

Climate Change

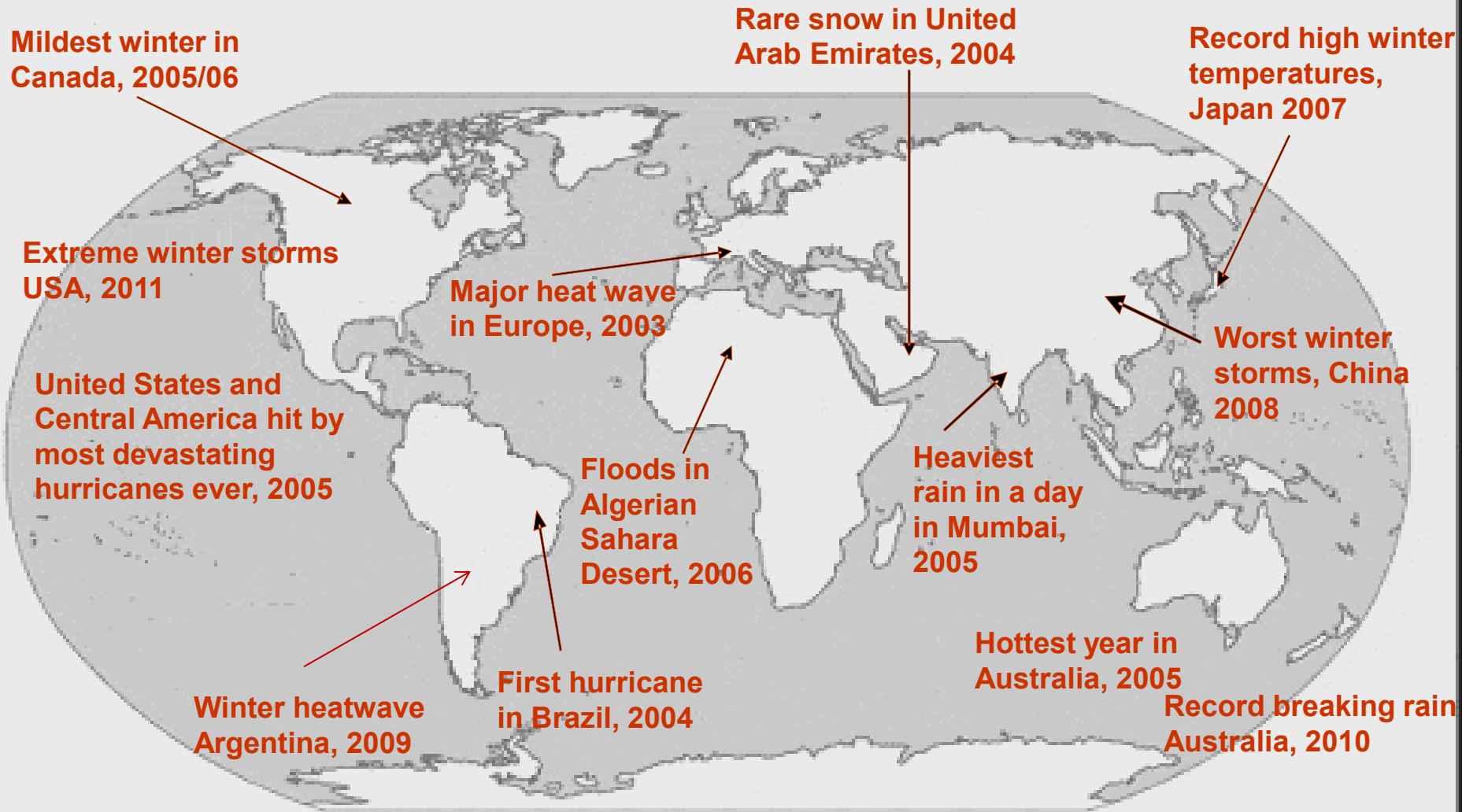
Are we to blame?

