A dark tunnel with train tracks leading to a bright light at the end. The text is overlaid on the image.

The light at the end of  
the tunnel is the oncoming  
6<sup>th</sup> Mass Extinction...

**YOURS!**

And mankind is  
the primary  
cause

# Preparing to live with climate change



We all know what happened to the  
Dinosaurs 65 million years ago





# Why we need conservation

Earth is in the midst of the Sixth Mass Extinction: 50% of all species are disappearing

The last mass extinction was 65 million years ago. And it wasn't the first!

It is best known for the extinction of non-avian dinosaurs, but massive amounts of plant species became extinct at that time as well

If present trends continue one half of all species of life on earth will be extinct in less than 100 years, as a result of habitat destruction, pollution, invasive species, and climate change

There have been  
five previous mass  
extinctions

Climate change is  
implicated in almost  
every case!

Everyone knows  
what happened to  
the dinosaurs, and  
when

But they weren't  
the first to go

# Ordovician-Silurian mass extinction



**443 million years ago.** 85% of sea life wiped out due to ***climate change***

# Late Devonian mass extinction

2



**359 million years ago.** 75% of life wiped out. Start of the carboniferous era. Caused by asteroid impact and then *climate change*

# Permian mass extinction

3



**248 million years ago.** 96% of life wiped out. Various possible causes including massive methane release; asteroid impact; drop in oxygen levels; flood basalt eruptions

# Triassic-Jurassic mass extinction

4



**200 million years ago.** Possibly due to *climate change*; basaltic eruptions and impact events

# Cretaceous-Tertiary mass extinction



**65 million years ago.** Due in part to *climate change* and basaltic eruptions but eventually to a massive impact event. End of the dinosaurs and much else besides



# Some worrying facts

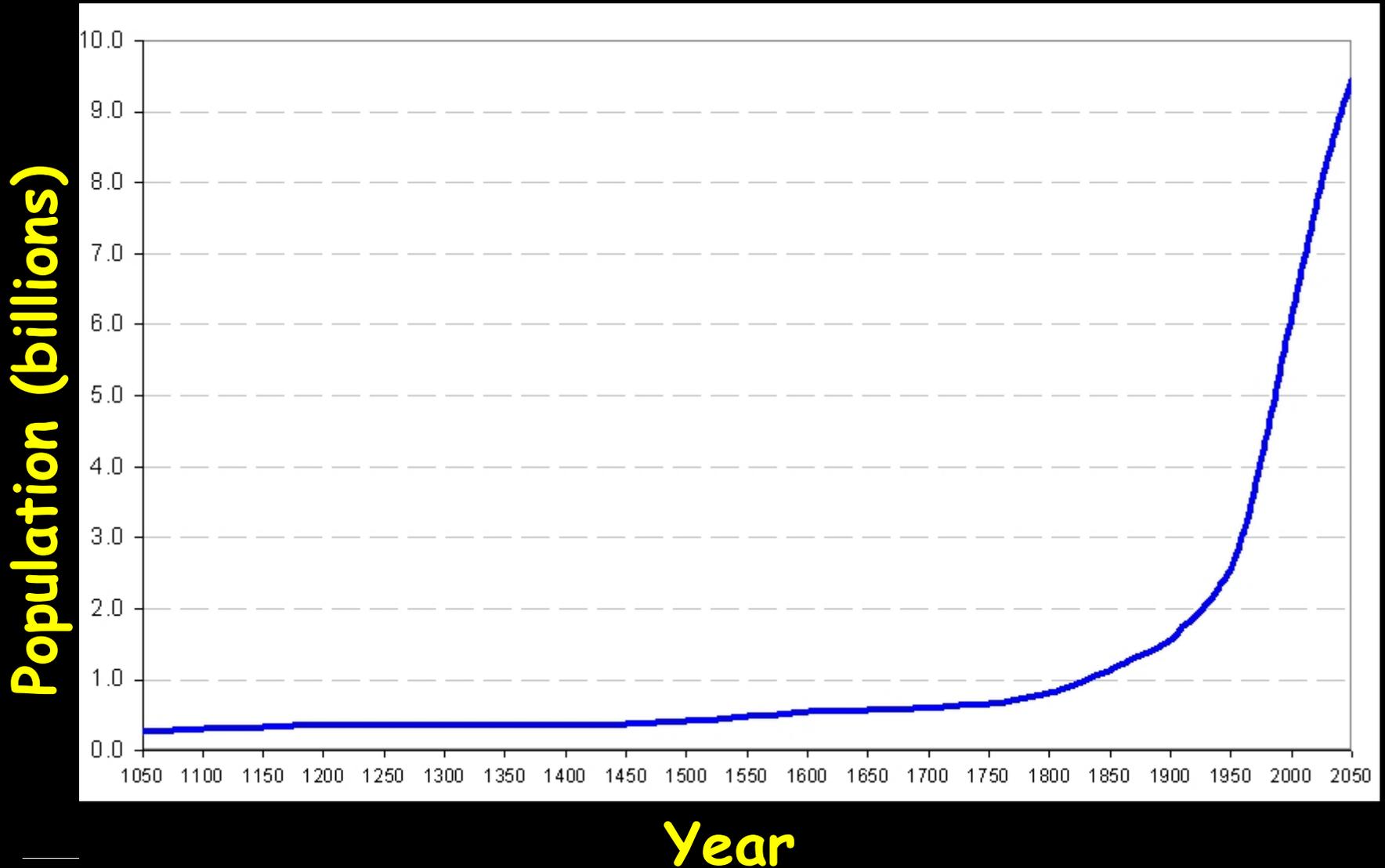
- The survival of 1 in 4 land mammals is in doubt
- **More than 1 in 3 marine mammals are under threat**
- Amphibians are in severe trouble. 1 in 3 is extinct or threatened
- 1 in 5 reptiles faces a battle to survive
- Habitat loss and degradation caused by agriculture and deforestation affects 40 per cent of the world's mammals
- Over-fishing is decimating fish stocks
- Man-made carbon dioxide from fossil fuels is causing global warming....



