



Seawater Greenhouse

Charlie Paton

www.seawatergreenhouse.com



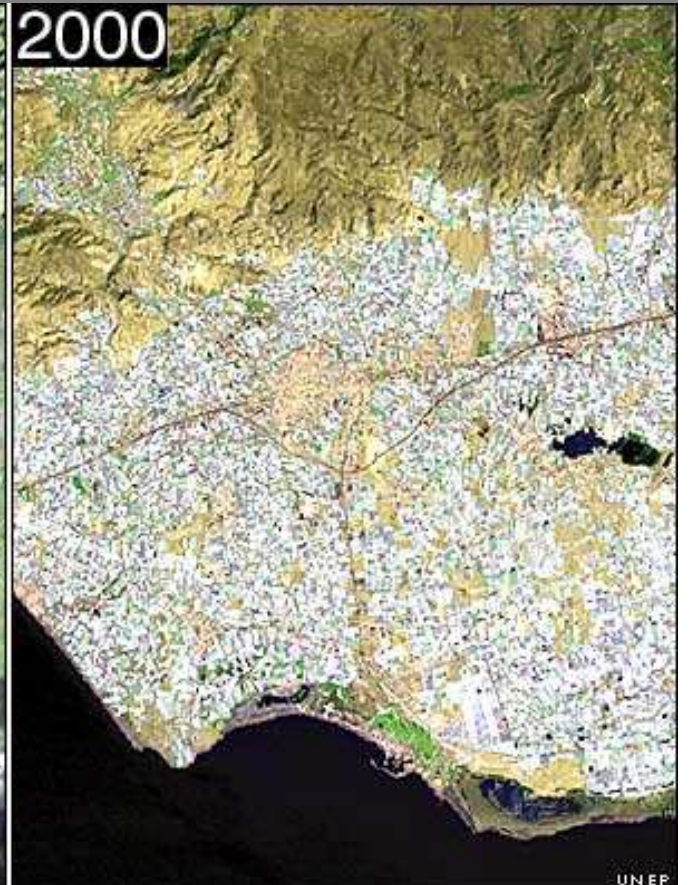




1974

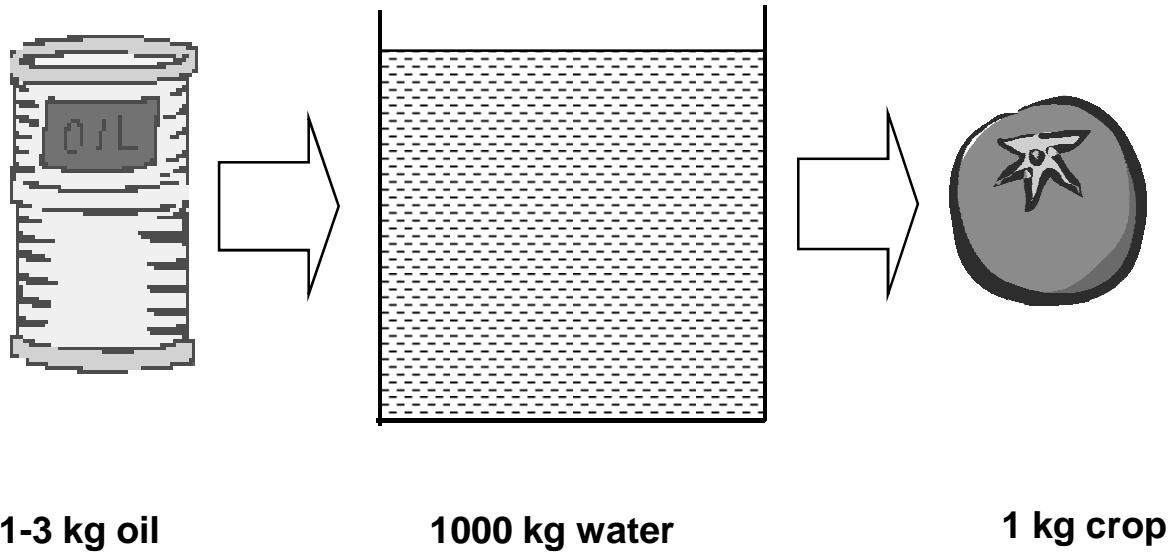


2000



UNEP

UNEP



**Economy of conventional desalination
for agricultural use**



Sunlight + Seawater + Wind



Evaporation



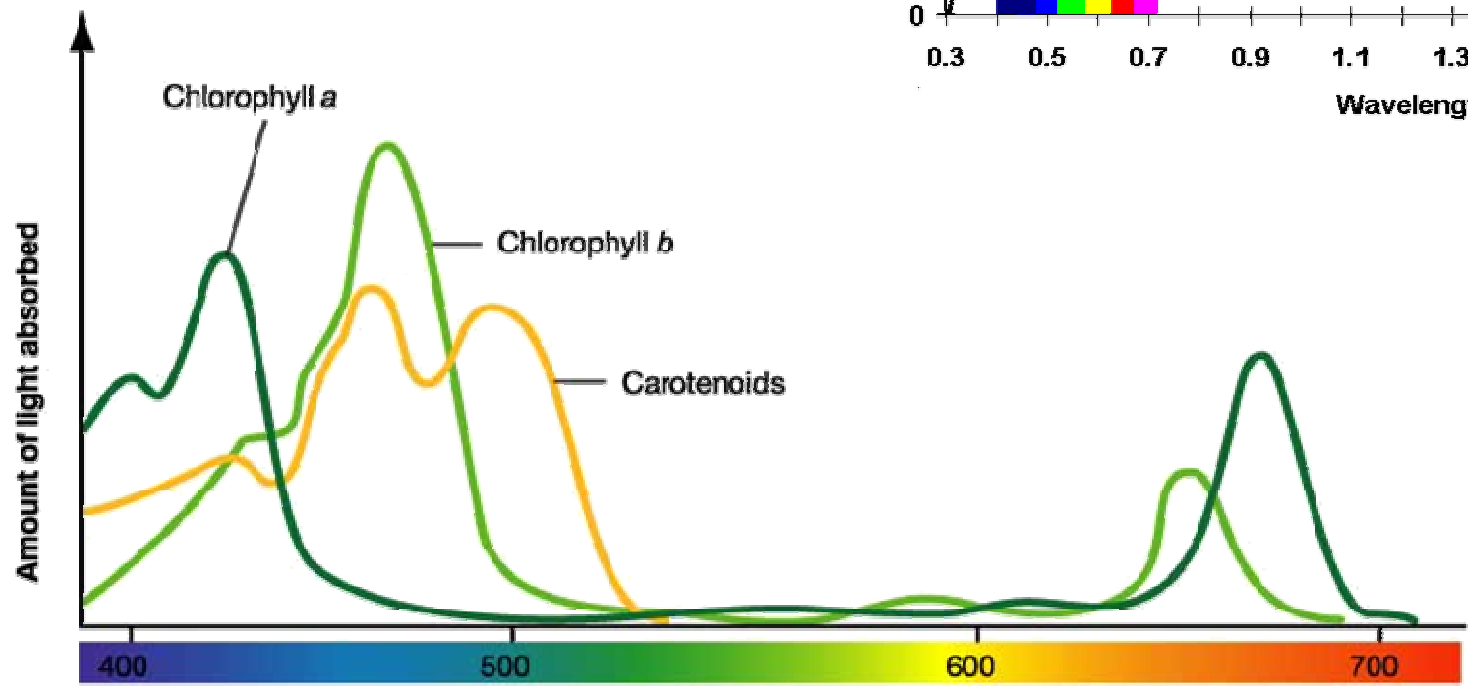
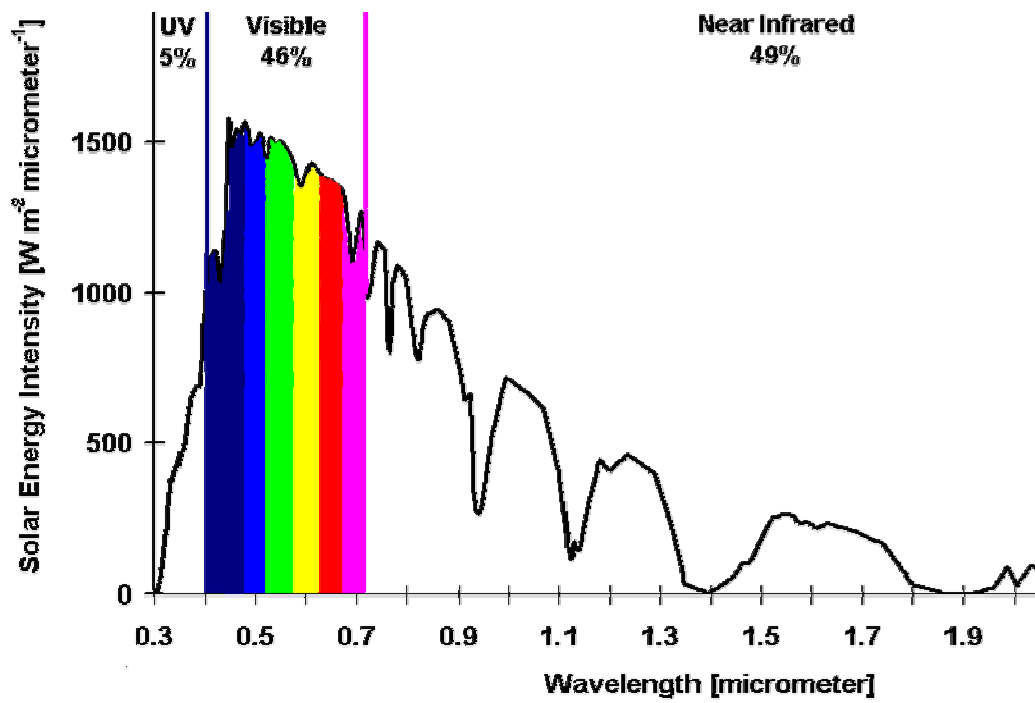
Fresh Water + Cool, Humid Air