Presentation Flow

- Global changes
- Climate Science Findings
- Impacts on India
- Underlying Causes of Climate Change

What changes are we seeing

Unusual weather events around the world



Pederson Glacier (Alaska)



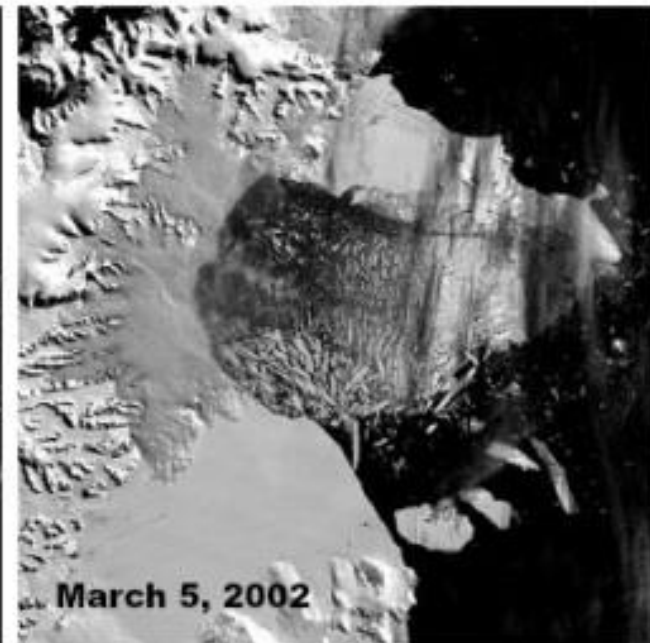
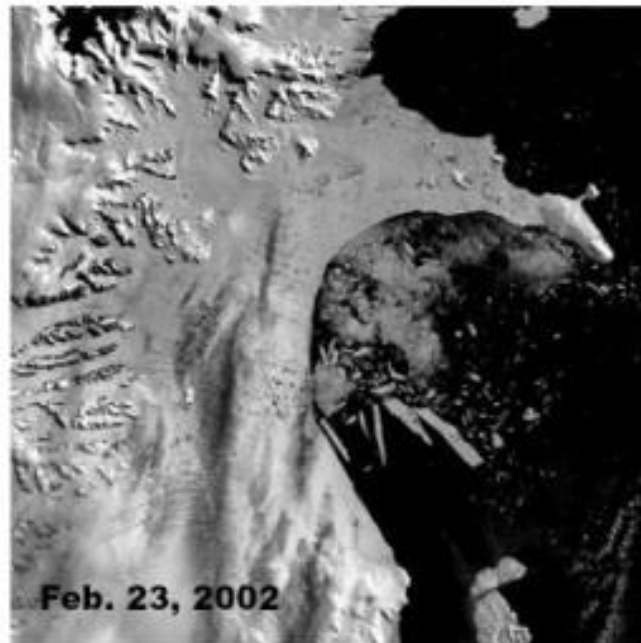
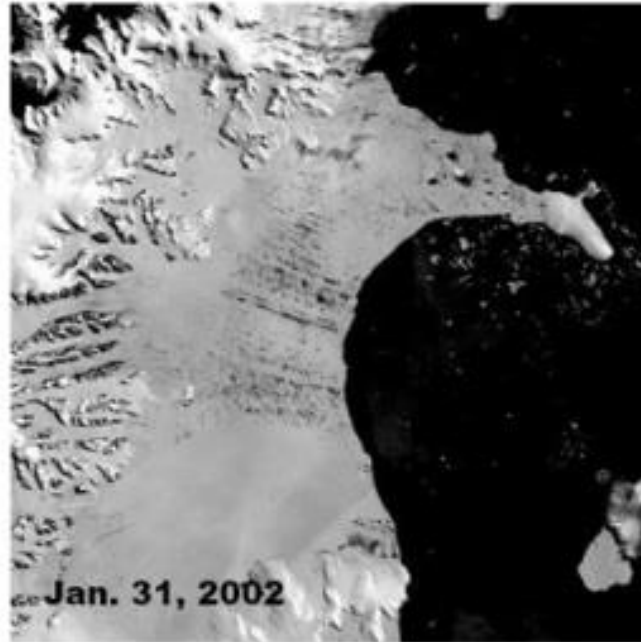
Glaciers are retreating

2005

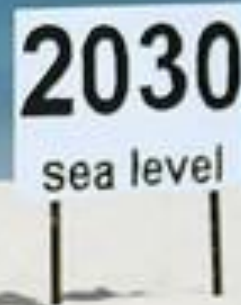
Parts of some Antarctic ice shelves are collapsing

Larsen B ice shelf, Antarctica

3250 km² of ice,
220 m thick
collapsed in 2002



Sea levels are rising



Drought in many places around the world



Increase in Wildfires





All is not well

Climate Science Findings

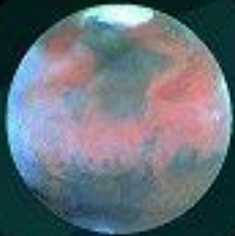
Planets and atmospheres

Mars

Thin atmosphere

(Almost all CO₂ in ground)