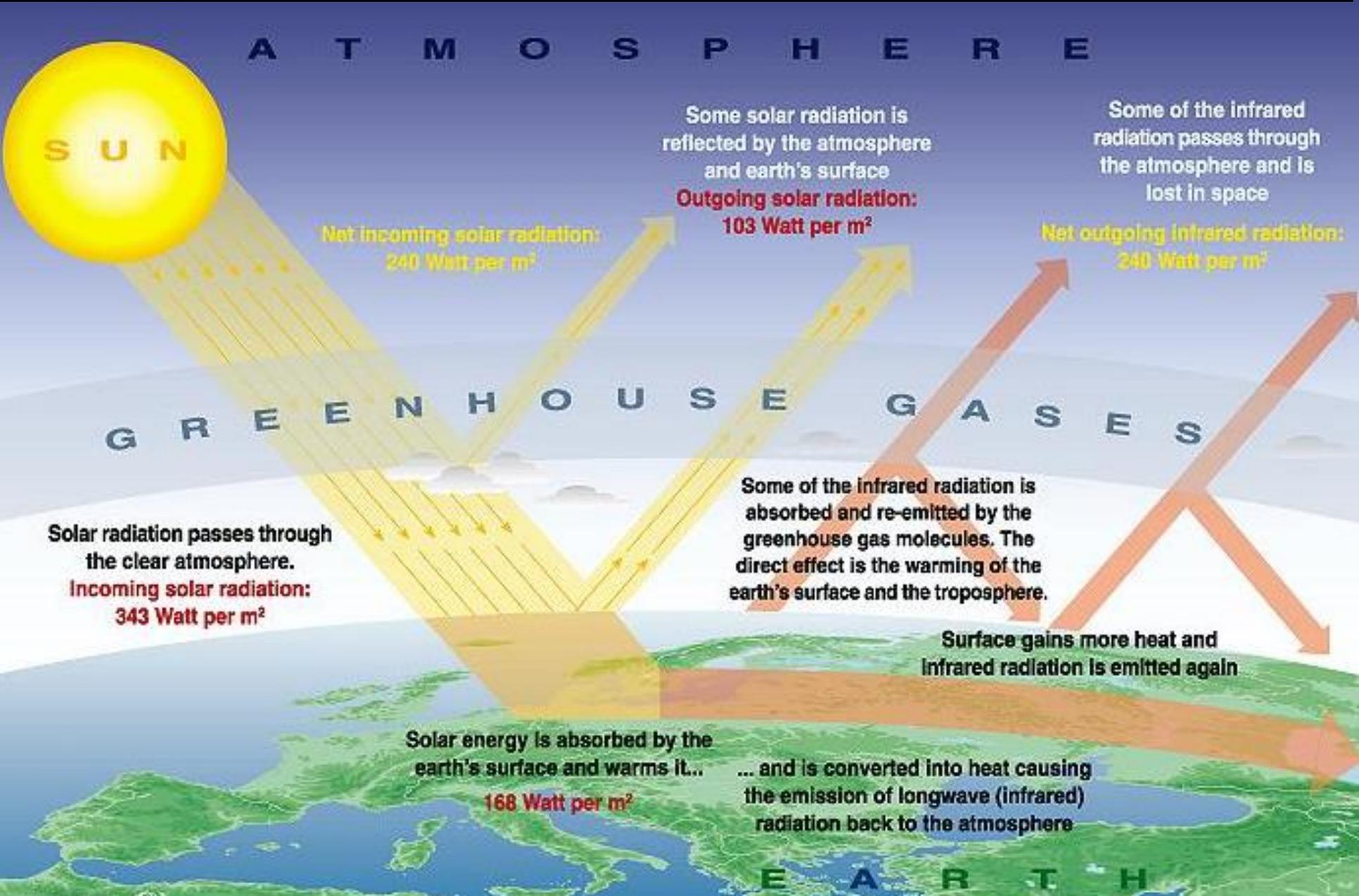
# It gets worse

- Global warming means that the hot and dry areas of the World will become even more parched
- Rising sea levels caused by melting ice and expansion of the sea water will flood low-lying lands (like Bangladesh) And all our major cities are at sea level!
- The seas will become more acid and this will seriously affect corals at the base of the ecological chain
- Increasing World population puts increasing pressure on scarce resources

