



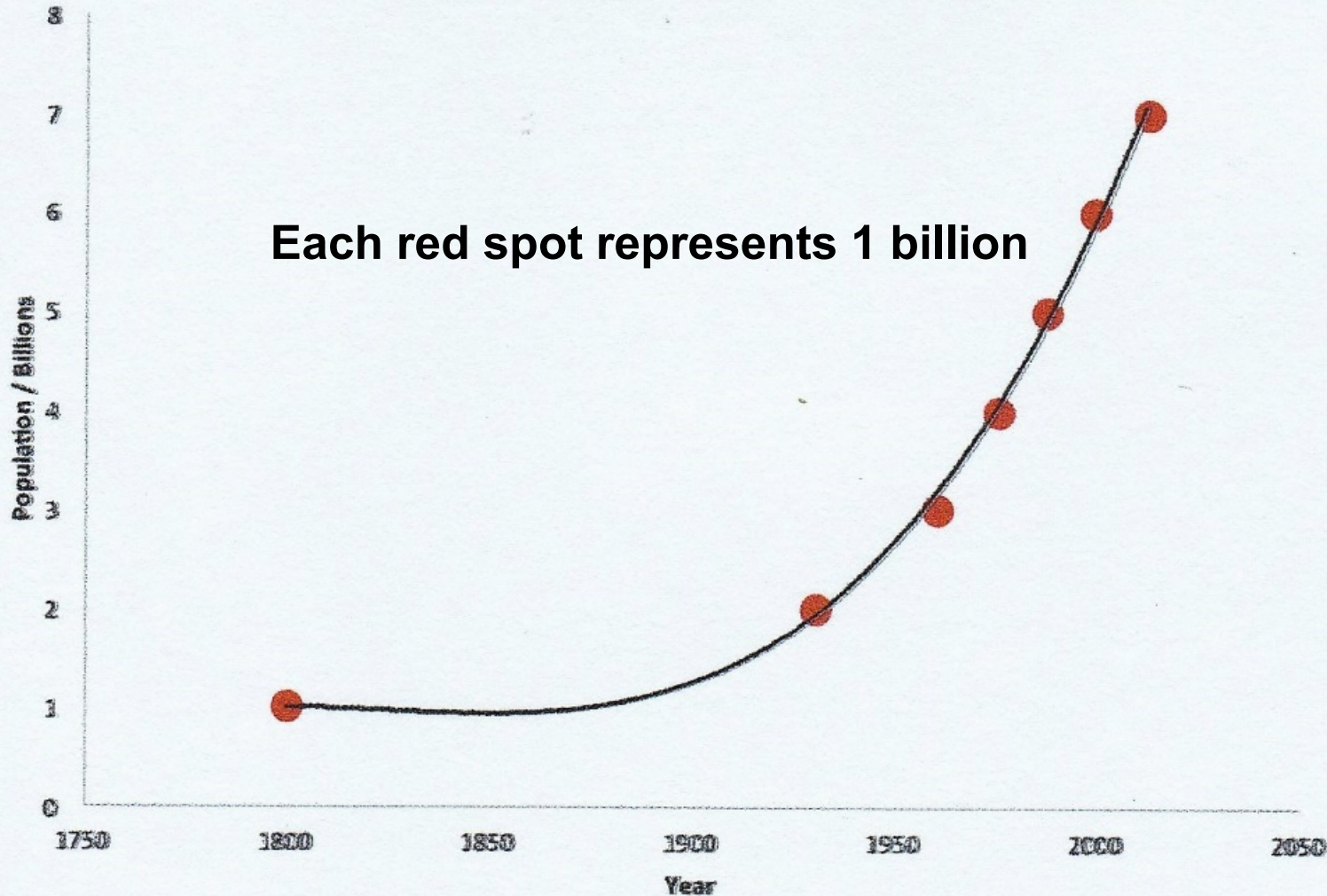
# **Climate Change and the Importance of RENEWABLE ENERGY**

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**Chairman of Med Green Forum & IEI**  
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- 1- Climate Change**
- 2- Renewable Energy A Global Senario**
  - A- Geothermal Energy**
  - B- Hydropower**
  - C- Biomass & Biogas**
  - D- Waste to Energy**
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# CLIMATE CHANGE

## Human Population Growth



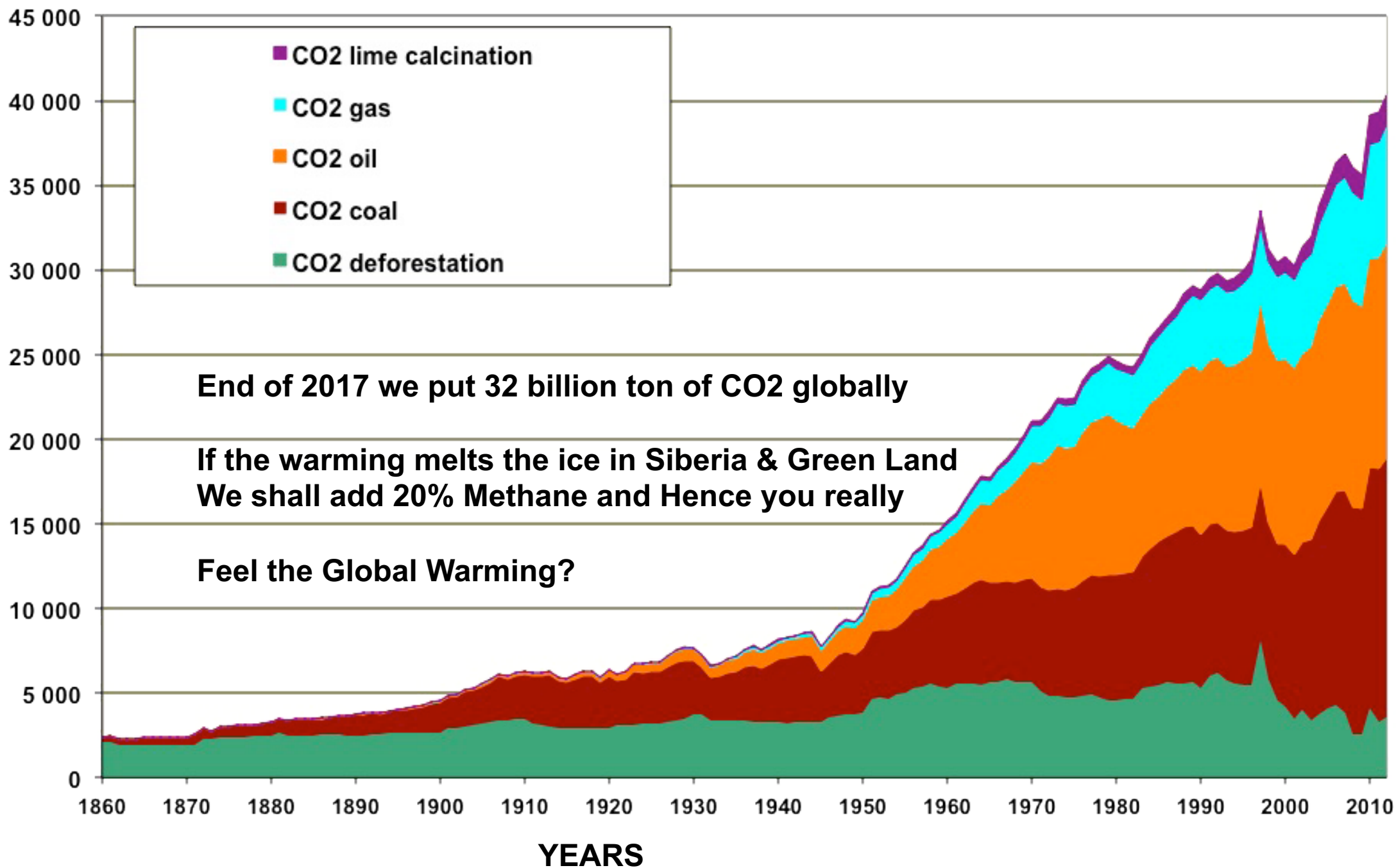
Quoting Dr Russell-Jones  
in "Gilgamesh Gene"