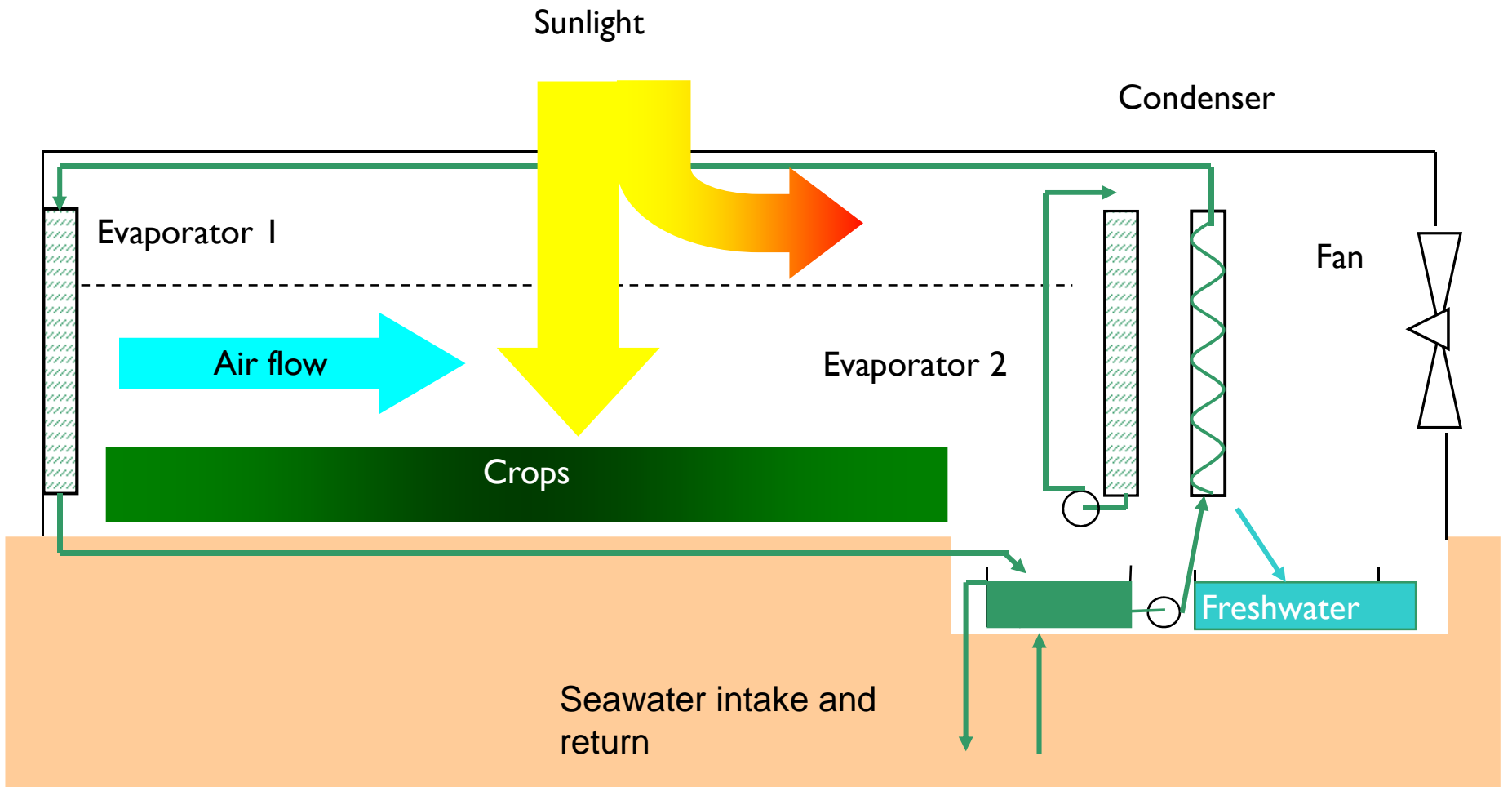


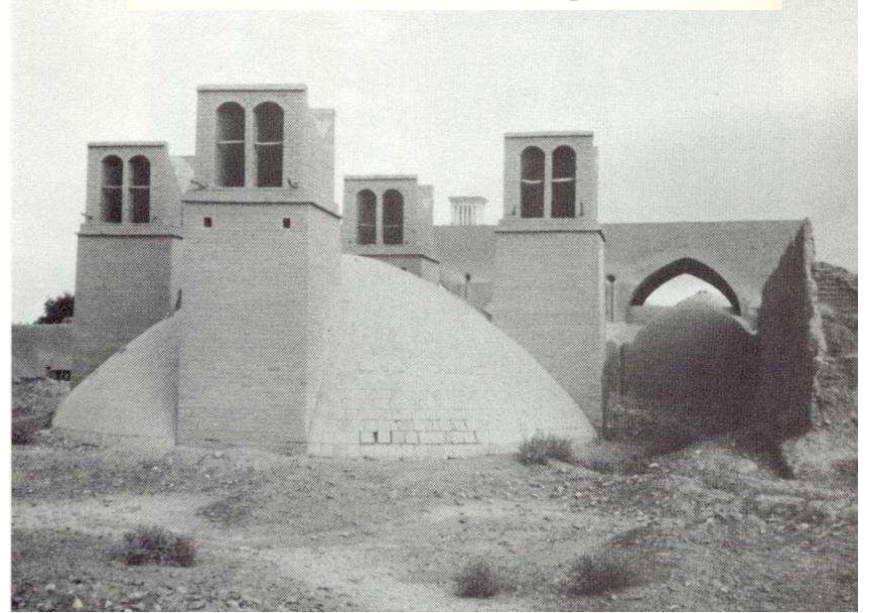
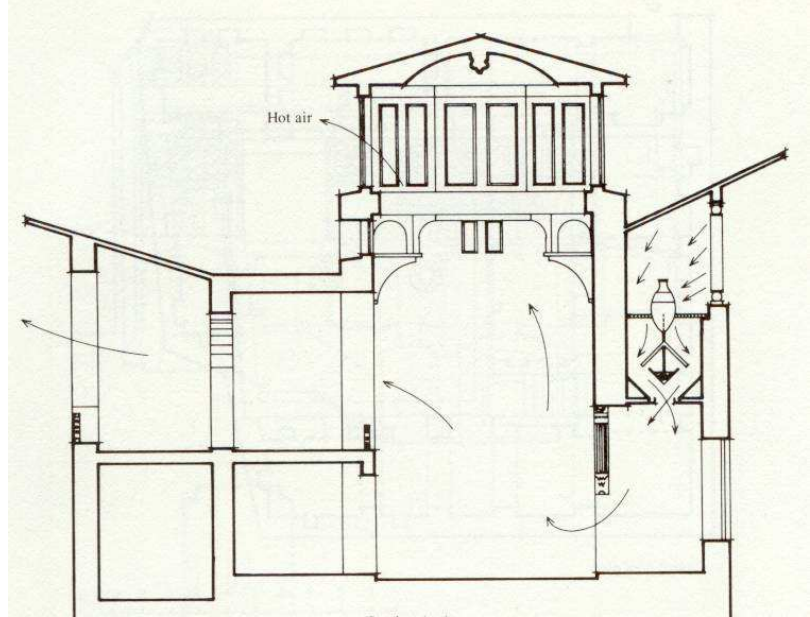
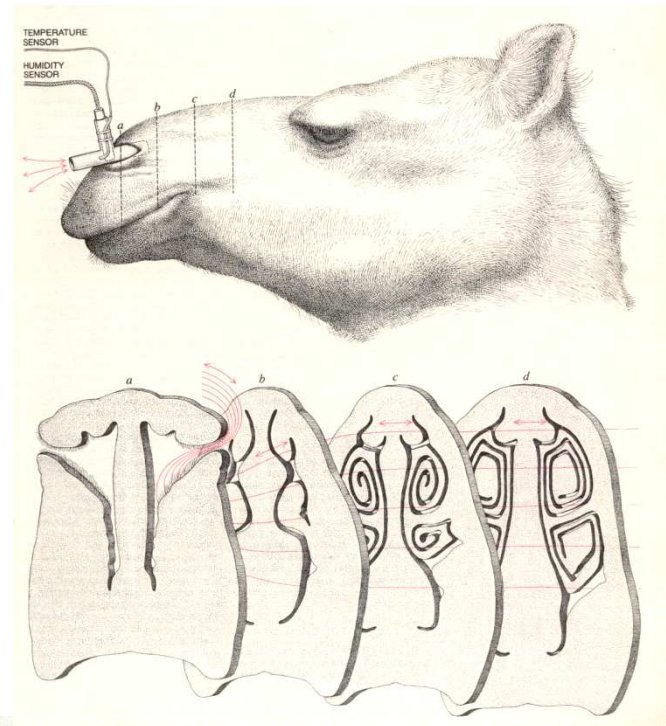