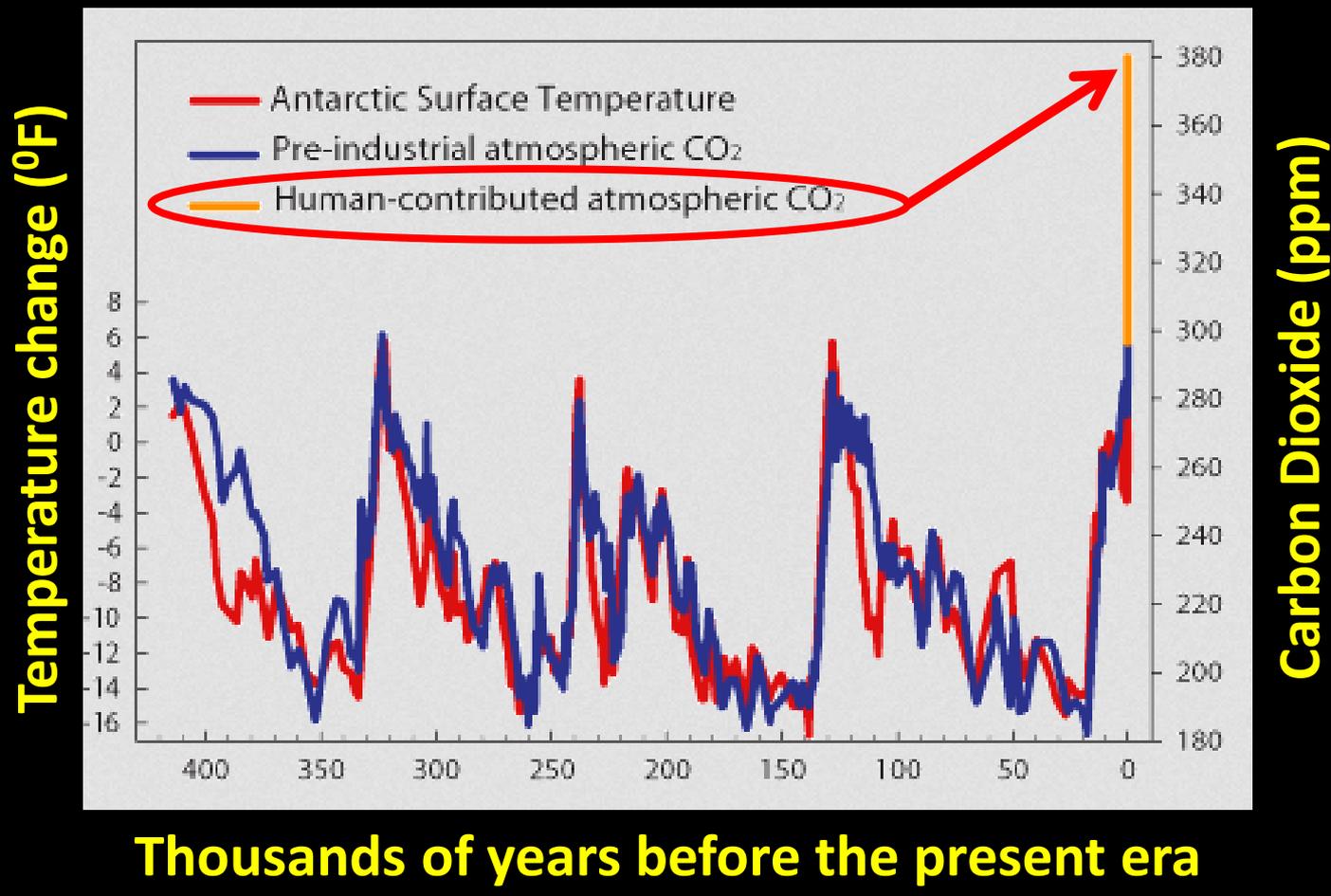
# World Population and growth rate



# The Greenhouse effect

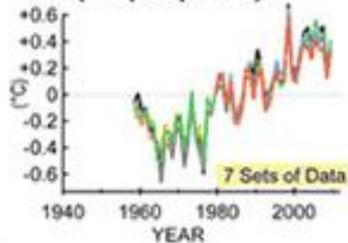


# Correlation between Temperature and Carbon Dioxide during the last 400,000 years



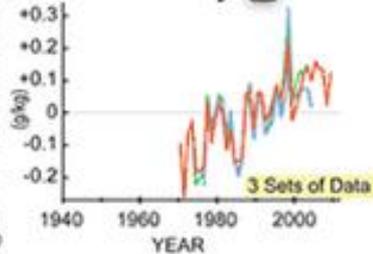
# Met Office indications

Air Temperature Near Surface (Troposphere) ↑

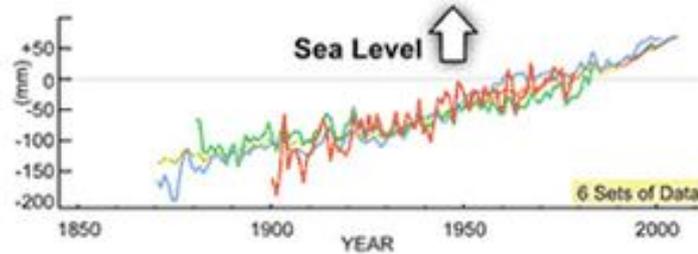
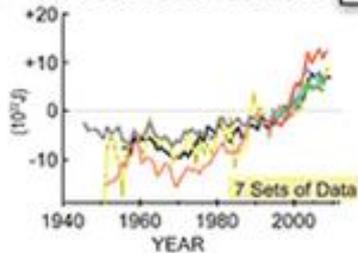