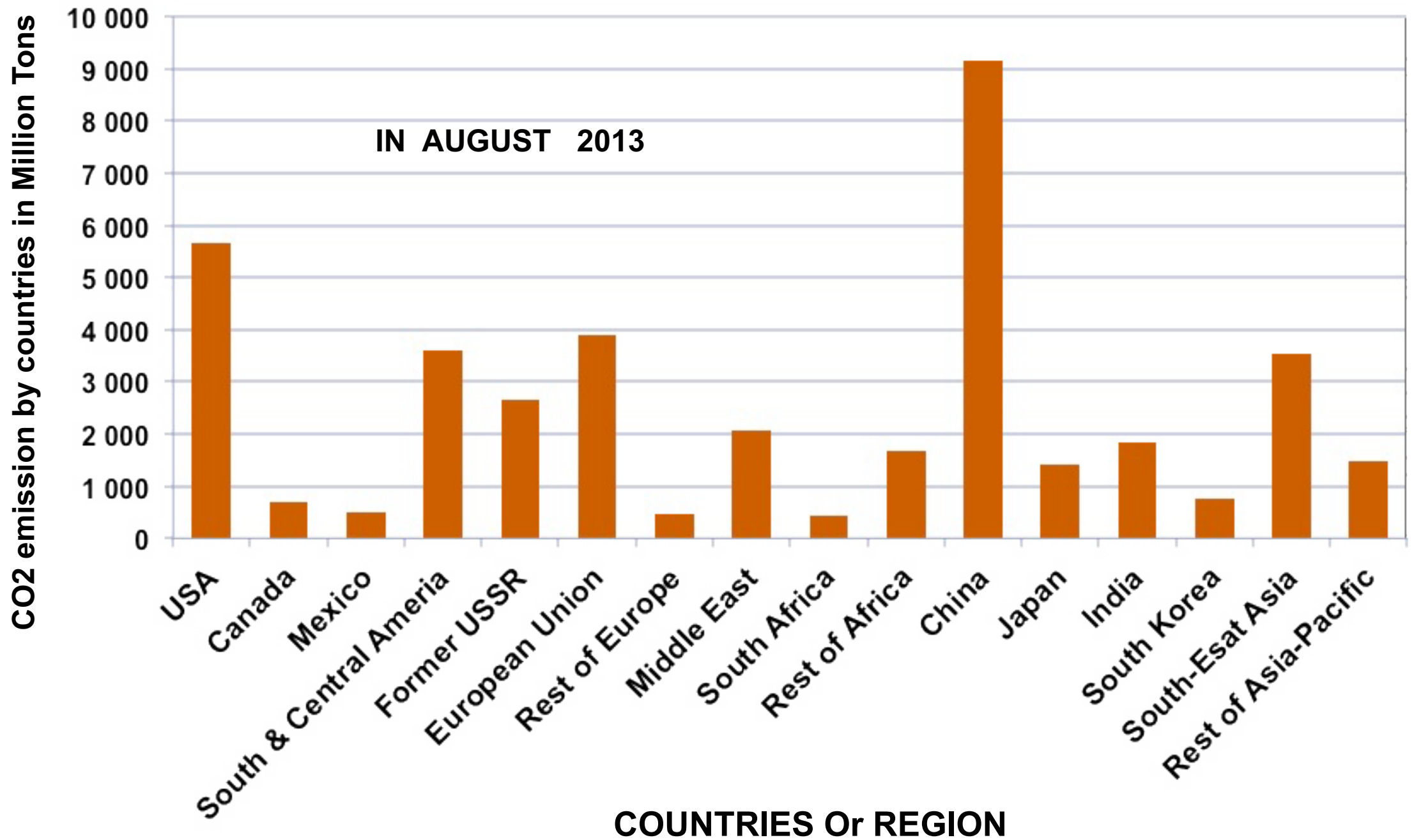
The growth is Exponential  
In any situation when populations  
Run out of control as in locusts  
or rats, they soon outrun their  
food supply or have disease or  
Starvation.

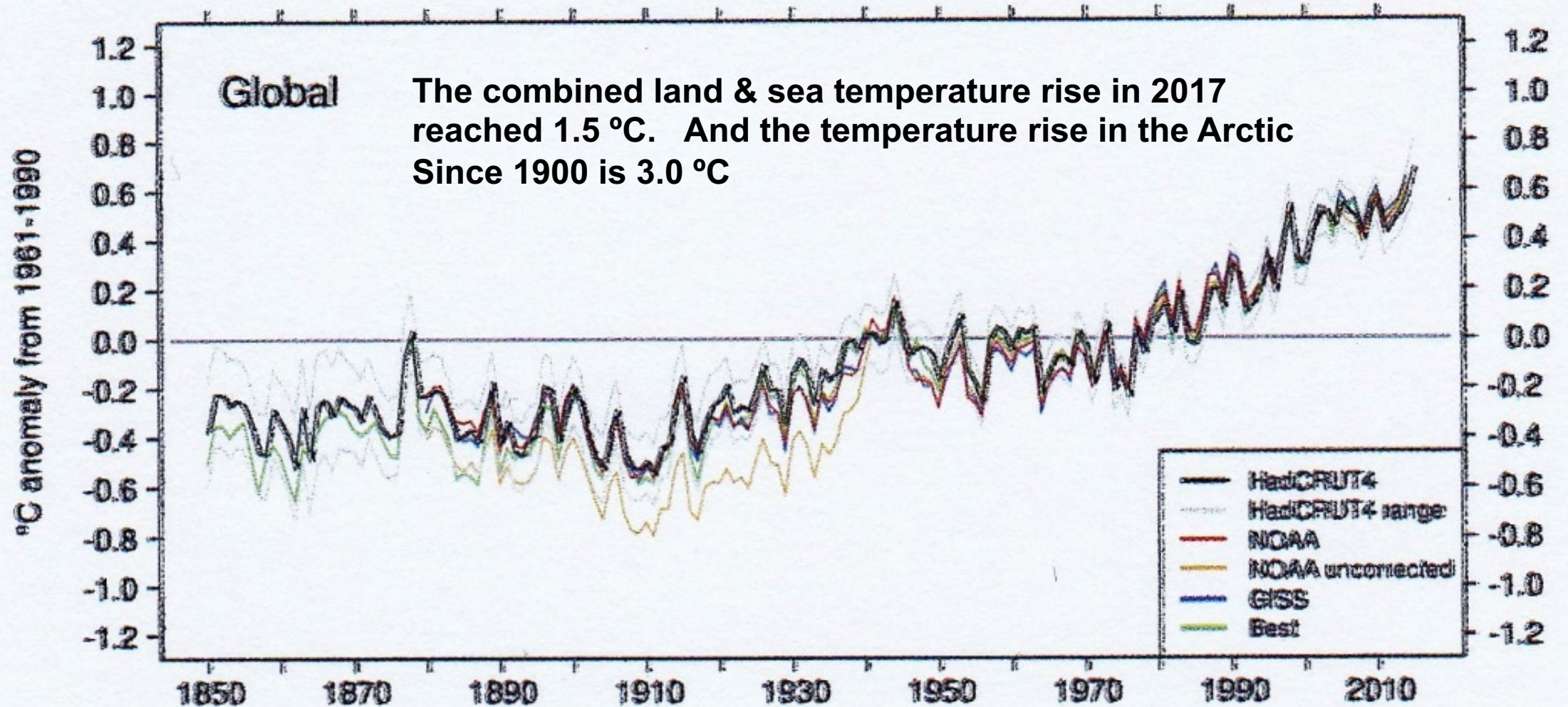
In human case we have the  
knowledge to protect ourselves  
but insufficient insight to  
appreciate the existential threat  
Posed by:

**CLIMATE CHANGE**

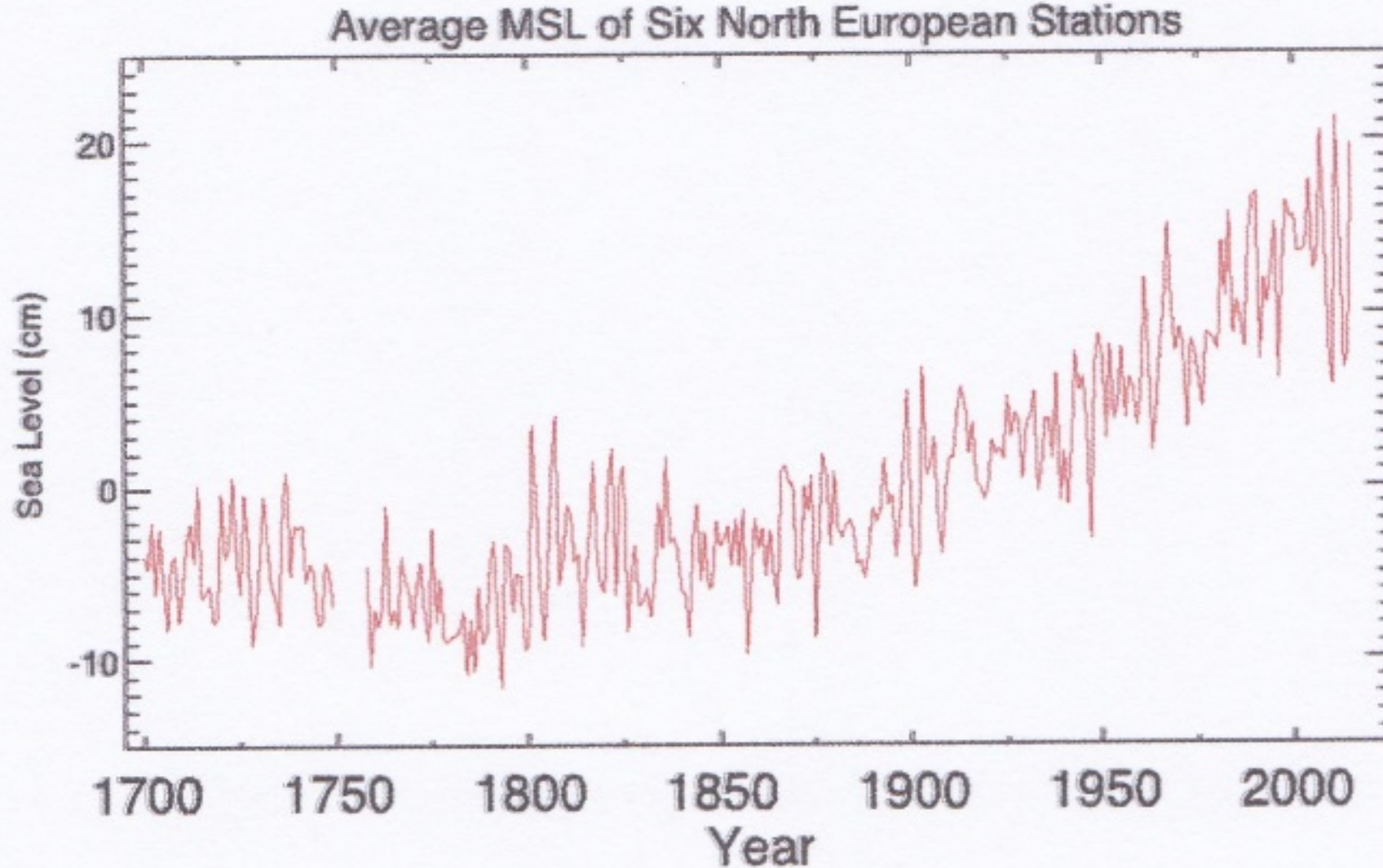
CO2 Emission in million ton







**Global Temperature rise since 1850 averaged between north and south, sea & land**



Since 1900 the rise  
Is 1.7 mm per annum

But since 1993 this  
Increase to 3.2 mm  
per annum

IPCC predicting by  
2100 The rise could  
Reach 2 metre

10% of the World  
Population live on  
coastal area

Places like the Nile  
Delta, Bangladesh and  
Vietnam will be  
effected



**Self Ignited Fires**



**STOP**  
**NO**  
**BOATS**

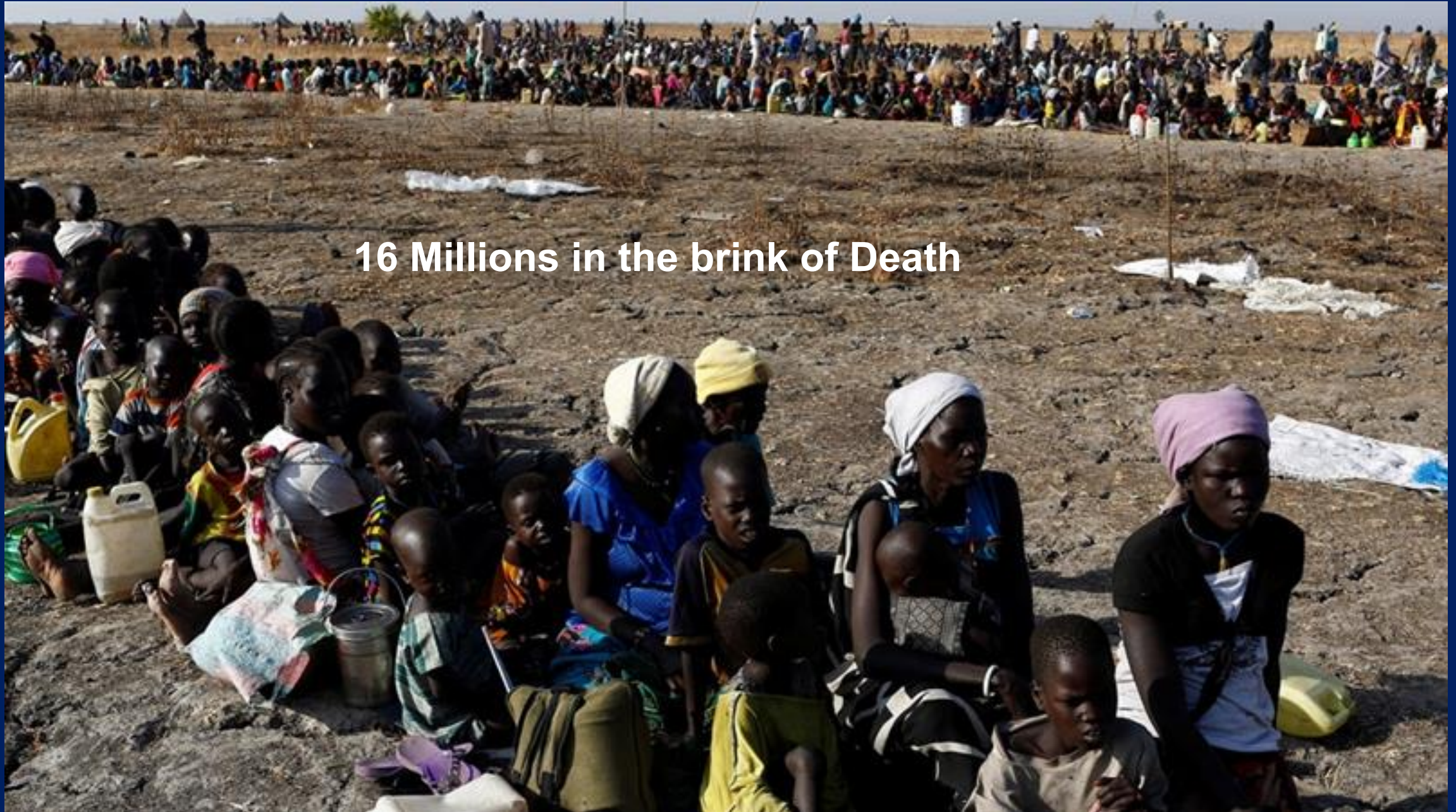


## **Drought & Flood**



The guardian news paper

**On Saturday 19 August, 2017, under heading:  
Kuwait feels the heat. Kuwait temperature reached  
54 °C**



**16 Millions in the brink of Death**

**In 2010, Paris alone had Heat Wave killed 10,000 persons**



**UK Flooding Due to Excessive Rain**



© UNHCR/A. McConnell

Imagine being forced to flee your country in order to escape to safety. If you were lucky you had time to pack a bag. If not, you simply dropped everything and ran.



**Escaping from Death  
To have a chance to live  
It is all Man Made?**

**If we need to secure our life on the Earth**

**For the next 200 years then, we must**

**Apply seriously the following:**

**A- Energy Conservation**

**B- Use energy efficiency &  
recycling of all our materials**

**C- Use of Renewable Energy**

**D- Use of Green Buildings  
and Cities**

# Geothermal Energy



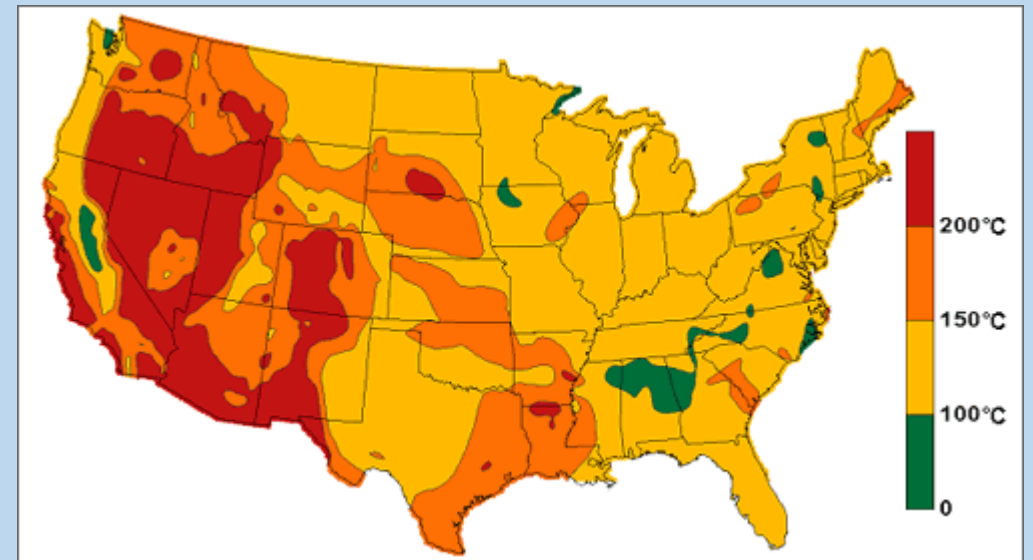
The 120-MWe [Nesjavellir](#) power station in southwest Iceland



Malaysia first 30 MW Geothermal Plant



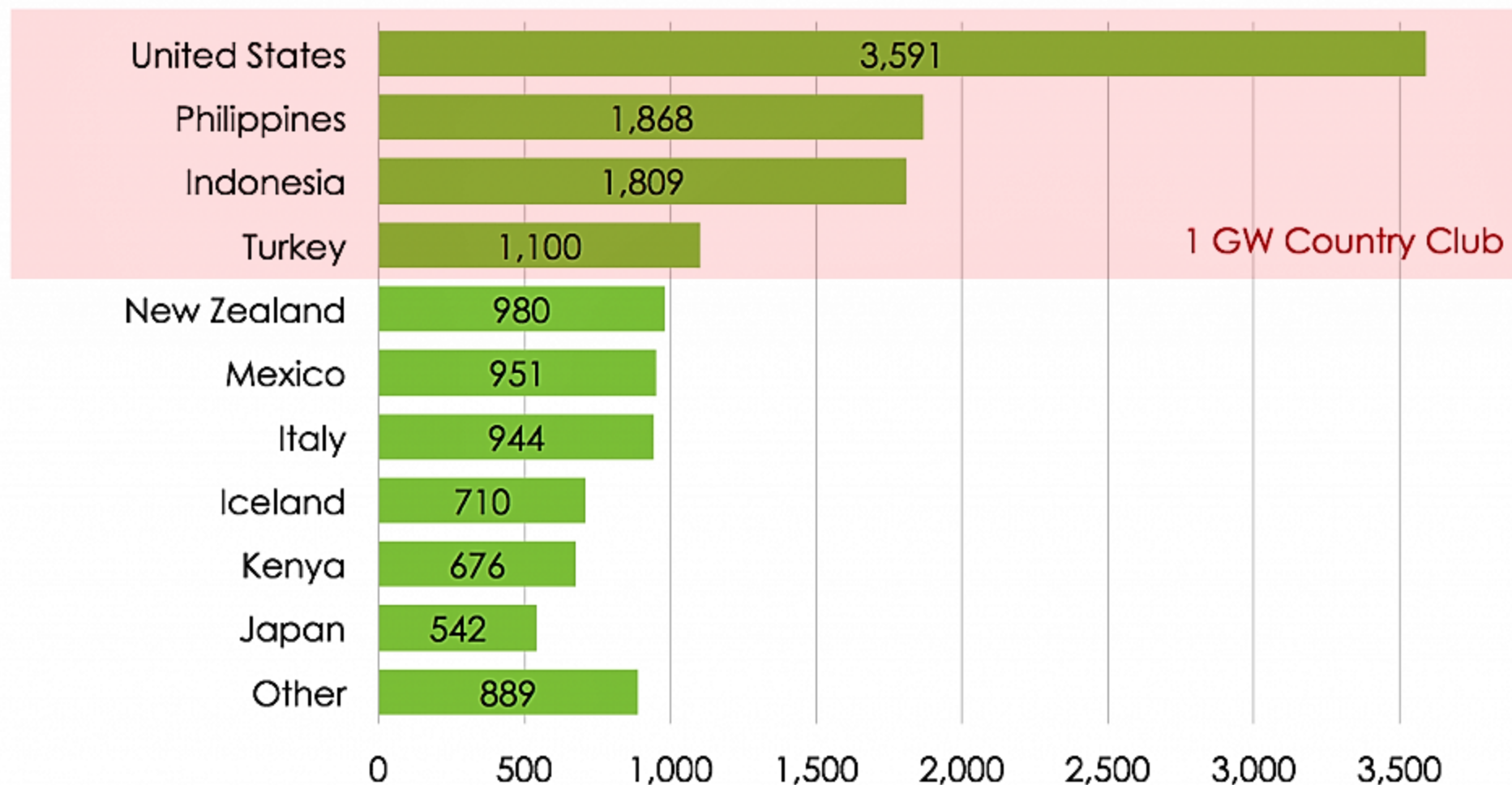
**48 MW  
Geothermal  
Plant in  
Chile**