Average temperature : - 50°C



Earth

0,03% of CO₂ in the atmosphere

Average temperature : + 15°C



Venus

Thick atmosphere

containing 96% of CO₂

Average temperature : + 420°C



They trap some of the heat leaving the Earth. Without them, Earth's average temperature would be -20°C



**They are called
Green House Gases
(GHGs)**

The main greenhouse gases

Name	Pre-industrial concentration (ppmv *)	Concentration in 1998 (ppmv)	Atmospheric lifetime (years)	Main human activity source	GWP **
Water vapour	1 to 3	1 to 3	a few days	-	-
Carbon dioxide (CO ₂)	280	365	variable	fossil fuels, cement production, land use change	1
Methane (CH ₄)	0,7	1,75	12	fossil fuels, rice paddies waste dumps, livestock	23
Nitrous oxide (N ₂ O)	0,27	0,31	114	fertilizers, combustion industrial processes	296
HFC 23 (CHF ₃)	0	0,000014	260	electronics, refrigerants	12 000
HFC 134 a (CF ₃ CH ₂ F)	0	0,0000075	13,8	refrigerants	1 300
HFC 152 a (CH ₃ CHF ₂)	0	0,0000005	1,4	industrial processes	120
Perfluoromethane (CF ₄)	0,00004	0,00008	> 50 000	aluminium production	5 700
Perfluoroethane (C ₂ F ₆)	0	0,000003	10 000	aluminium production	11 900
Sulphur hexafluoride (SF ₆)	0	0,0000042	3 200	dielectric fluid	22 200