Change from Average

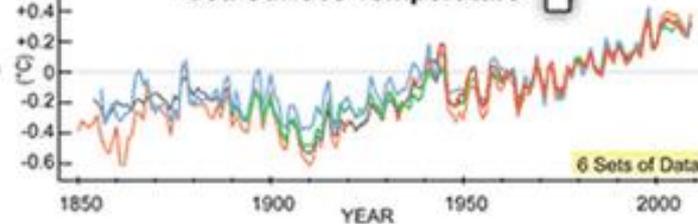
Specific Humidity ↑



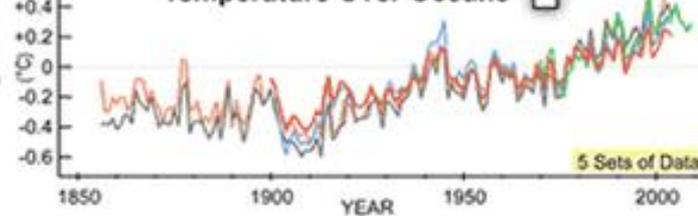
Ocean Heat Content ↑



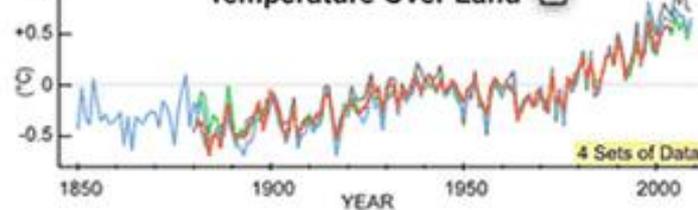
Sea-Surface Temperature ↑



Temperature Over Oceans ↑

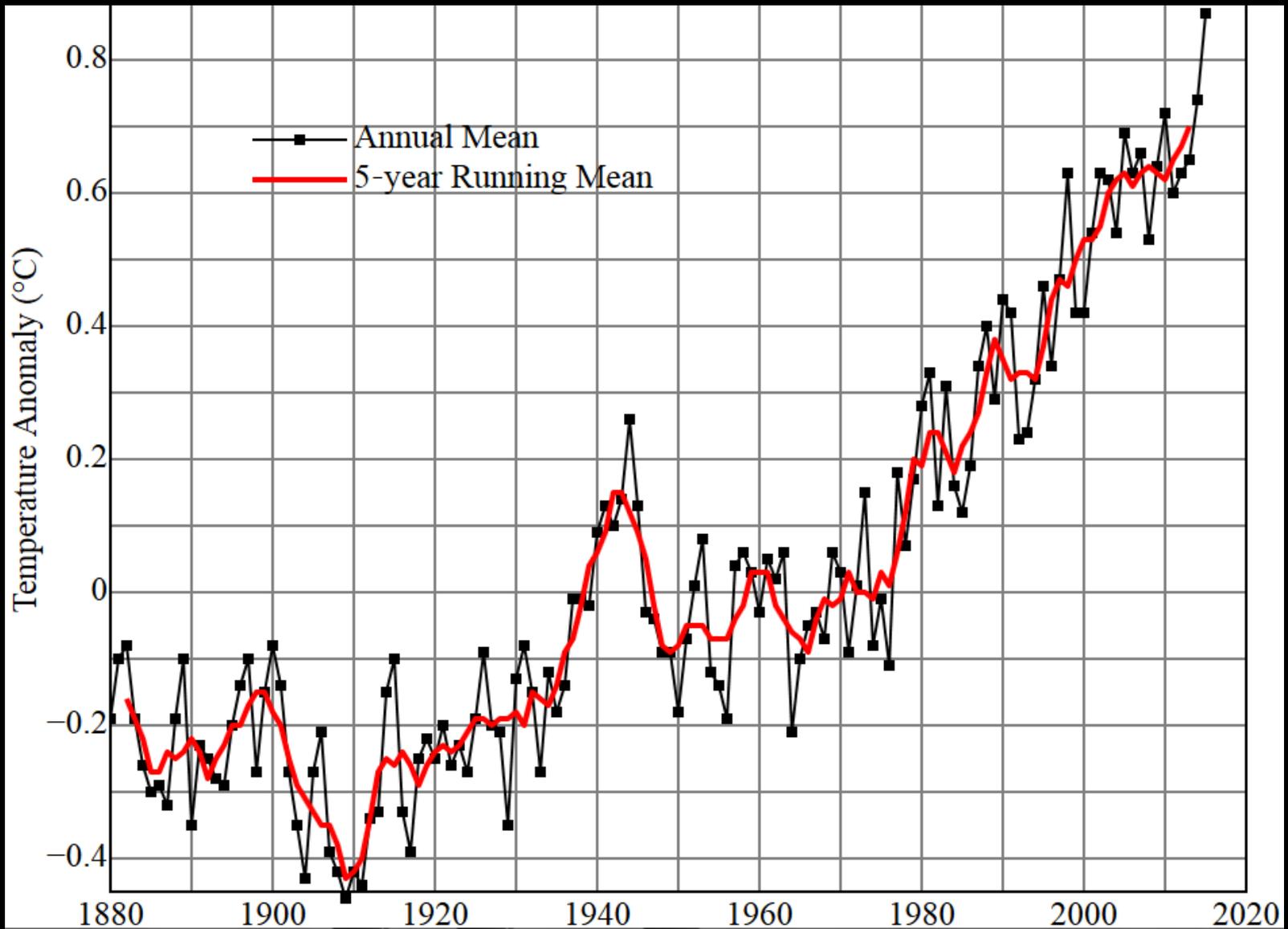


Land Surface Air Temperature Over Land ↑



Seven  
important  
parameters  
steadily  
increasing

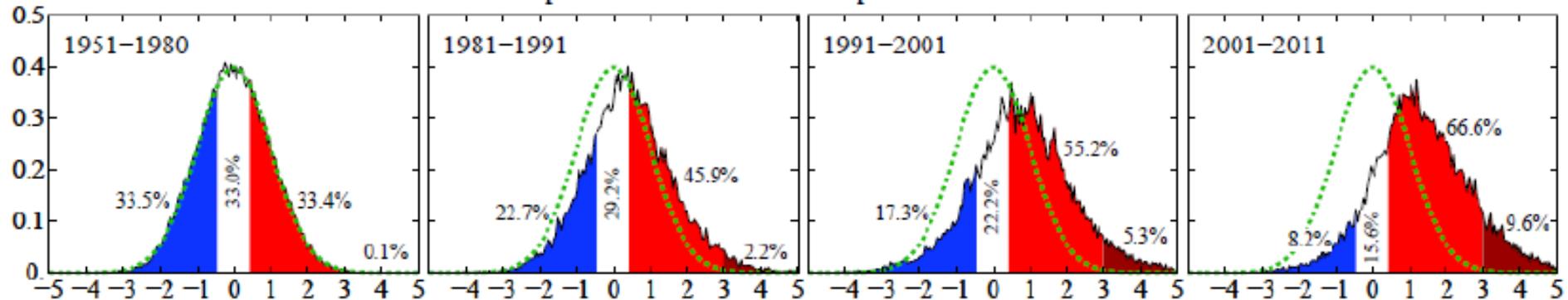
# Global mean temperature change 1880-2015



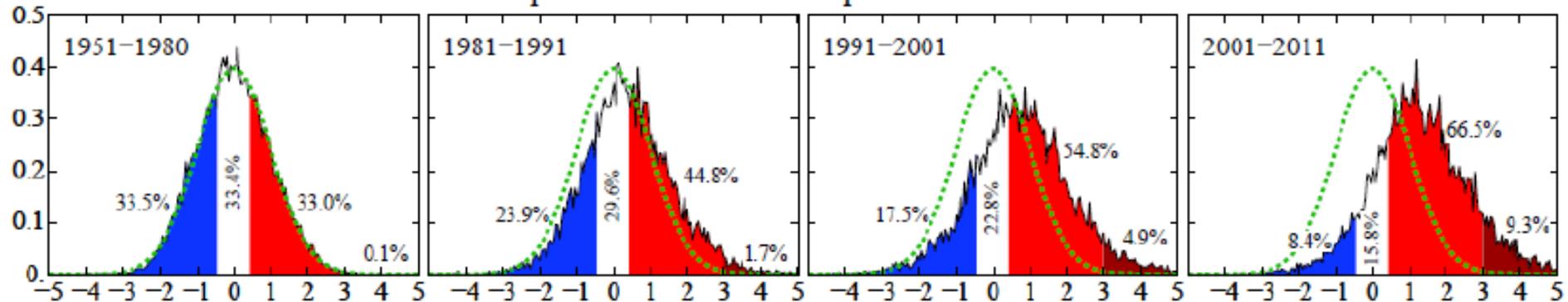
# Statistical change about the norm

Extreme events at more than 3 standard deviations shown in deep red

Northern Hemisphere Land Summer Temperature Anomalies: All Stations



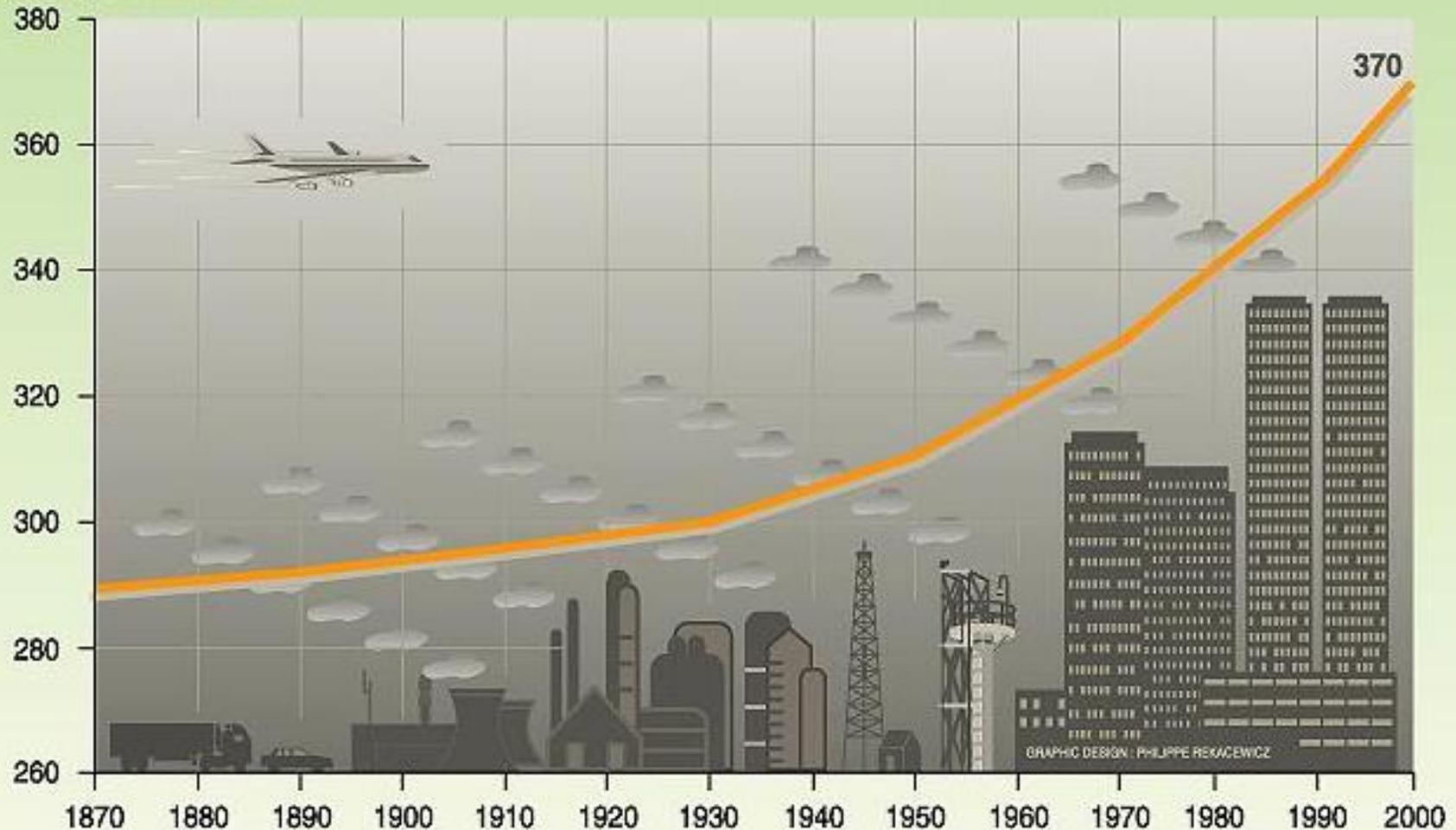
Northern Hemisphere Land Summer Temperature Anomalies: Limited Stations