**Geothermal temperature at 6 km depth in USA**

## TOP 10 GEOTHERMAL COUNTRIES

INSTALLED CAPACITY - MW (JANUARY 2018) – 14,060 MW IN TOTAL



Source: TGE Research (2017), GEA (2016), IGA (2015), JESDER (2017) Enerji Atlası (2017)

# Hydropower



**Quatinah Barrage / Lake Homs Dam, Syria**

located in Syria, The dam was constructed during the reign of the Egyptian Pharaoh Sethi between 1319-1304 BC



**18 GW scheme at the Three Gorges**  
**An example of Large Hydro ( $> 10$  MW)**

- **Small Hydro (1 – 10 MW)**
- **Mini Hydro (100 kW – 1 MW)**
- **Micro Hydro ( $< 100$  kW)**

**And finally Pico Hydro ( $< 5$  kW)...**



**Hydropower in Sweden is very important, on River Indalsälven only there are six dams with a total capacity of 626 MW**

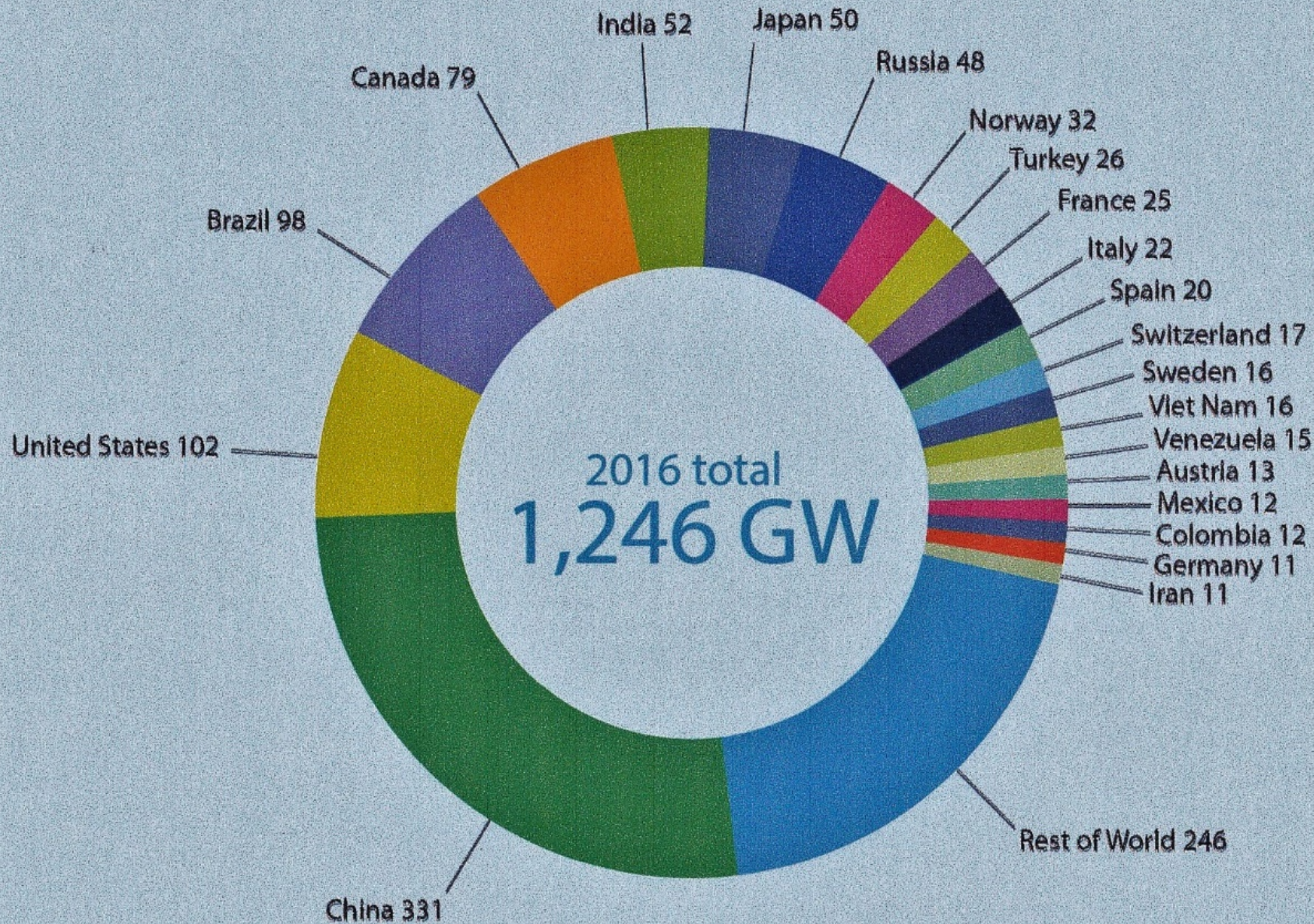
Ref: Global Energy World, June 28, 2013



**France has emerged as top tidal energy generator with 500 GWh of electricity produced from its tidal resources in 2016, according to the International Energy Agency's (IEA) renewables statistics for 2017.**

**South Korea has 495 GWh**

**Canada has 13 GWh station**

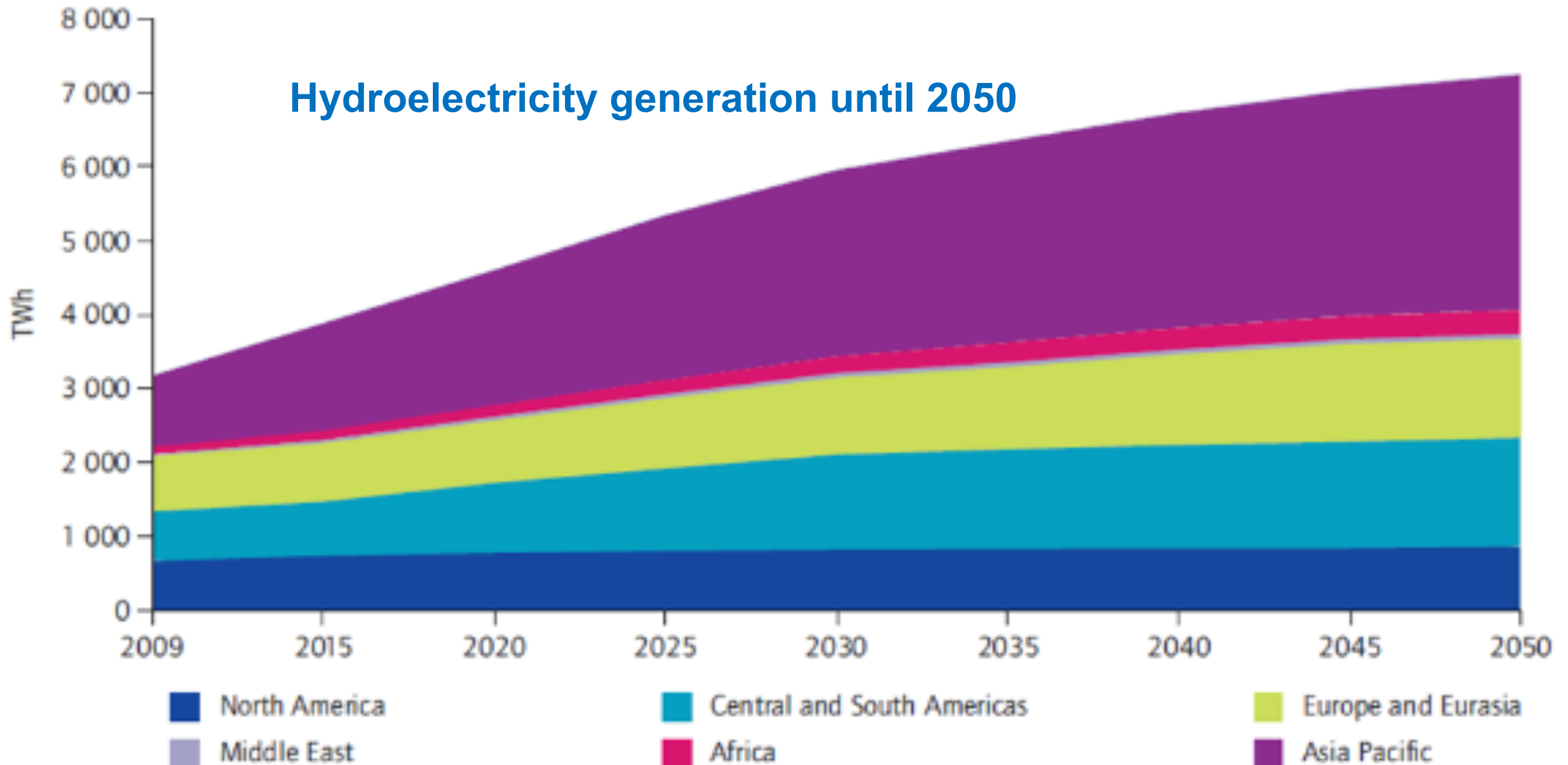


**World installed  
Hydropower  
Capacity in GW  
at the end of  
2016  
Including 150  
GW  
Pumped  
storage**

Ref: 2017 KEY TRENDS IN  
HYDROPOWER

## in the Hydropower Roadmap vision (TWh)

### Hydroelectricity generation until 2050



Sources: IEA, 2012c and MME data.