Some are natural

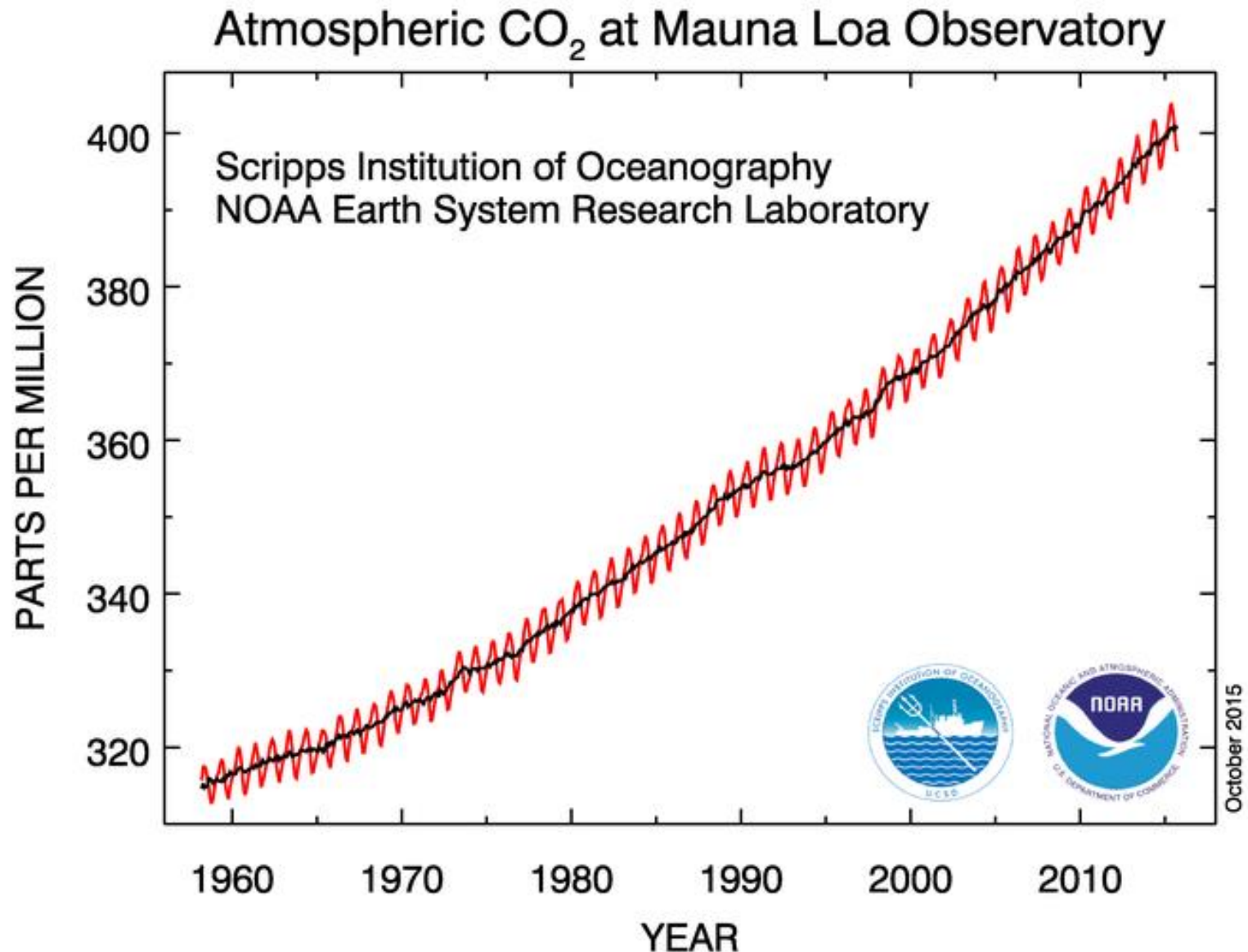
some

man-made

* ppmv = parts per million by volume, ** GWP = Global warming potential (for 100 year time horizon).

Not only are we creating
new greenhouse gases,
we are adding to natural
ones as well

Atmospheric CO₂ has increased from a pre-industrial concentration of about 280 ppm to about 397 ppm at present