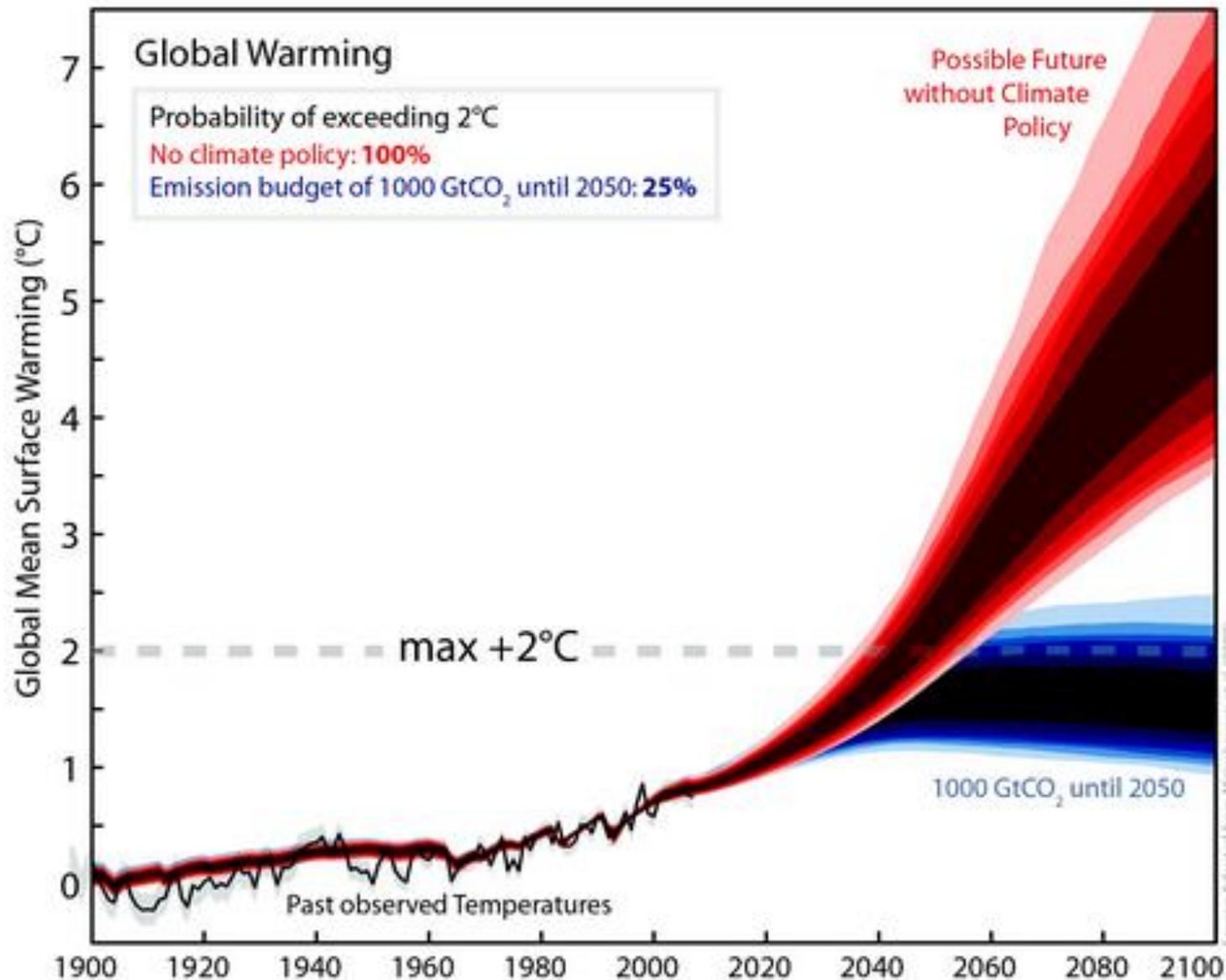
# CO<sub>2</sub> levels rising dramatically

## Global atmospheric concentration of CO<sub>2</sub>

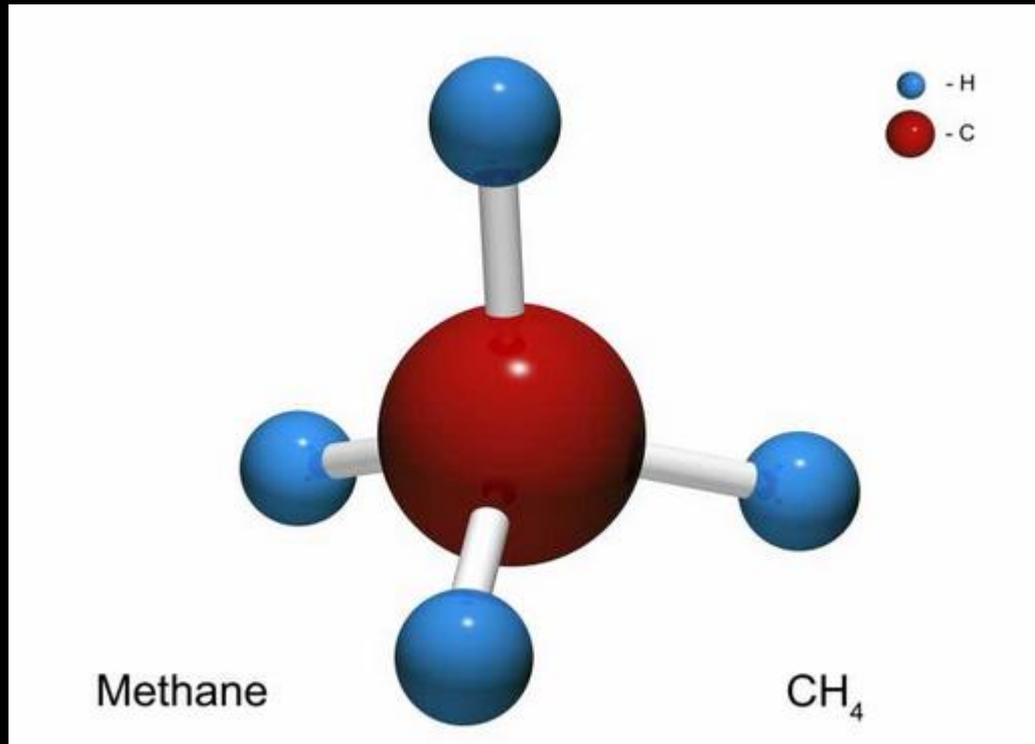
Parts per million (ppm)