# **BIOMASS & BIOGAS**



**Tamar Energy's 3MW facility near Retford is set to provide enough green electricity to power 6,000 homes**



**8.5 megawatt biogas plant in Brandenburg, Germany, is located in Vettin**



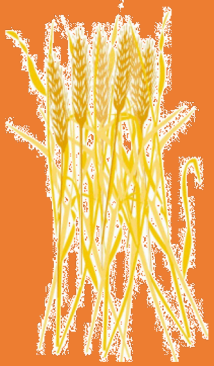
**Texas Biomass plant  
140 MW**

**USA has 188 Biomass  
Plants with a capacity  
of 23,035 MW**

# Crops to produce Bioethanol or Biodiesel

## BIOFUELS

### Cereals and root crops



**Wheat**  
**/cereals**



**Corn**  
**(maize)**



**Sugar beet**  
**/ Cane**



**Potato**



**Bioethanol**

### Oilseeds



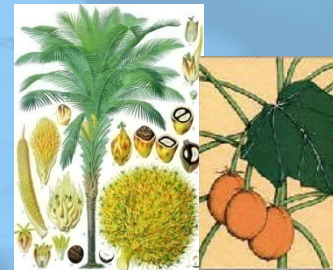
**OSR**



**Sunflower**



**Soybean**

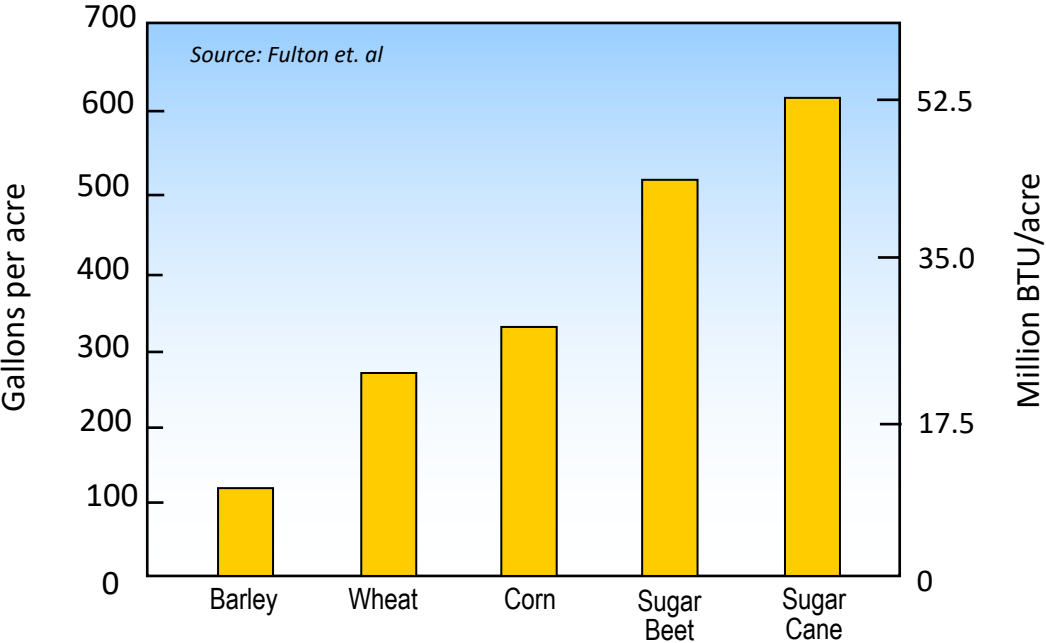


**Palm/  
Jatropha**

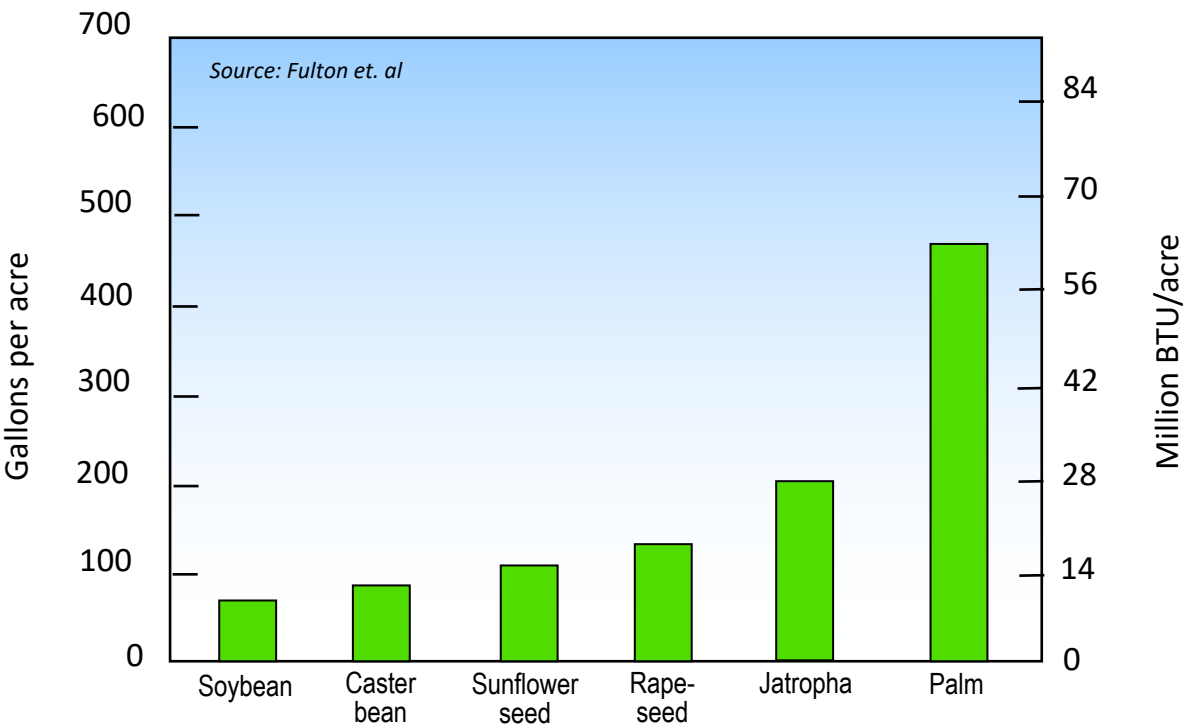


**Biodiesel**

# Ethanol Production from Sugars



# Biodiesel Production from Oils



# Algae is the Future Fuel



| Gallons of Oil per Acre per Year |          |
|----------------------------------|----------|
| Corn                             | 18       |
| Soybeans                         | 48       |
| Safflower                        | 83       |
| Sunflower                        | 102      |
| Rapeseed                         | 127      |
| Oil Palm                         | 635      |
| Micro Algae                      | 500-1500 |

Published on Global Energy World: Dec 20, 2012



**A French Biochemist – Pierre Calleja invented Biolamp using Algae absorbing CO<sub>2</sub> and Light to produce electricity stored in a battery then using LED lamps to light streets, underground car parks and shops. Algae has the ability to absorb 150-200 times of trees.**

**filling the  
lamp form  
with  
microalgae-  
containing  
fluid**



**Indoor Lighting**



**The Airbus A321 aircraft powered by jet engines flew from Toulouse to Paris with a blend of renewable jet fuel produced by Amyris and Total. The fuel produced from sugarcane in Brazil**