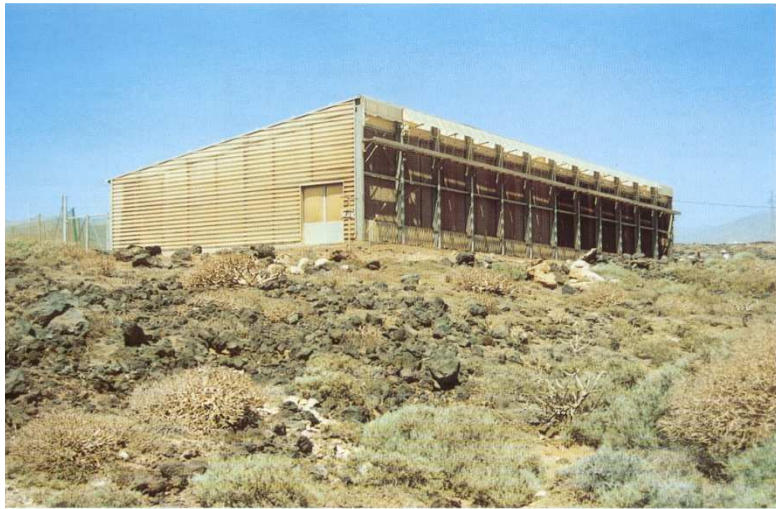




Photosynthesis Action Spectrum







Outside



8 litres / m² / day

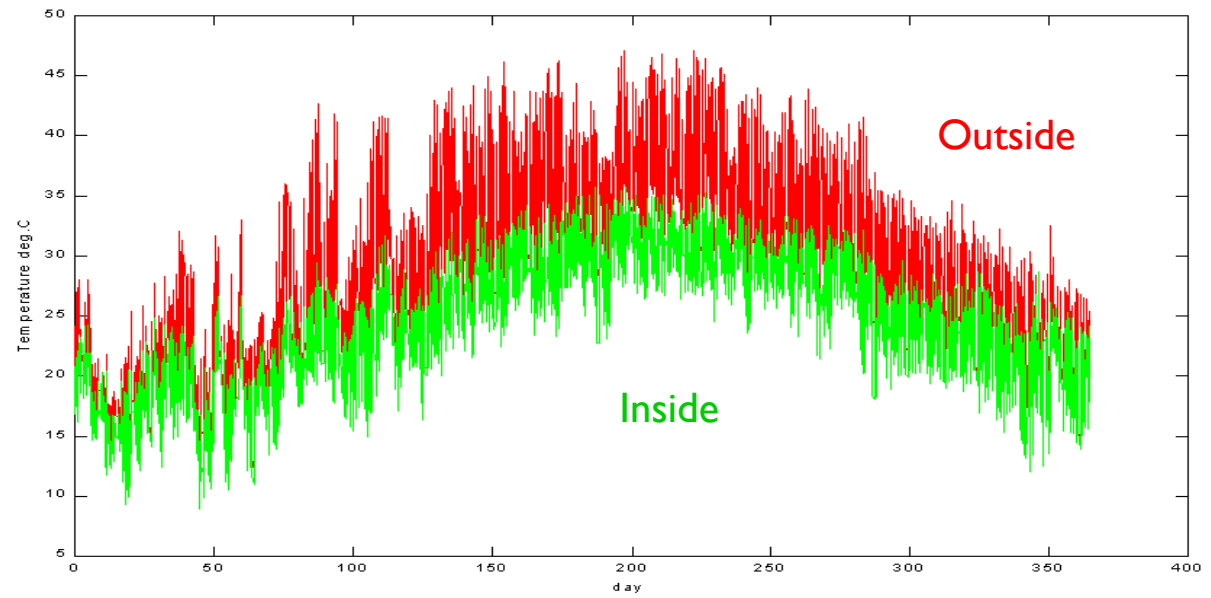


Inside

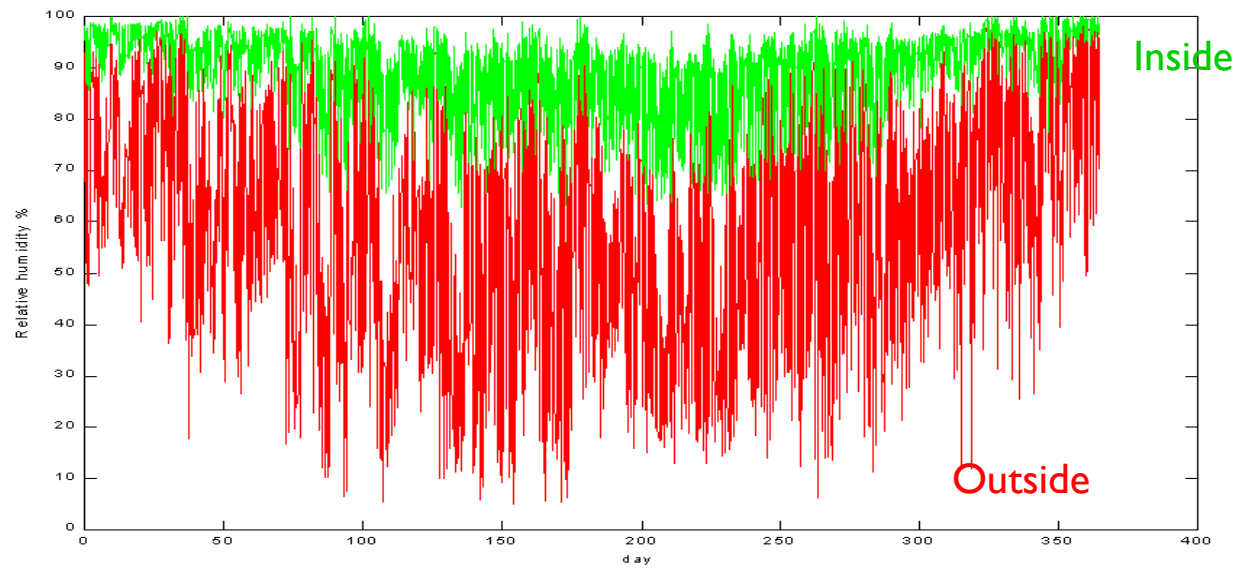


1.2 litres / m² / day

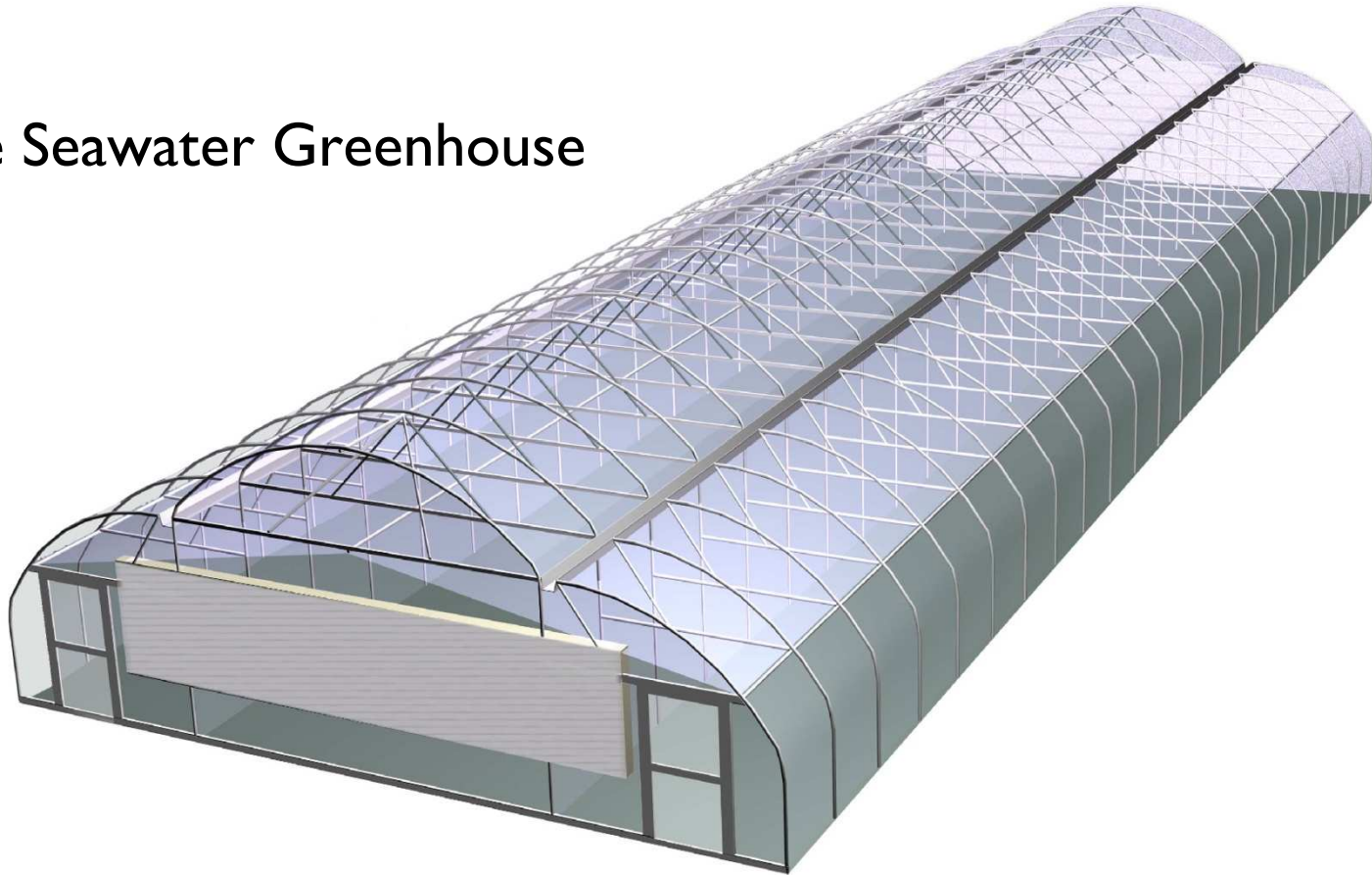
Temperature



Relative Humidity



The Seawater Greenhouse