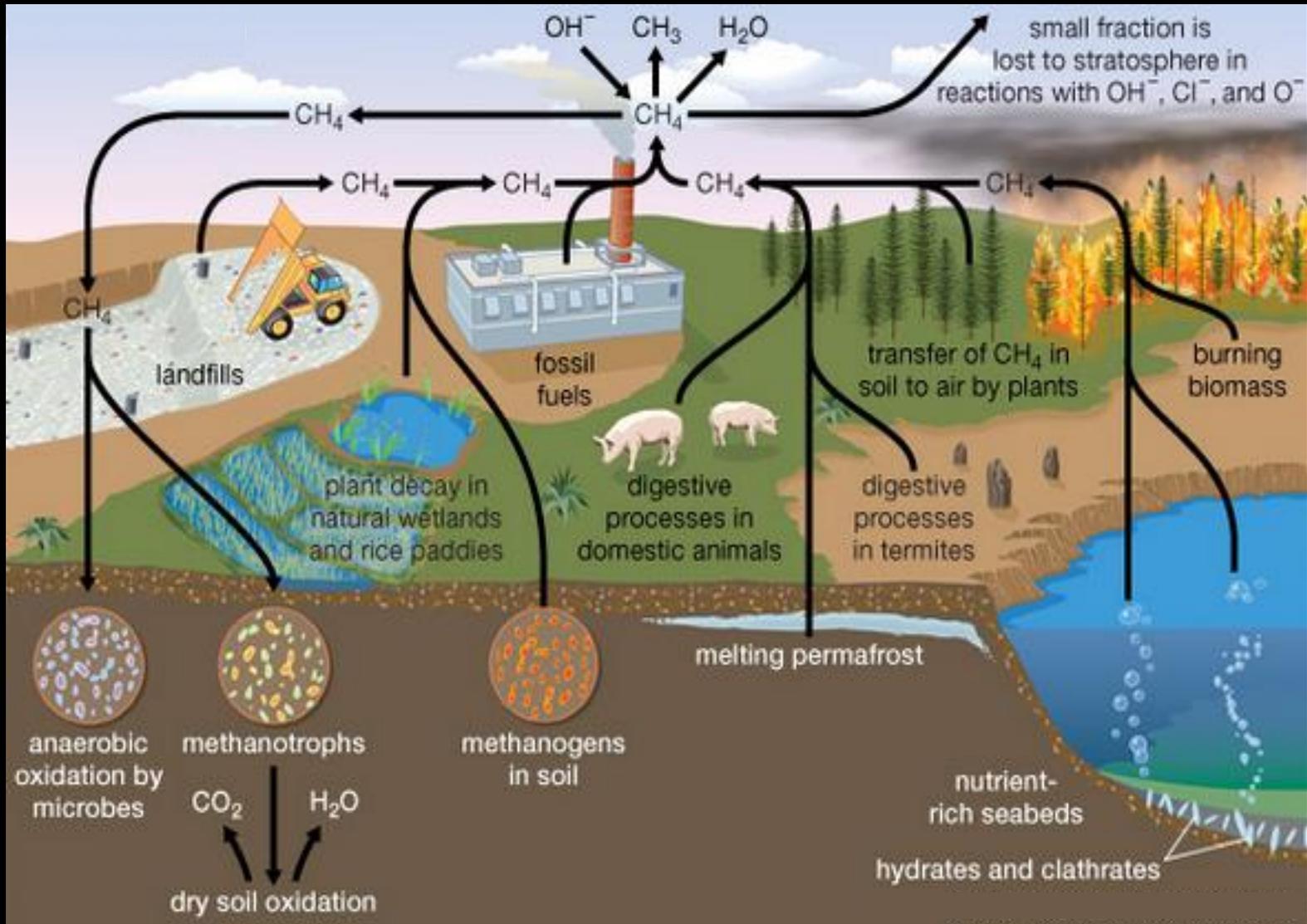
# And if we do nothing...