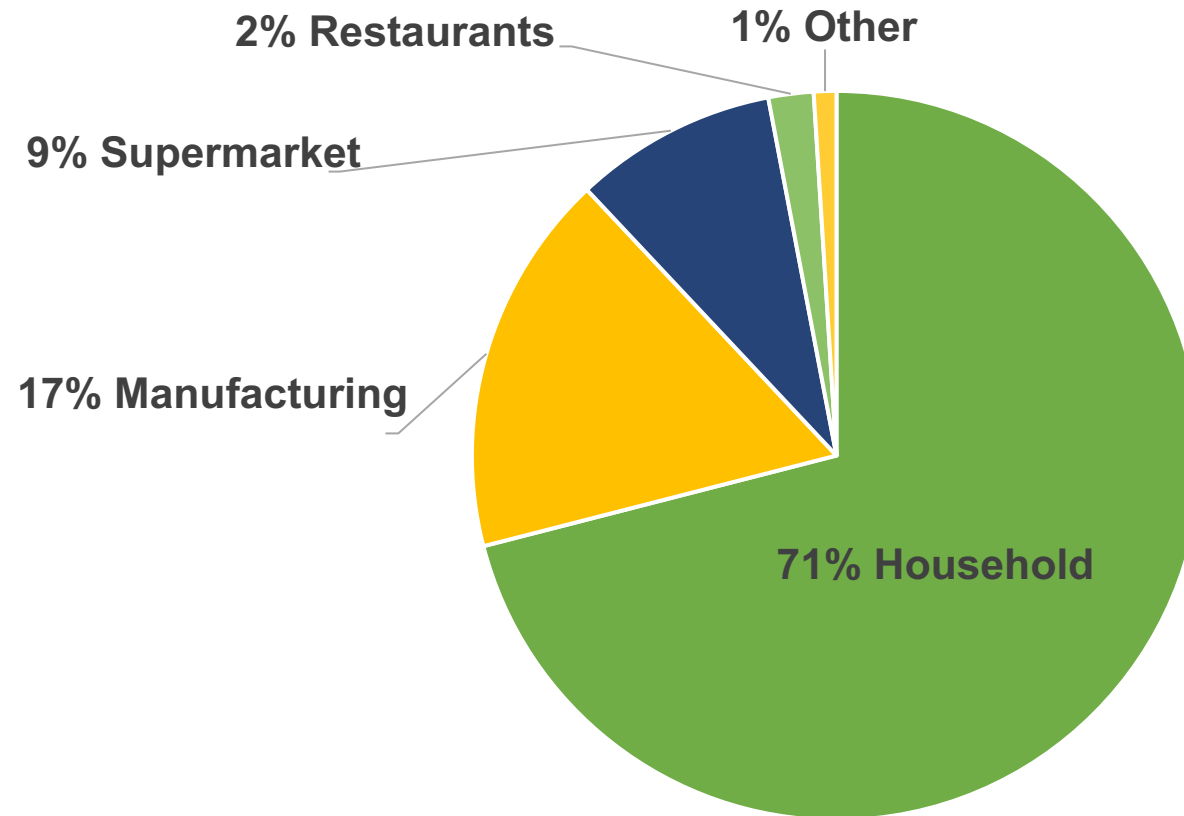


**Global cumulative biopower installed capacity increased significantly from 49 Gigawatts (GW) in 2006 to 87.6 GW in 2013**  
**End of 2016 = 110 GW**  
**Expected to reach 165.1 GW by the end of 2025 mostly Solid Biofuel**

Ref: Global Energy World October 6, 2014

# **WASTE TO ENERGY**

## UK FOOD WASTE BY SECTOR

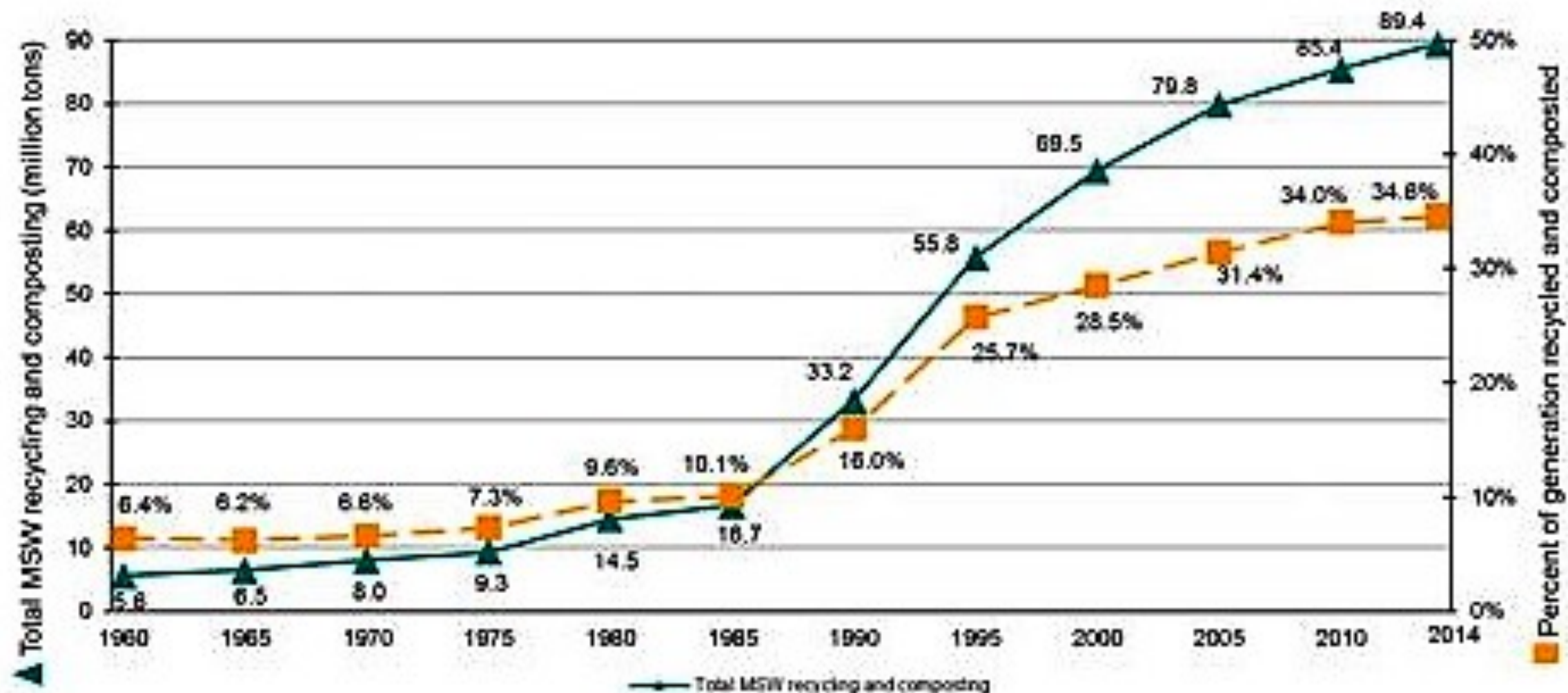


UK households waste  
The equivalent of  
**6 meals** per week

112.6 kg of food wasted  
Each year in the UK per  
Household.

**A third of all food is thrown out Globally**

£13 billion worth of food is thrown out instead of eaten in the UK each year



**MSW Recycling and Composting Rates, 1960 to 2014**

| Region      |                                                 | Waste Generation Per Capita (kg/capita/day) |                |         |
|-------------|-------------------------------------------------|---------------------------------------------|----------------|---------|
|             |                                                 | Lower Boundary                              | Upper Boundary | Average |
| <b>AFR</b>  | = Africa                                        | 0.09                                        | 3.0            | 0.65    |
| <b>EAP</b>  | = East Asia & Pacific                           | 0.44                                        | 4.3            | 0.95    |
| <b>ECA</b>  | = Europe & Central Asia                         | 0.29                                        | 2.1            | 1.1     |
| <b>LAC</b>  | =Latin America & Caribbean                      | 0.11                                        | 5.5            | 1.1     |
| <b>MENA</b> | = Middle East & North Africa                    | 0.16                                        | 5.7            | 1.1     |
| <b>OECD</b> | = 35 Countries including USA<br>Canada & Turkey | 1.10                                        | 3.7            | 2.2     |
| <b>SAR</b>  | = South Asia Region                             | 0.12                                        | 5.1            | 0.45    |

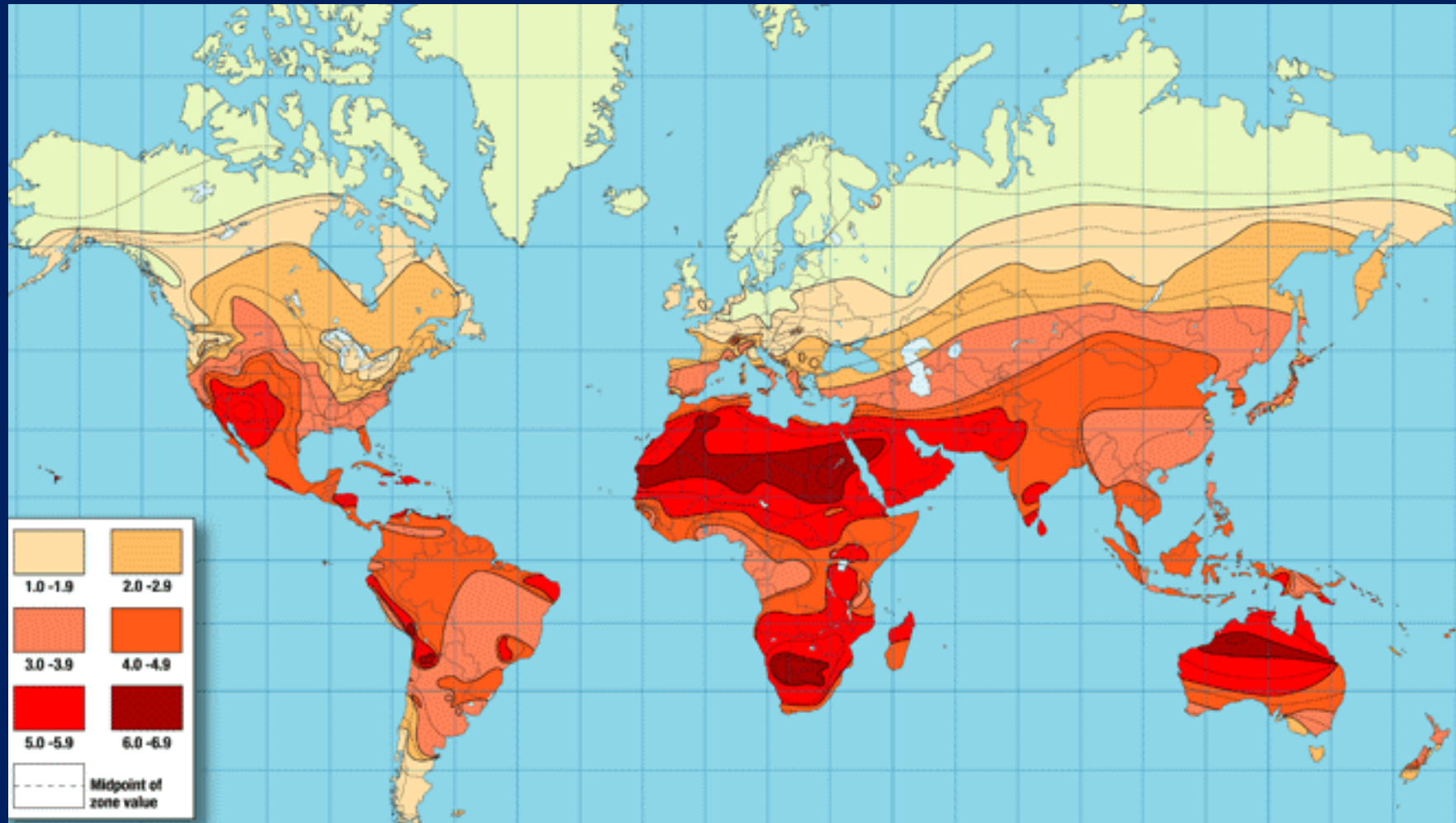
EU average is: 1.4 **GCC has high per capita waste generation rate, primarily because of high standard of living and lack of awarness about sustainable waste management practices.**

