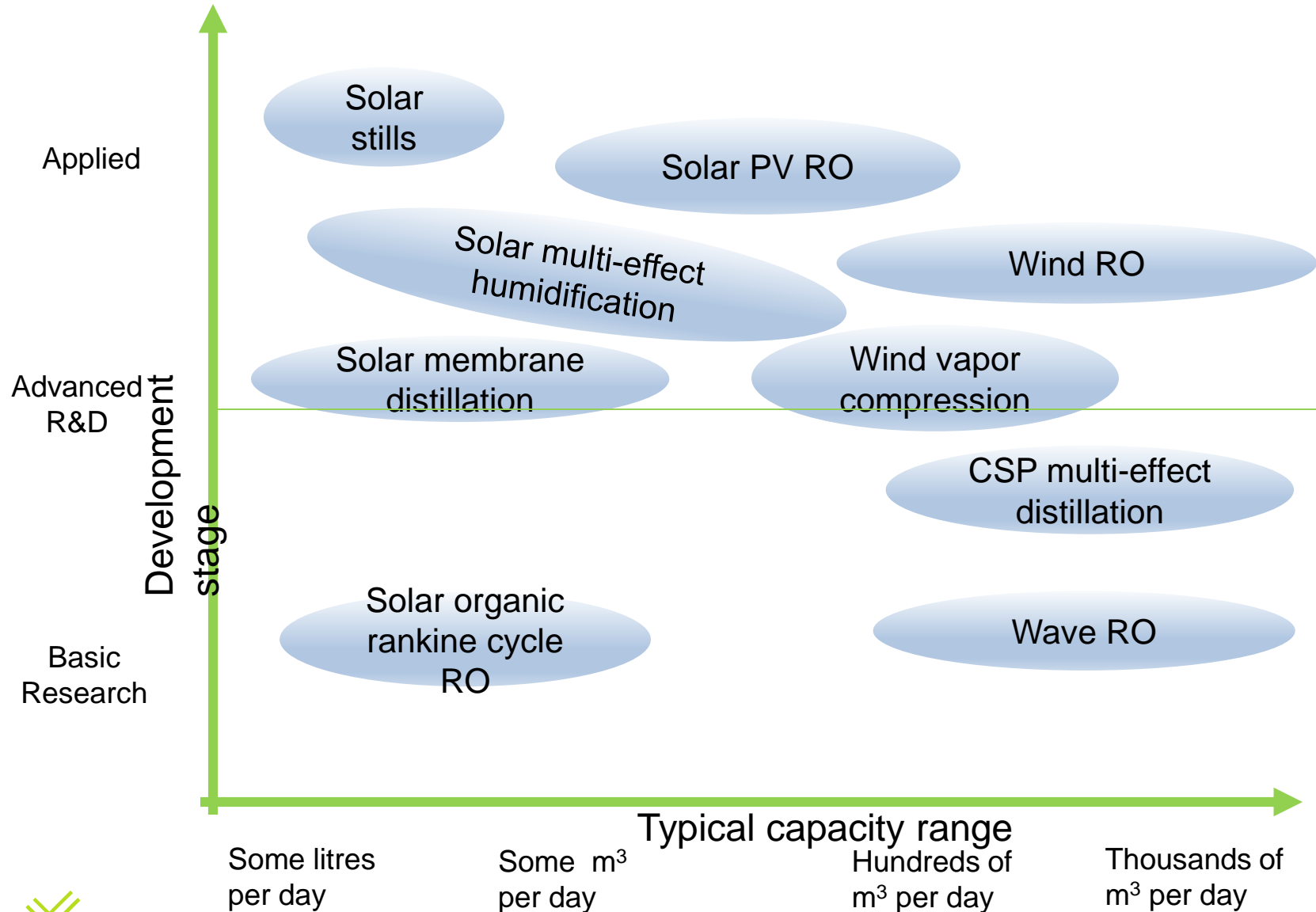


Sadus Solar PV Plant **10 kW**. Installed in **1993**.



In Saudi Arabia, Solar Village, the First **350 kW** CPV, installed in **1977**.