# CH<sub>4</sub> - Methane



# The Methane cycle



# The elephant in the room?



# Methane - the elephant in the room!

Asian nations have developed a taste for Milk and Beef

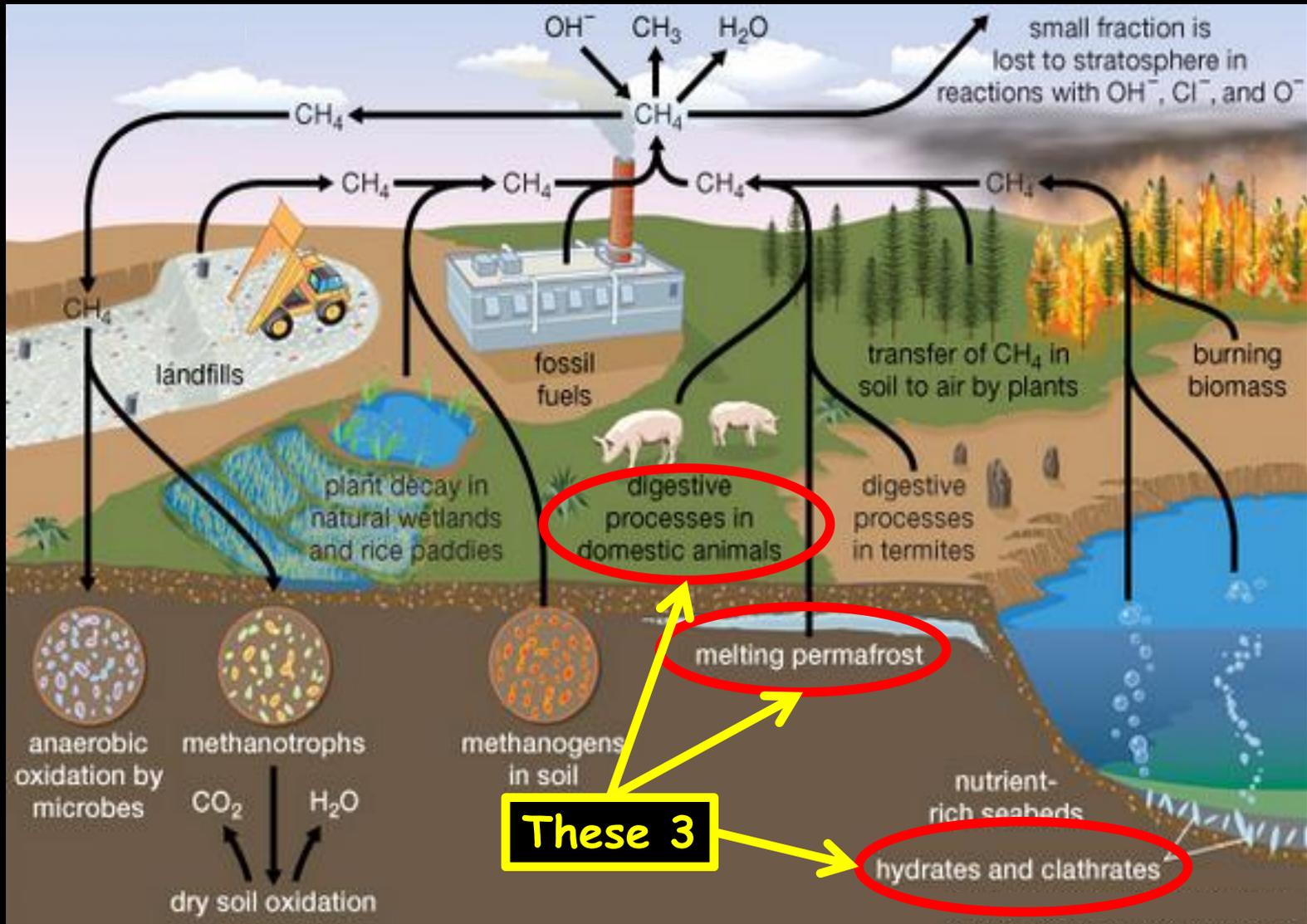
Cattle produce methane

If the temperature continues to rise in the Arctic the Tundra will also thaw out.

If the Tundra thaws out vast quantities of Methane will be released from Methane Hydrate.

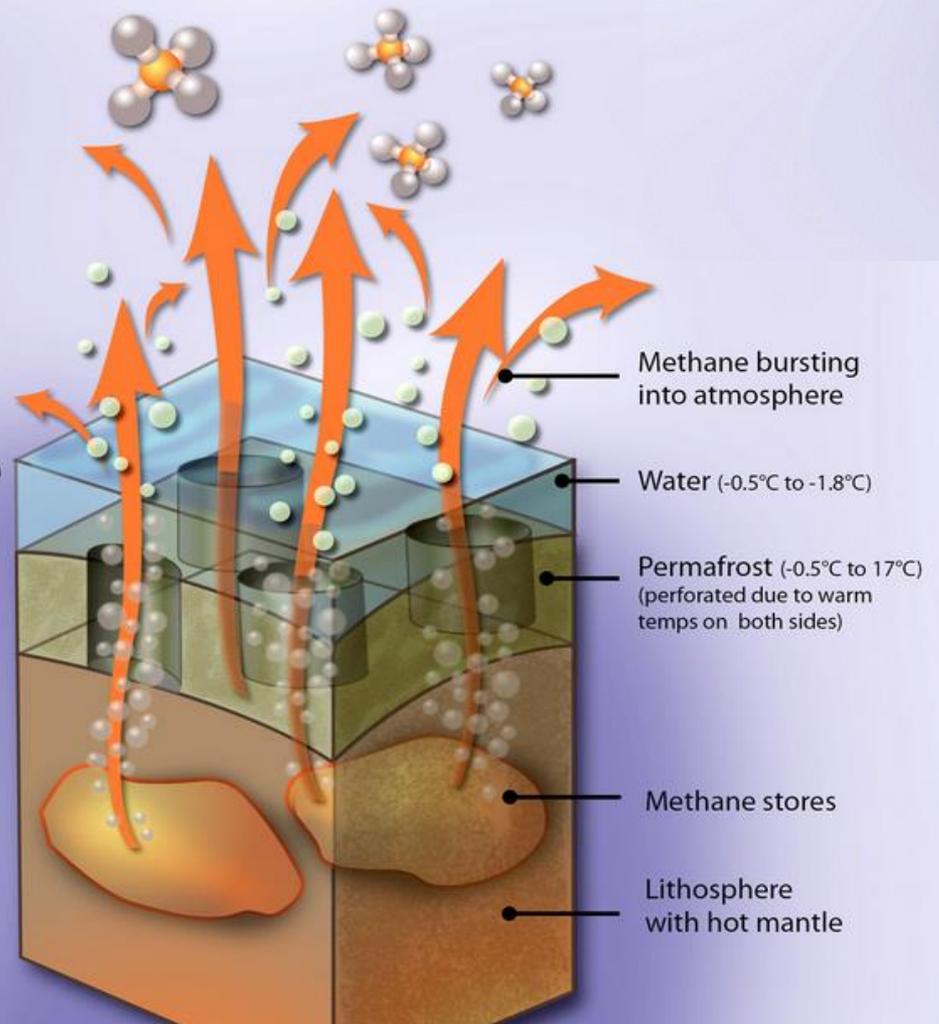
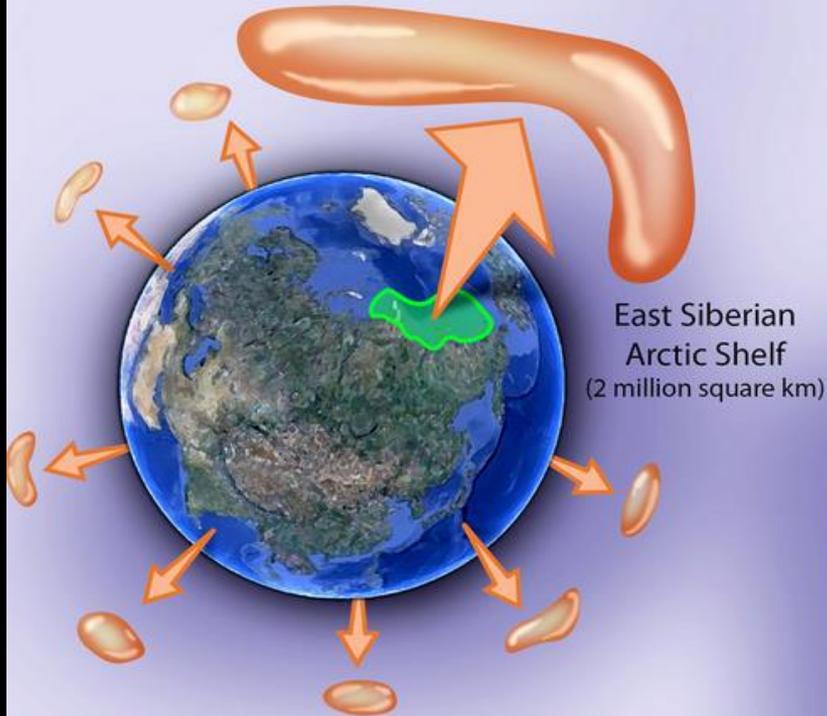
As a greenhouse gas, Methane is 21 times more potent than  $\text{CO}_2$