| COUNTRY      | POPULATION- Million | (MSW/year)X 10 <sup>6</sup> ton | COMMENT                                                                                                                                                                                                                                                                 |
|--------------|---------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Saudi Arabia | 32                  | 13                              | Huge quantity of sewage sludge is produced on daily basis which presents a serious problem due to its high treatment costs and risk to environment, human health and marine life<br><br>- wastewater generation in the Middle East is 80-200 litres per person per day. |
| UAE          | 9                   | 5                               |                                                                                                                                                                                                                                                                         |
| Qatar        | 2.5                 | 2.5                             |                                                                                                                                                                                                                                                                         |
| Kuwait       | 4.5                 | 2.0                             |                                                                                                                                                                                                                                                                         |
| Oman         | 4.5                 | 1.7                             |                                                                                                                                                                                                                                                                         |
| Bahrain      | 1.5                 | 1.5                             |                                                                                                                                                                                                                                                                         |

Ref: ECOMedia

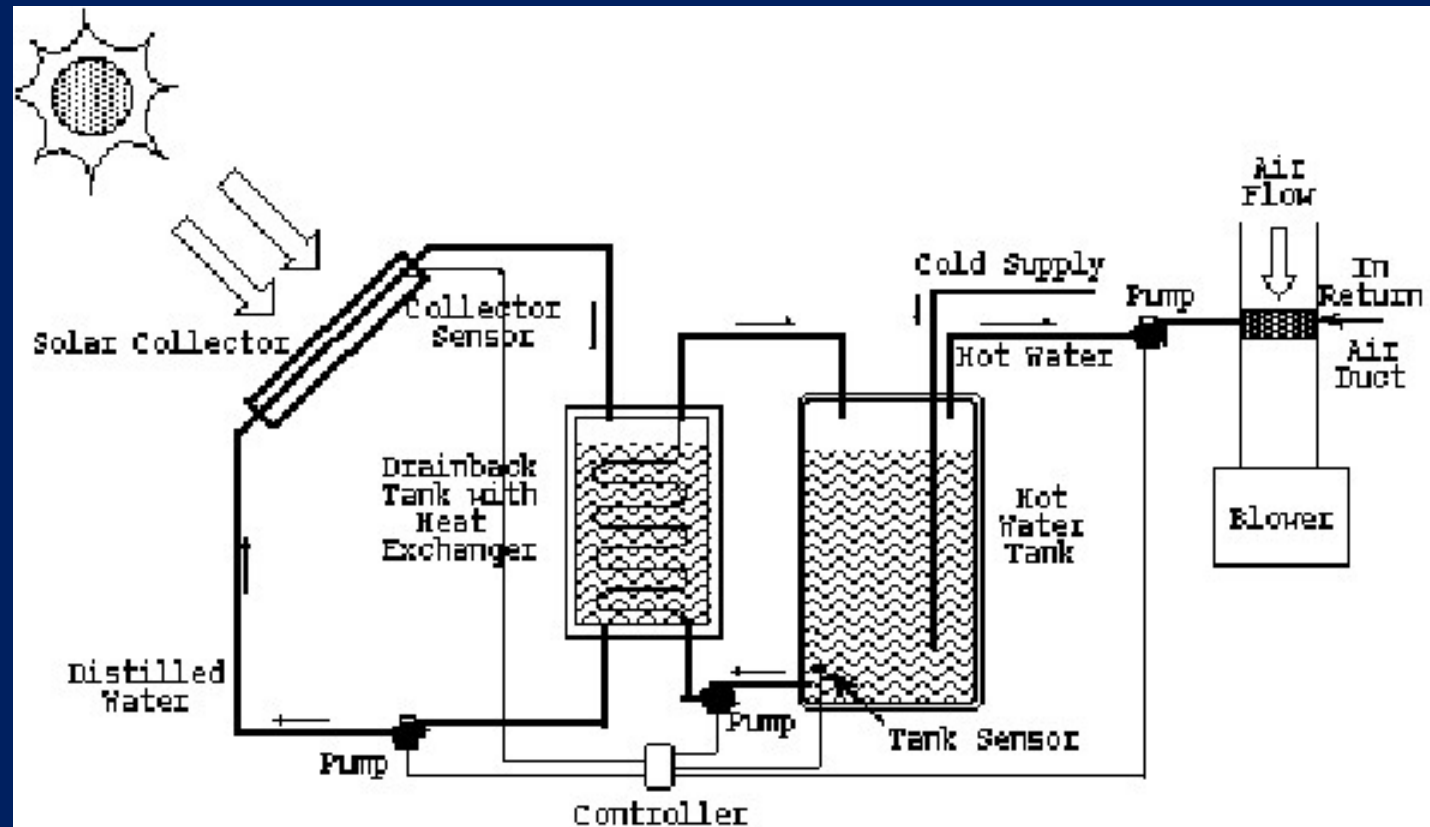
# **Solar Thermal Applications**

# Robust Global Solar Resource



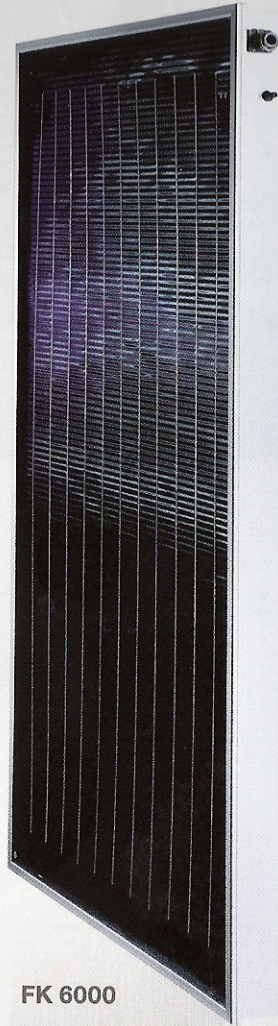
**Radiation in kWh/m<sup>2</sup> /day**

Source: <http://howto.altenergystore.com/Reference-Materials/Solar-Insolation-Map-World/a43/>

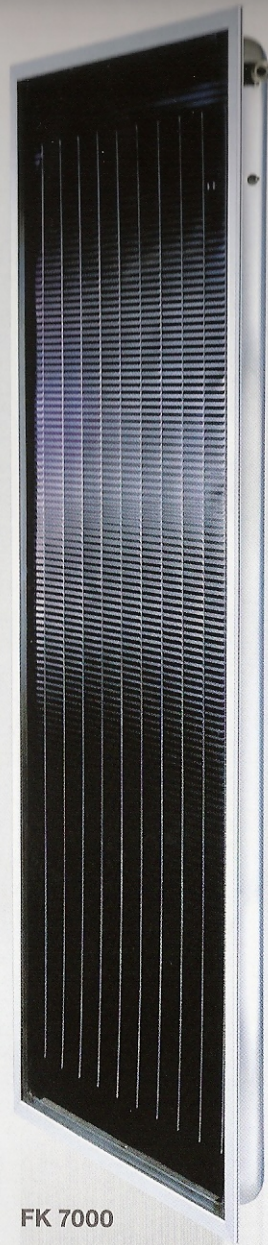


New US report to expand Solar Heating and Cooling (SHC) by US Solar Industry

This will create 50,250 new American jobs and save more than \$61 billion in future energy costs . This report provides a roadmap for increasing SHC capacity in the U.S. from 9 (GW) thermal to 300 GW thermal by 2050 through the installation of 100 million new SHC panels nationwide.