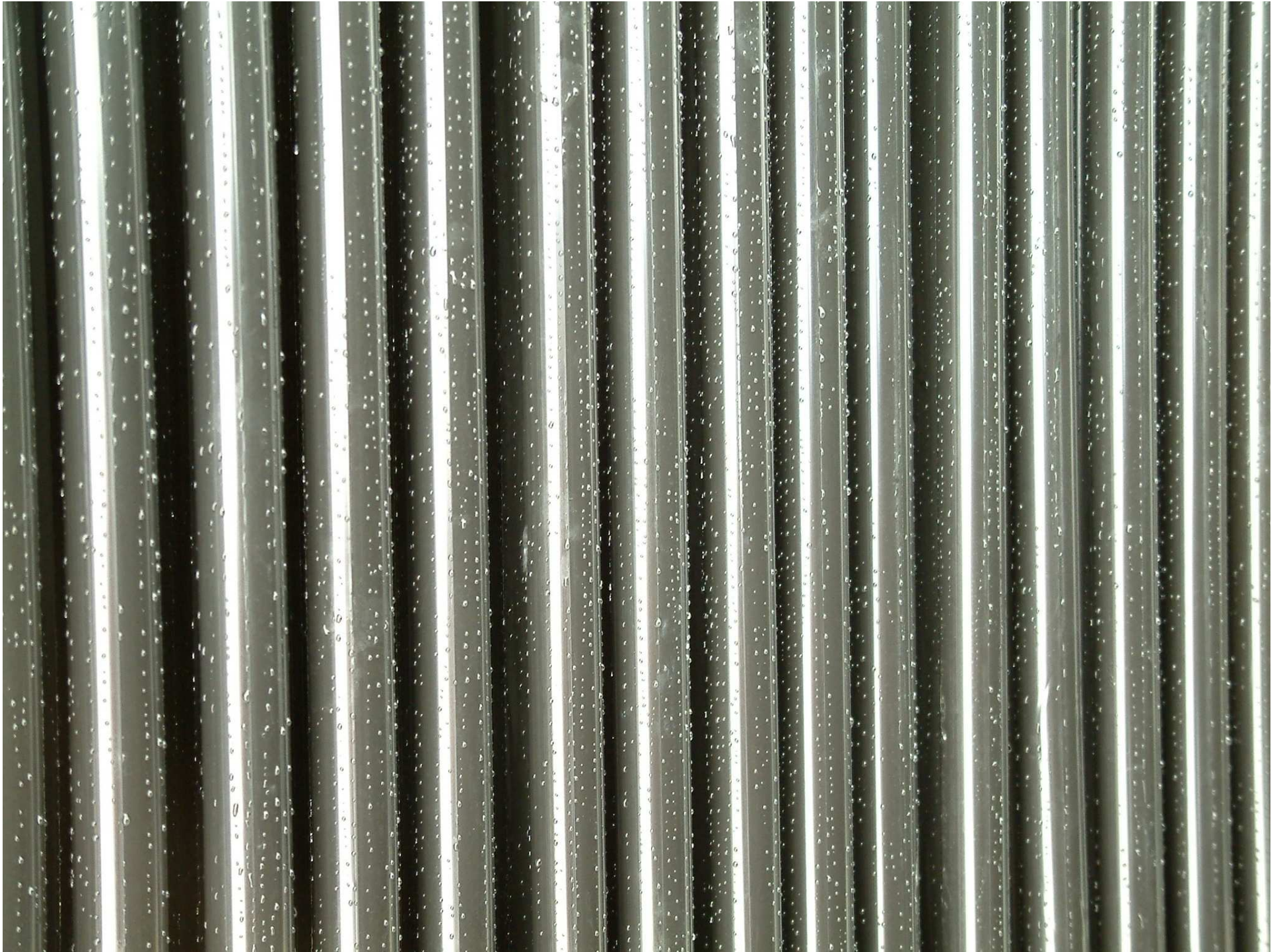












Greenhouse - Spain, Morocco, SG comparison

1 m2 Tomato crop over 1 year

UK

Spain

Morocco

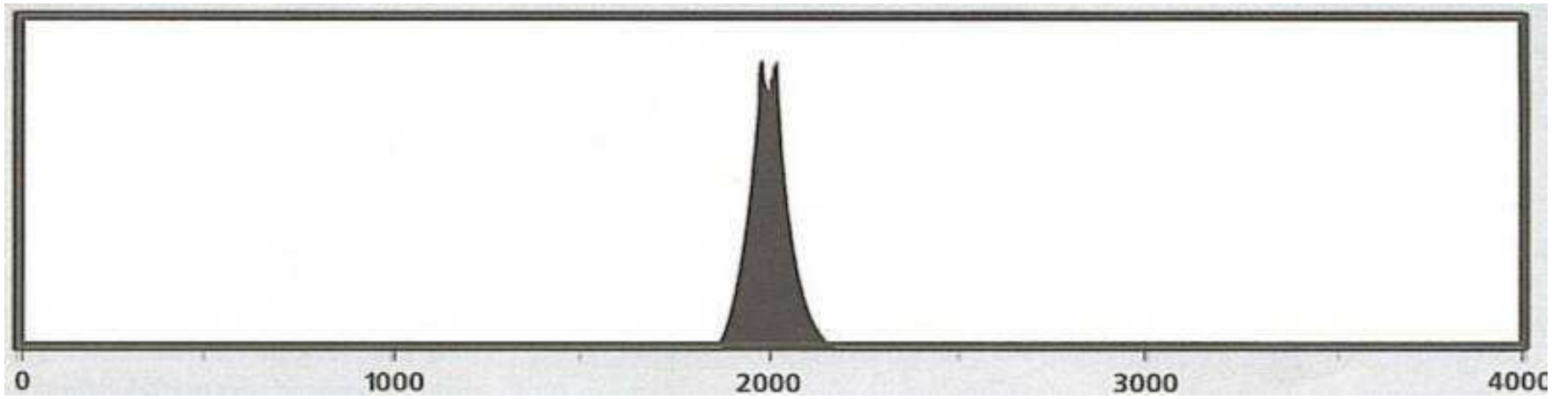
SG+PV in Morocco

Energy use	kWh/m2	480-560	0	0	0
Energy cost	€/m2	11	0	0	0
Greenhouse capital cost	€/m2	100	46	46	100
Finance cost @15%	€/m2	15	7	7	15
Yield	Kg/m2/year	60	36	36	60