Technologies : Development stage & Capacity range



The role of PV

It really is the coming together of two of the most elemental life forces, sunshine delivering clean drinking water



Solar water pumping








Solar water purification

Integrating energy and water systems at all scales offers unique opportunities for energy and water security.



Life-cycle cost analysis

Solar Powered VS. Conventional Water Pumping Systems

		Solar	Convnetional
	Initial capital cost	↑	↓
	Initial capital cost	↓	↑
	Initial capital cost	↓	↑
	Initial capital cost	↓	↑
	Initial capital cost	↓	↑



Off Grid Water Pumping, Desalination and Water Sanitation Forecast to 2019



Conservative	2009 MWp	2010 MWp	2011 MWp	2012 MWp	2013 MWp	2014 MWp	2015 MWp	2016 MWp	2017 MWp	2018 MWp	2019 MWp	CAGR 2009-2014	CAGR 2014-2019
Low Volume Tube	9.9	6	5.9	8.2	8.9	12.1	14.5	16.5	19.4	23.3	33.5	4%	23%
High Volume Tube	16.3	9.7	11.7	13.9	16.3	20.9	23.9	27.1	32	38.4	55.2	5%	21%
Surface, Booster, Other	3.3	1.9	2.8	4.2	3.4	4.5	4.9	5.6	6.5	7.9	11.3	6%	20%
Desalination	1	0.6	0.7	0.7	1.1	2.7	2.8	3.1	2.9	3.7	4.4	23%	10%
Water Treatment	0.5	0.3	0.2	0.5	0.7	1.4	1.3	1.8	2	2.2	3.2	23%	18%
Total	30.9	18.6	21.4	27.5	30.5	41.6	47.5	54	62.9	75.5	107.6	6%	21%
Accelerated	2009 MWp	2010 MWp	2011 MWp	2012 MWp	2013 MWp	2014 MWp	2015 MWp	2016 MWp	2017 MWp	2018 MWp	2019 MWp	CAGR 2009-2014	CAGR 2014-2019
Low Volume Tube	9.9	6	5.9	8.2	8.9	12.1	15.4	18.6	23.2	26.8	37.1	4%	25%
High Volume Tube	16.3	9.7	11.7	13.9	16.3	20.9	25.3	30.6	38.2	44.1	61.1	5%	24%
Surface, Booster, Other	3.3	1.9	2.8	4.2	3.4	4.5	5.2	6.3	7.8	9	12.5	6%	23%
Desalination	1	0.6	0.7	0.7	1.1	2.7	3.8	4.5	3.8	4.5	4.8	23%	12%
Water Treatment	0.5	0.3	0.2	0.5	0.7	1.4	1.7	2.1	2.8	3.5	3.7	23%	21%
Total	30.9	18.6	21.4	27.5	30.5	41.6	51.3	62.1	75.7	87.9	119.1	6%	23%

In 2014, 289.1-MWp of PV was deployed into remote habitation. Water pumping, desalination and water sanitation accounted for 14% of the remote habitation application.



Saudi Arabia

- Saudi Arabia is biggest desalinated water producer and uses over 1.5 million barrels of oil/day.
- In the future, Saudi Arabia will use solar energy to operate desalination plants, and encourage greater energy and water efficiency .
- The first plant will be a 30,000 m³ /day solar facility in Al-Khafji. A 100,000 m³/d plant will next be built and then country wide network.



- Research and development carried out by King Abdulaziz City for Science and Technology, the King Abdullah University for Science and Technology, and national science agency



The United Arab Emirates :

The UAE Reliant on Desalinated Water. Abu Dhabi Environment Agency is testing solar desalination to reduce environment impacts and energy use.



Micro businesses development

Aside of large or small scale projects development, micro businesses could be developed:



Water kiosk in Zambia

The water pumped could then be purified, filled into bottles/canisters and sold to the people living nearby.



Service provider transporting solar pump on motorcycle

The irrigation micro business by selling the pumping service to neighboring families



The Economics of Necessity.....

A wise man once said “prevention is better than cure”, therefore our vision should be to focus much more on protecting health and preventing disease. And this all calls for a much greater awareness of factors including providing safe drinking water. Water is indeed everyone’s business, an essential resource to all aspects of society. In short, water is life. Sanitation is Dignity