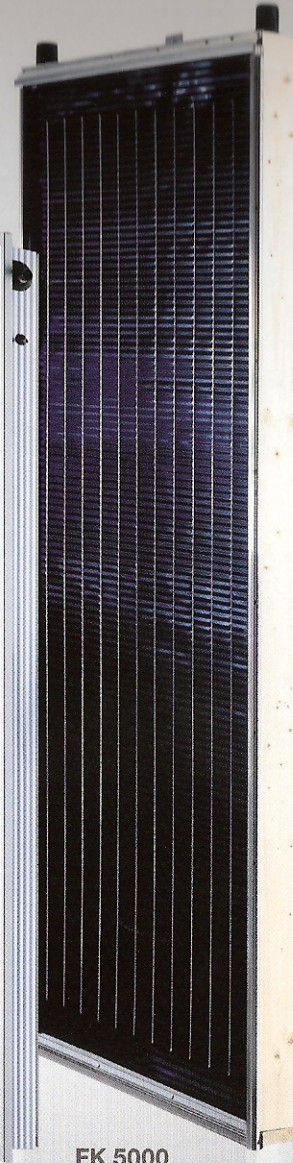
FK 6000



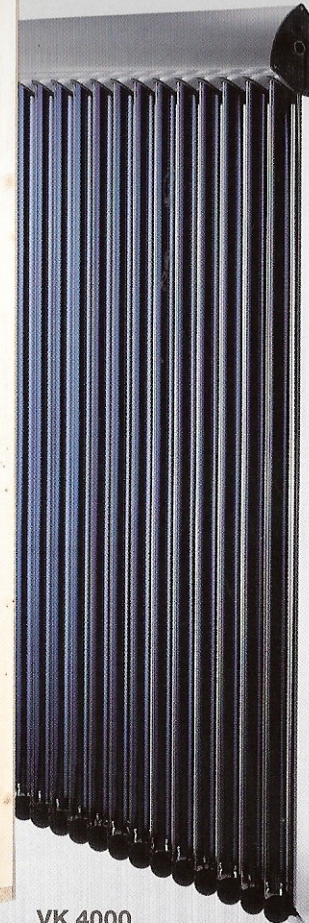
FK 7000



FK 8000



FK 5000

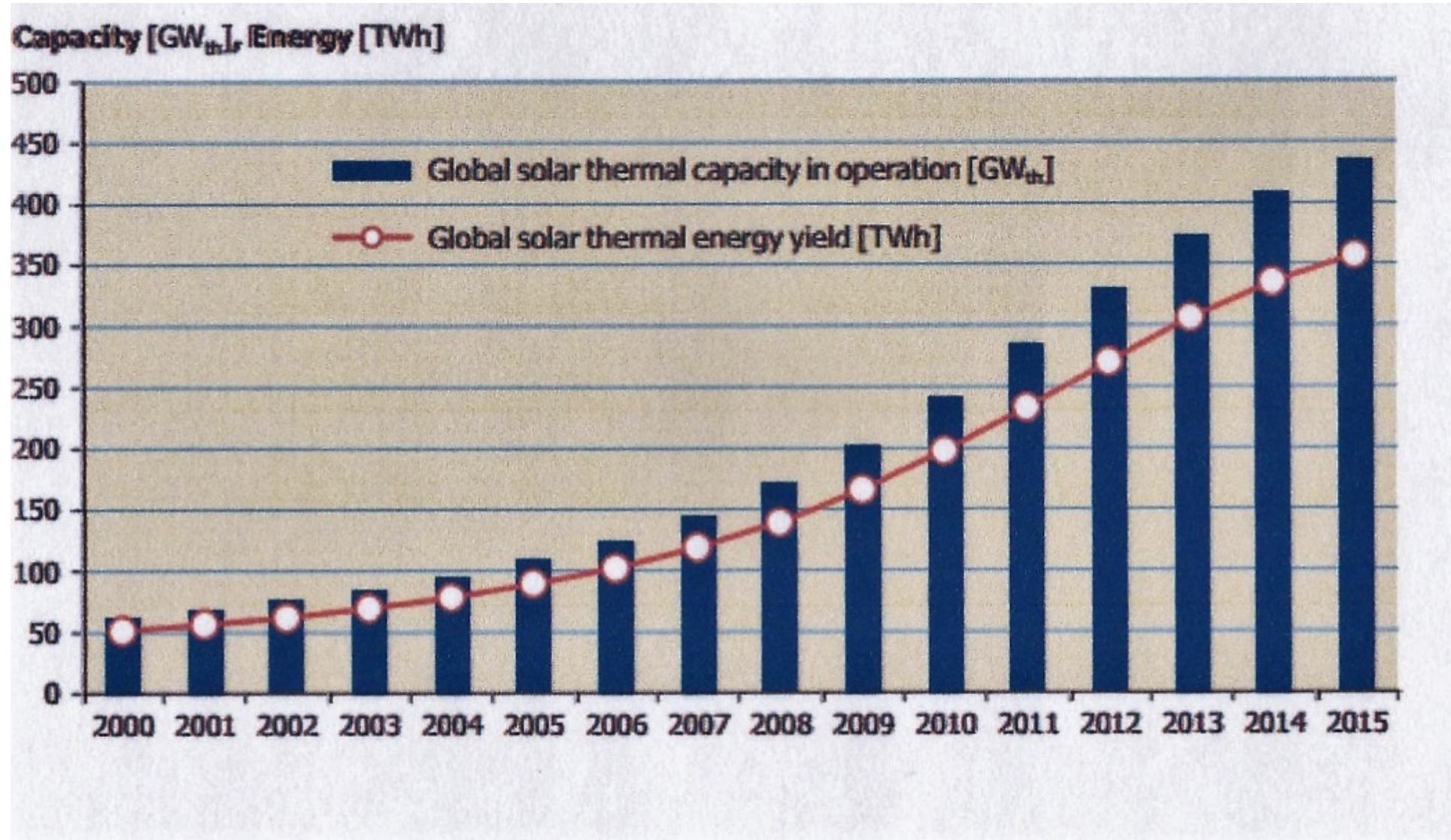


VK 4000

**Green one Tech – Solar Collectors, - 1,  
Austria, established 1991**

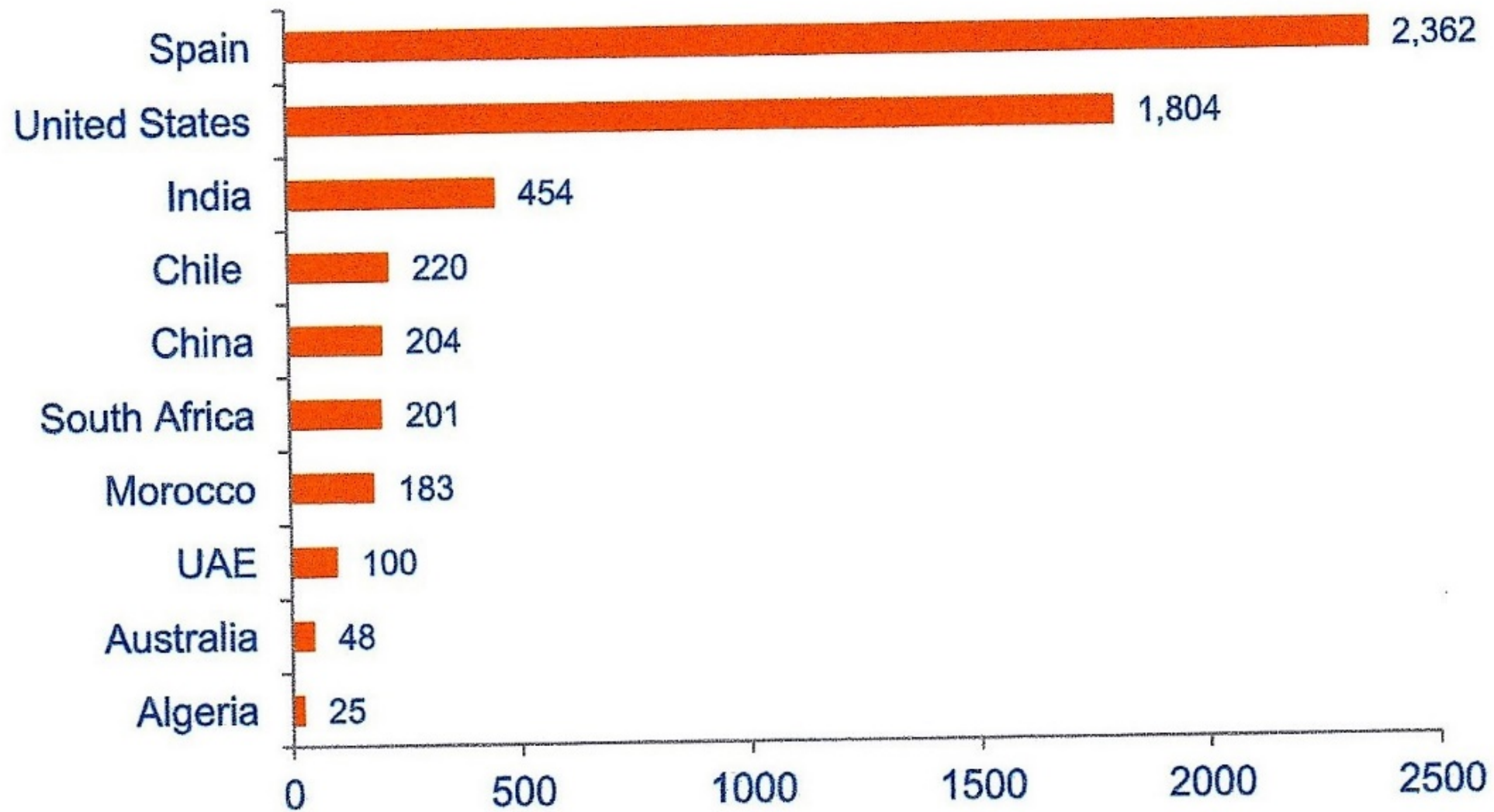


Islington London





## Concentrating Solar Power (CSP) in MW in the major countries end of 2016



**MW**

Ref: Statistica 2016