Labour	€/m2	16	8.5	4	10
Shipping to UK*	€/kg		4.5	9	15
Total fixed costs	€/m2	42	20	20	40
Overheads @ 20% of fixed costs	€/m2	8.4	4	4	8
Total expenses	€/m2	50	24	24	48
Crop Value @ €0.9/kg	€/m2	54.00	32	32	54
Profit	€/m2	4	8	8	6

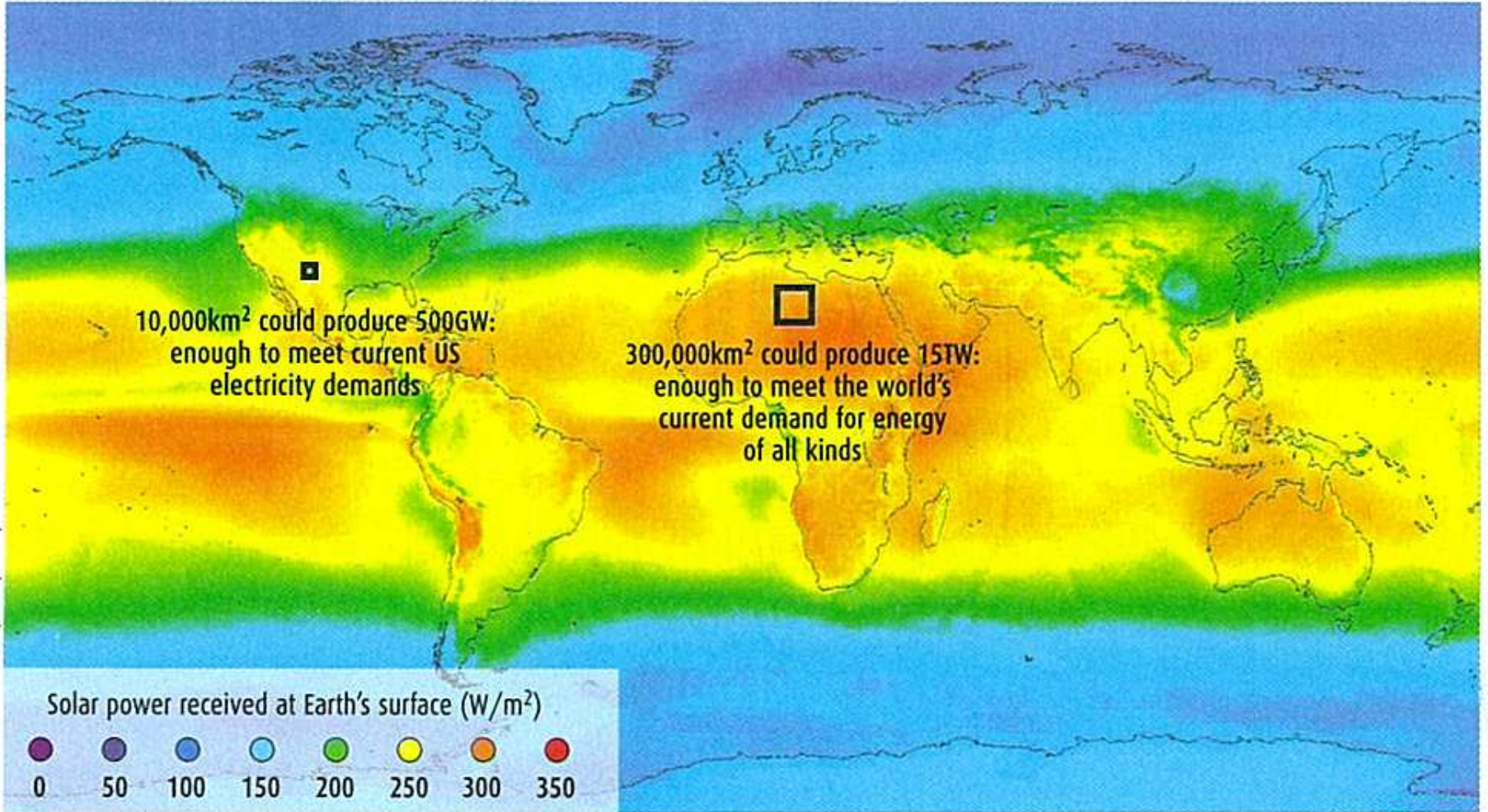
* Shipping to UK - €0.124/kg from Spain, €0.25/kg from Morocco