# Three big problem areas



# Melting permafrost

Similar amount of methane generated here as from the rest of the World Ocean



# Ignition of methane escaping from a frozen lake

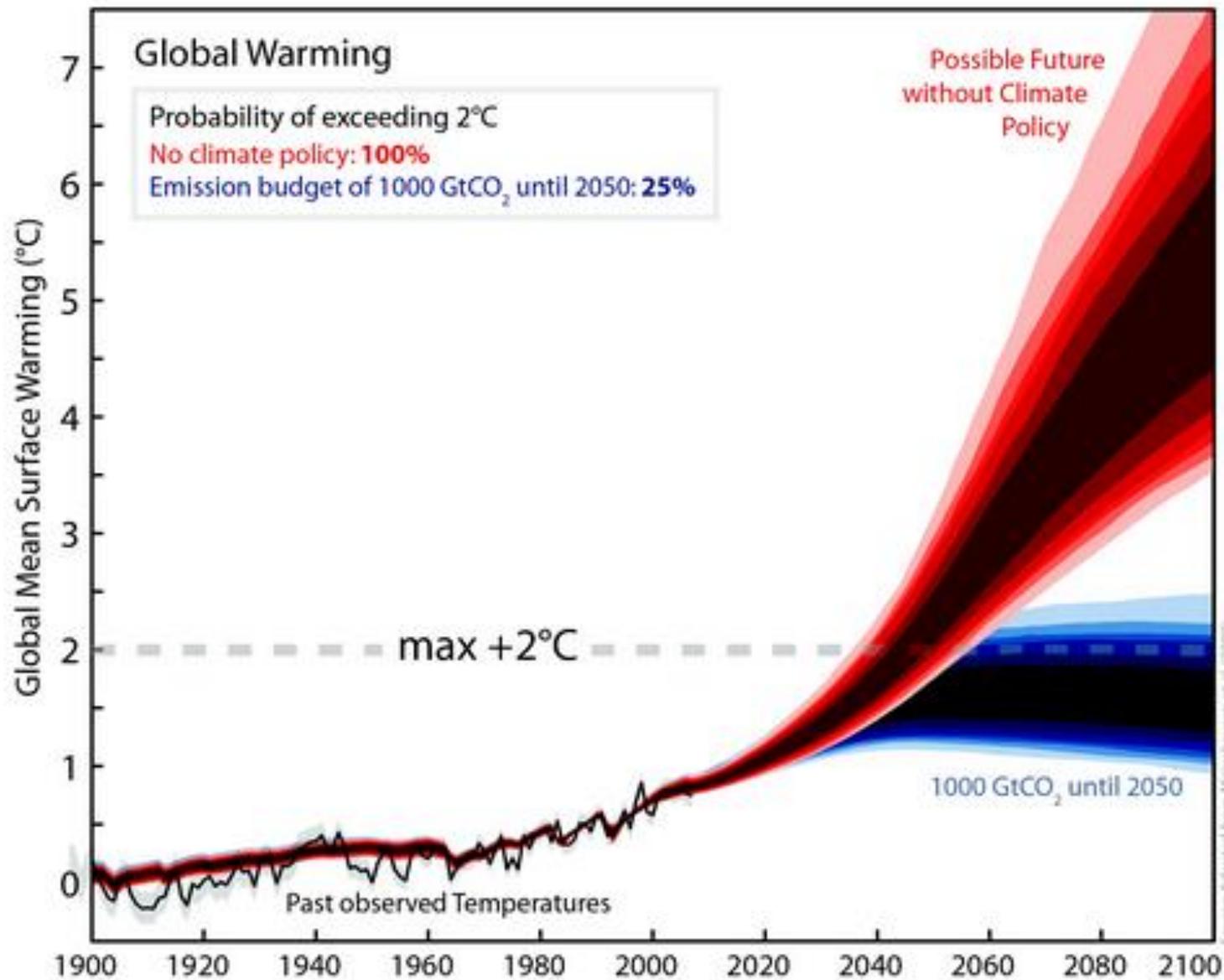




# How can we help?

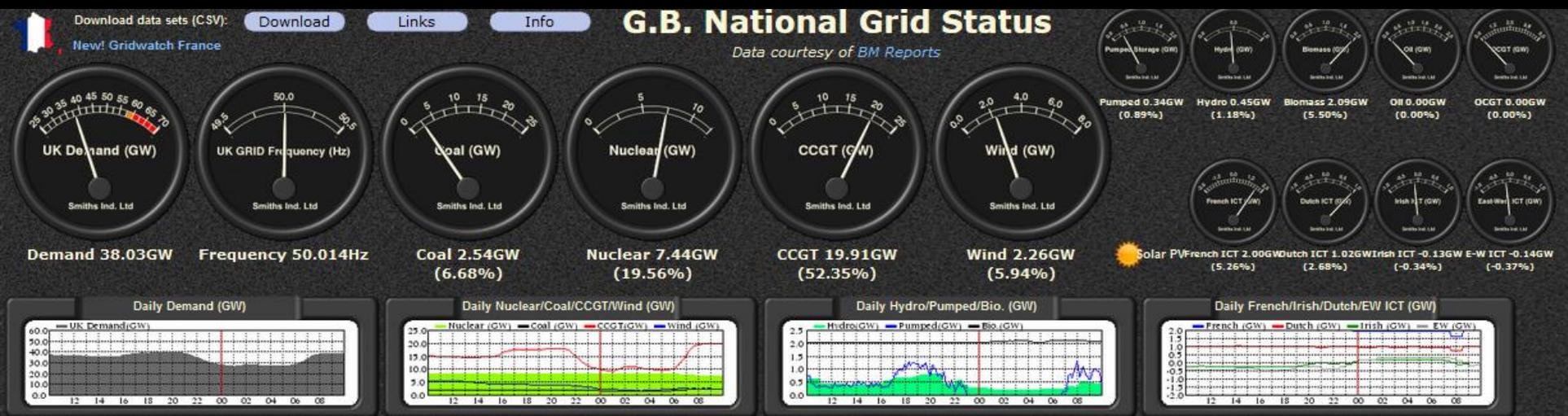
- Reduce global warming through stopping consumption of fossil fuels (gas; coal; oil)
- Build power stations relying on nuclear; wind and tidal energy, or even direct absorption of the Sun's energy and conversion to electricity
- Use less energy
- Insulate our houses properly
- Make sure we know the 3 R's

# Just a reminder...



# How much power do we need?

## What sources does it come from?



Supply and demand overview  
10:07 12<sup>th</sup> April

# A closer look at the details

Tuesday 12<sup>th</sup> April 2016 at 10:08

Demand	38.03 Gigawatts
Coal	6.68% Base load
Nuclear	19.56% Base load
Combined cycle gas turbine	52.35 % Instant ON-OFF
Wind	2.26% (can go as high as 12%)
Pumped storage	0.89%
Hydroelectric	1.18%
Biomass	5.50%
French connector	5.26% (nuclear)
Dutch connector	2.68% (wind?)
Solar	???? (not separately measured)



# The three R's ?

No - it's not Reading, Writing and 'Rithmetic

**Reuse things.** Don't just throw them away

**Reduce** our use of the planet's finite resources

**Recycle** all your materials

# Spot the recycling challenge!



Do you really want this?



Which then leads to this



And this - and more CO<sub>2</sub>



Or this - idyllic beach scene



# WEEE recycling undertaken



# Plastics recycling - but how many times?



# Automotive recycling