(organic cherry vine tomatoes - €13 retail)

Peak oil



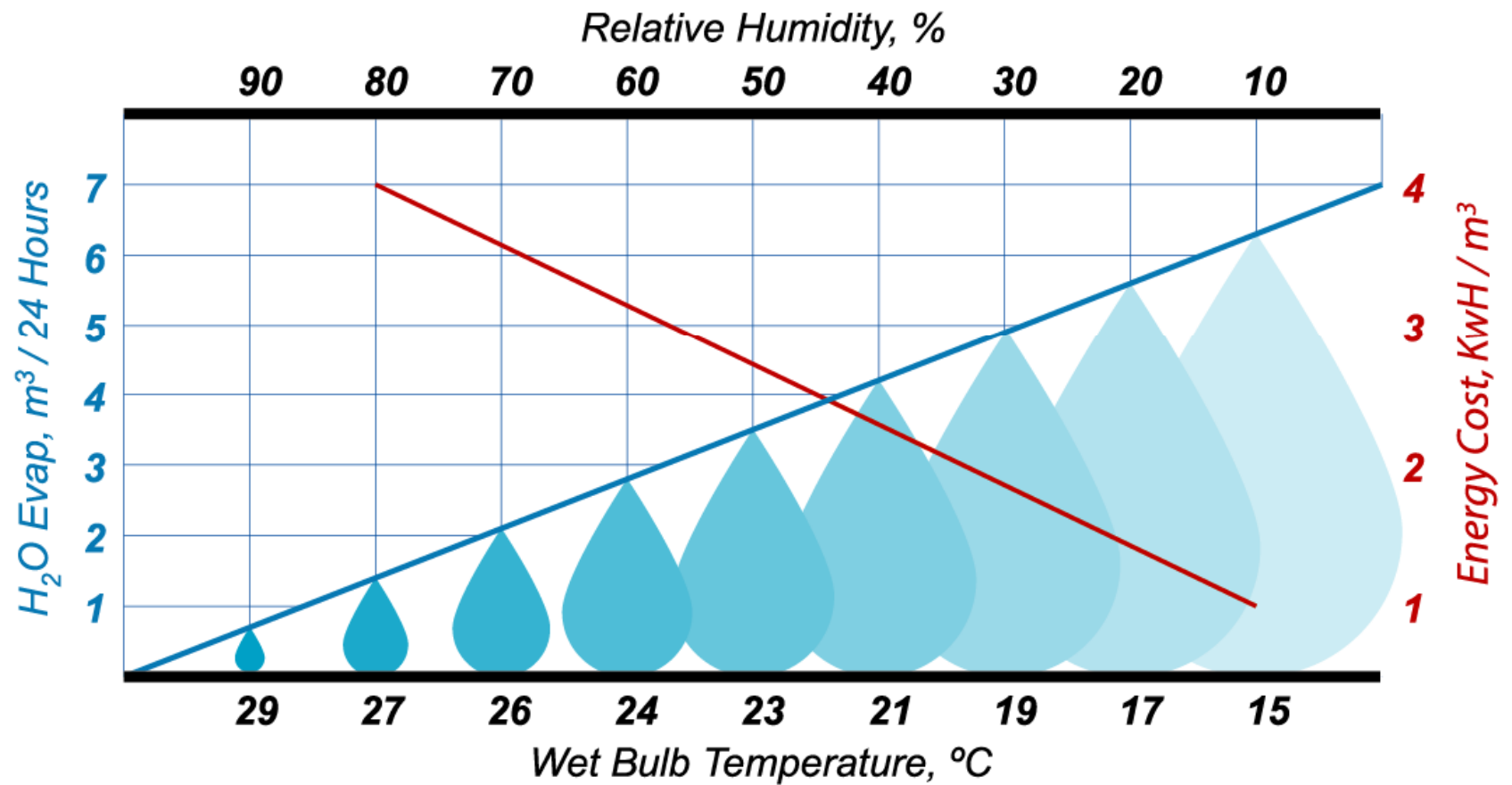
A big enough area of photovoltaic cells could supply all the electricity for the most energy-hungry country on Earth - or even meet the whole world's energy needs



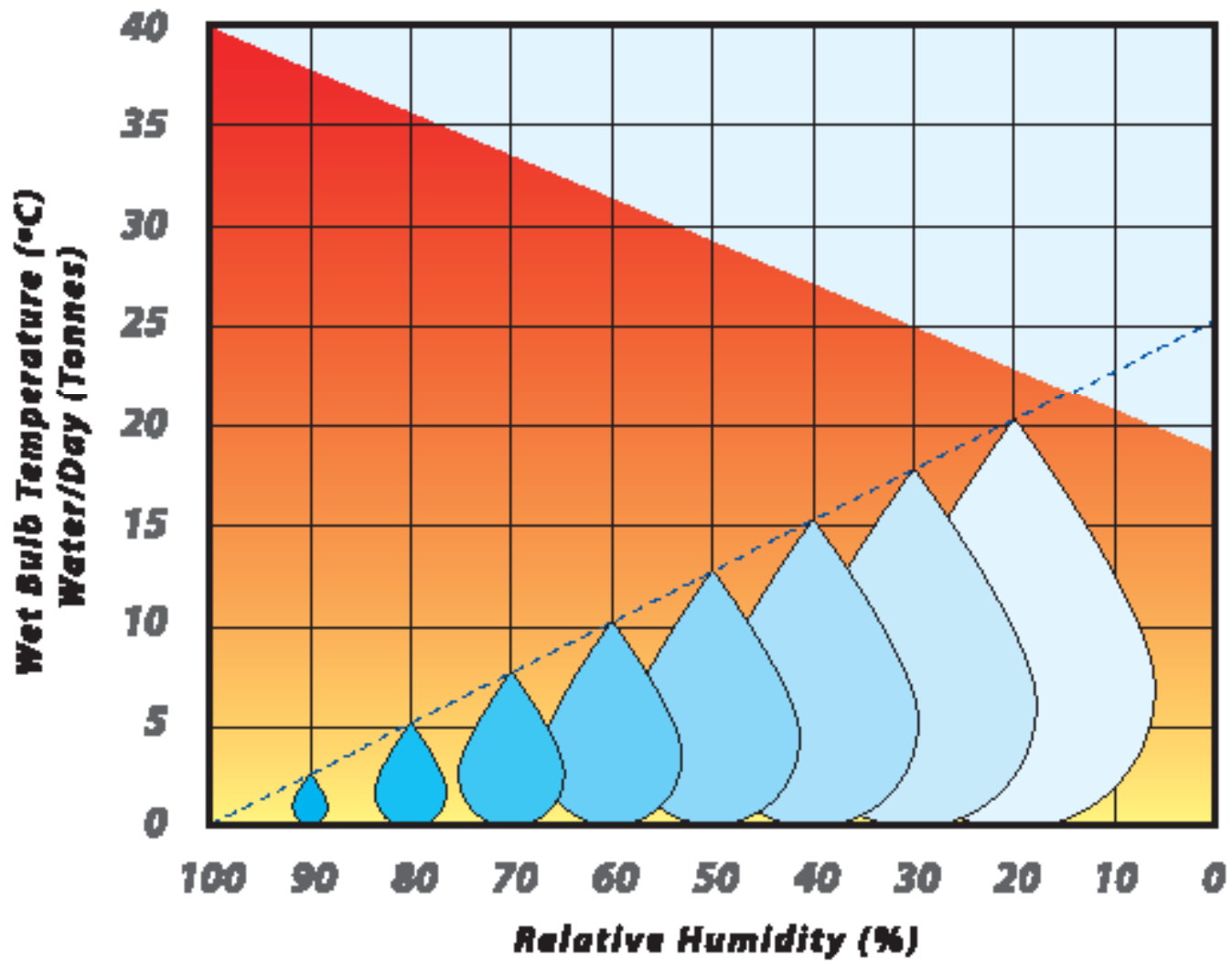
SOURCE: MATTHIAS LOSTER/NASA/NOAA/EIA, 2005

Source: New Scientist

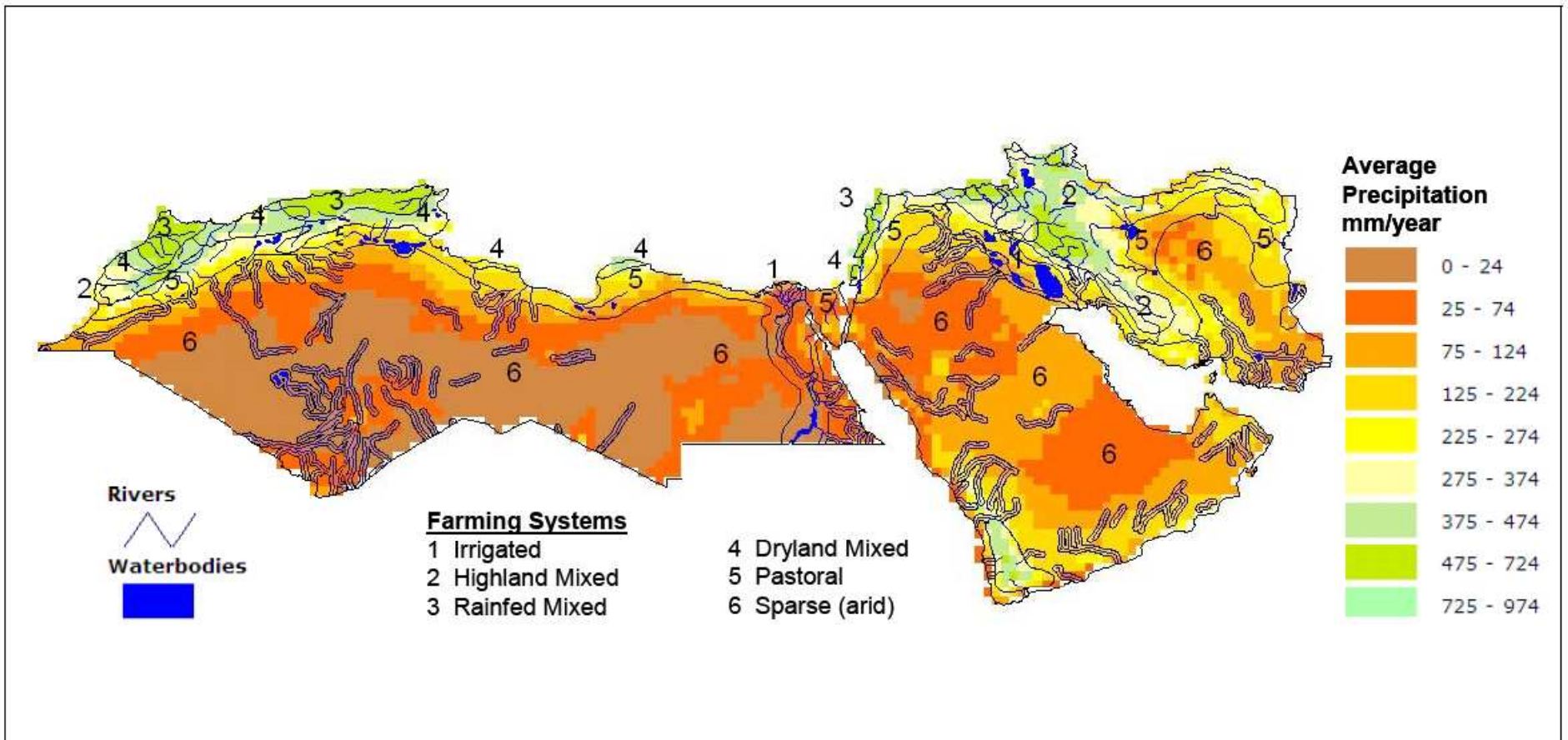
Cooling potential of Air at 30°C



Cooling Potential of Air at 40°C



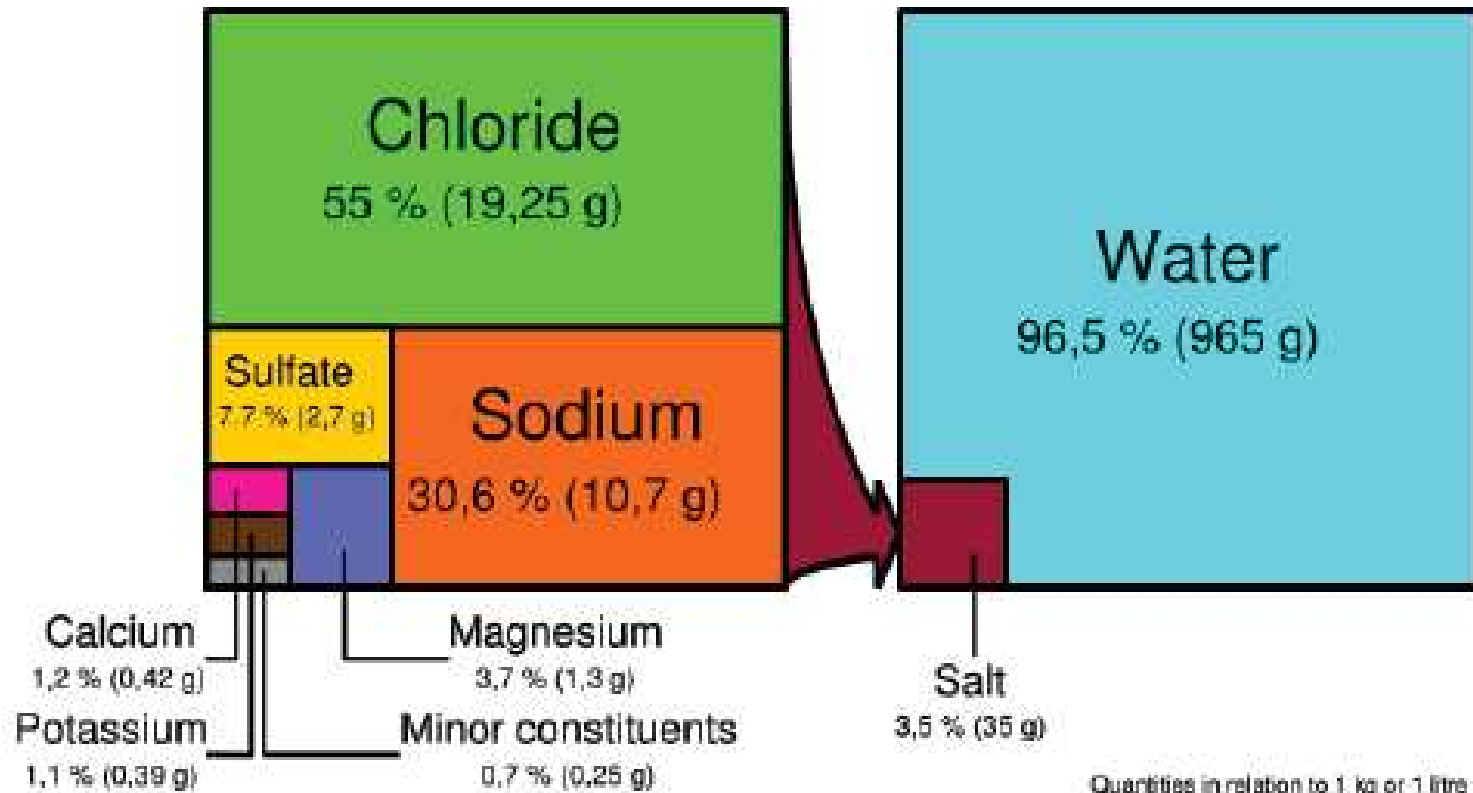




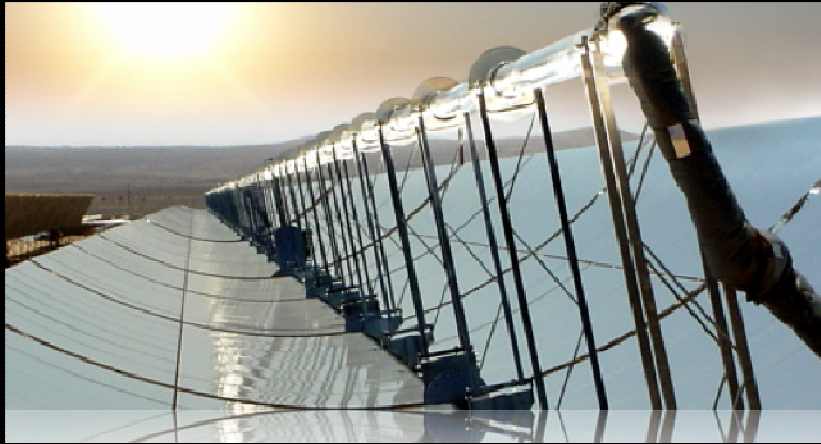
Annual Precipitation in the MENA Region – FAO 2007

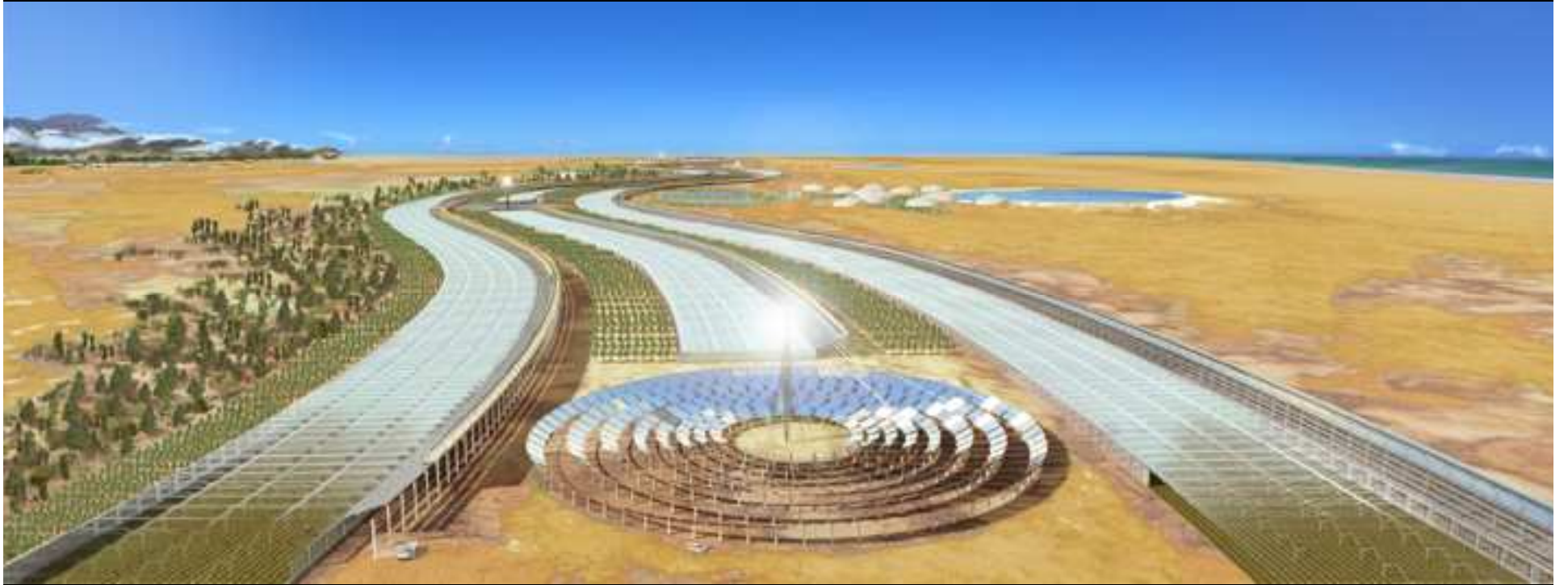
Sea salts

Sea water

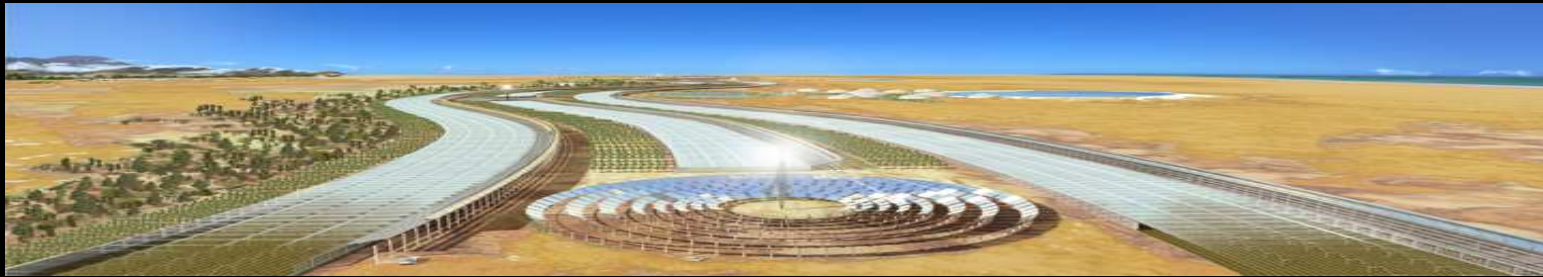


Quantities in relation to 1 kg or 1 litre of sea water.





Seawater Greenhouse / CSP Synergies



- *Distilled water for turbines*
- *Distilled water for cleaning mirrors*
- *Dust suppression from plants and evaporators*
- *Use of waste heat for increased water production*
- *Biomass – Jatropha ‘diesel’ For night time operation*
- *Shared infrastructure*
- *Shared ideal conditions – hot, sunny remote desert*



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Green house integration