Methane and nitrous oxide fare no better

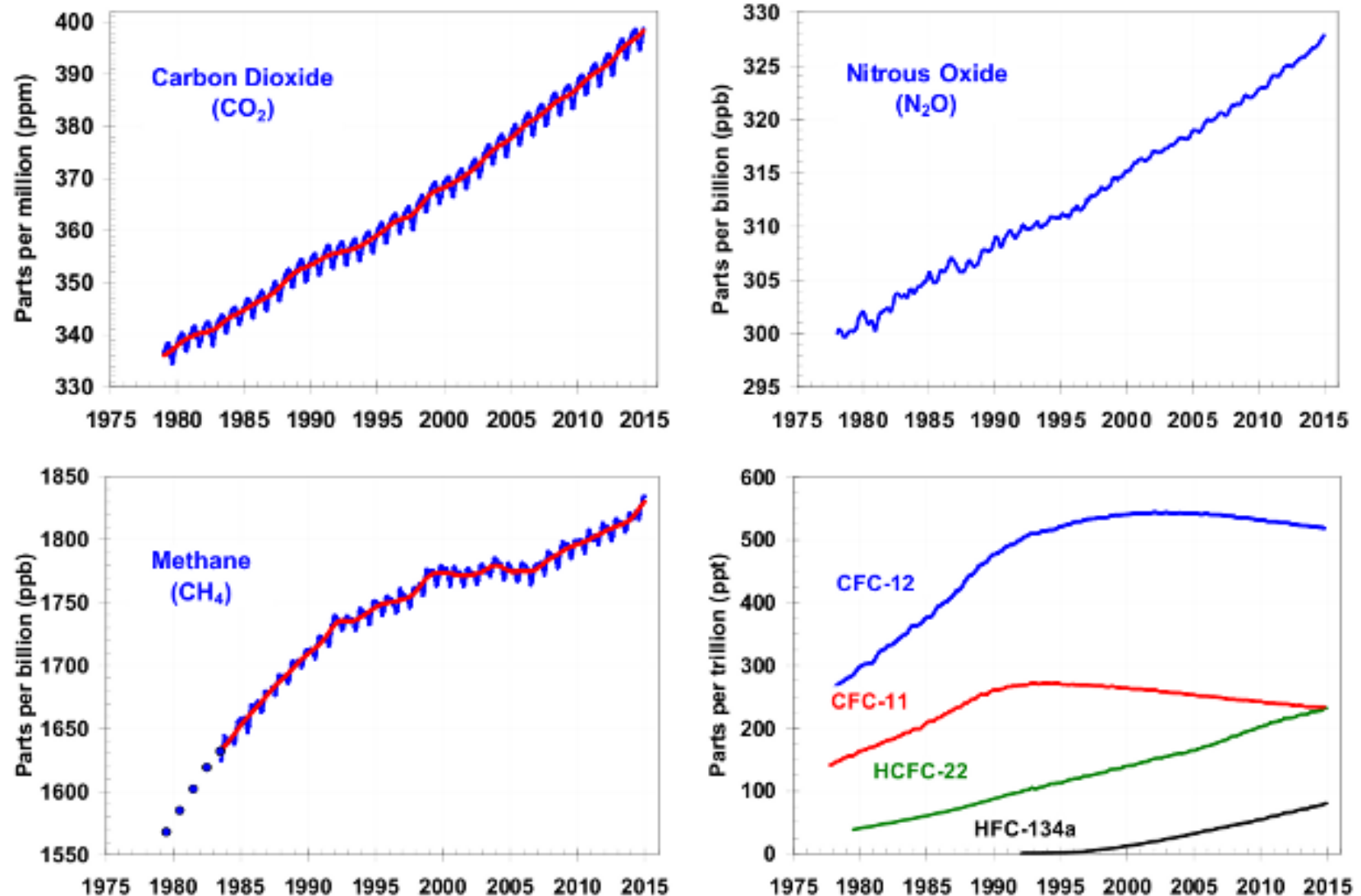
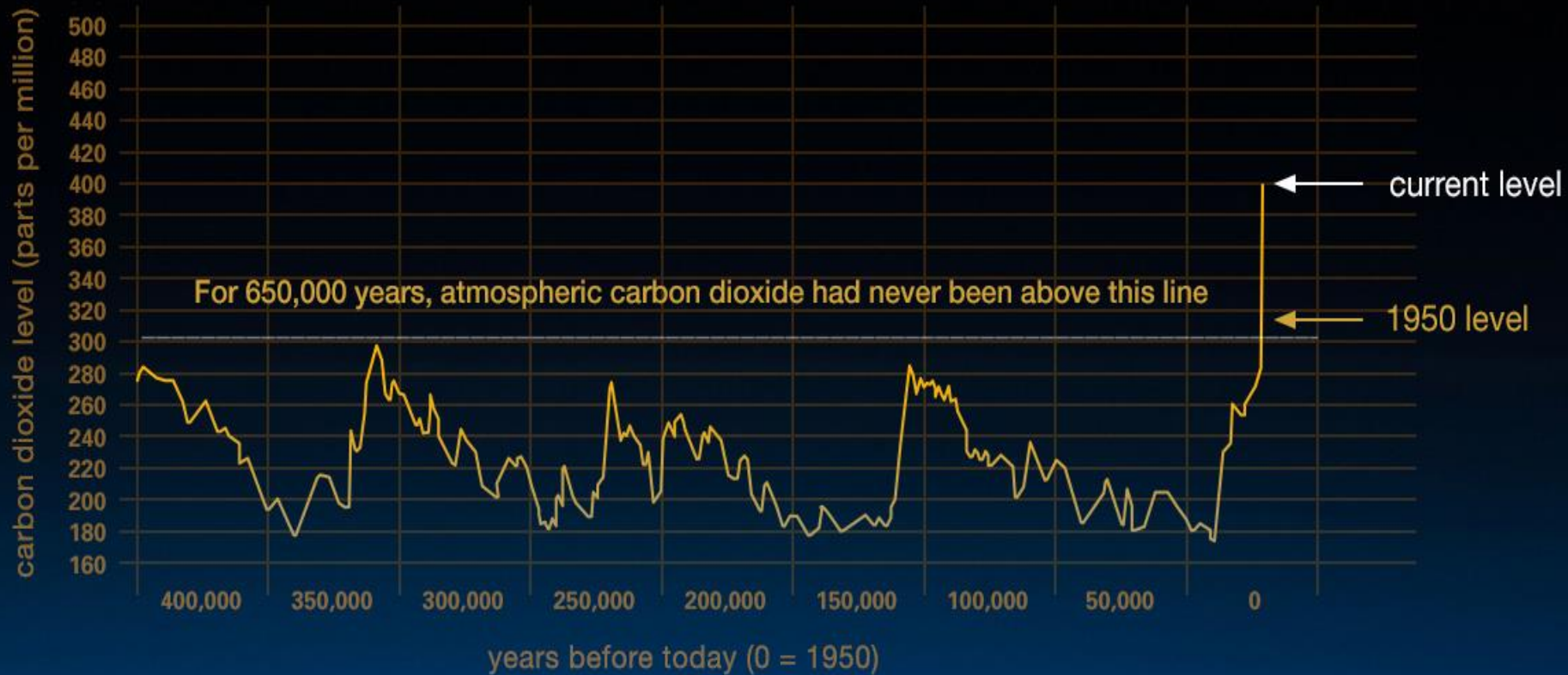


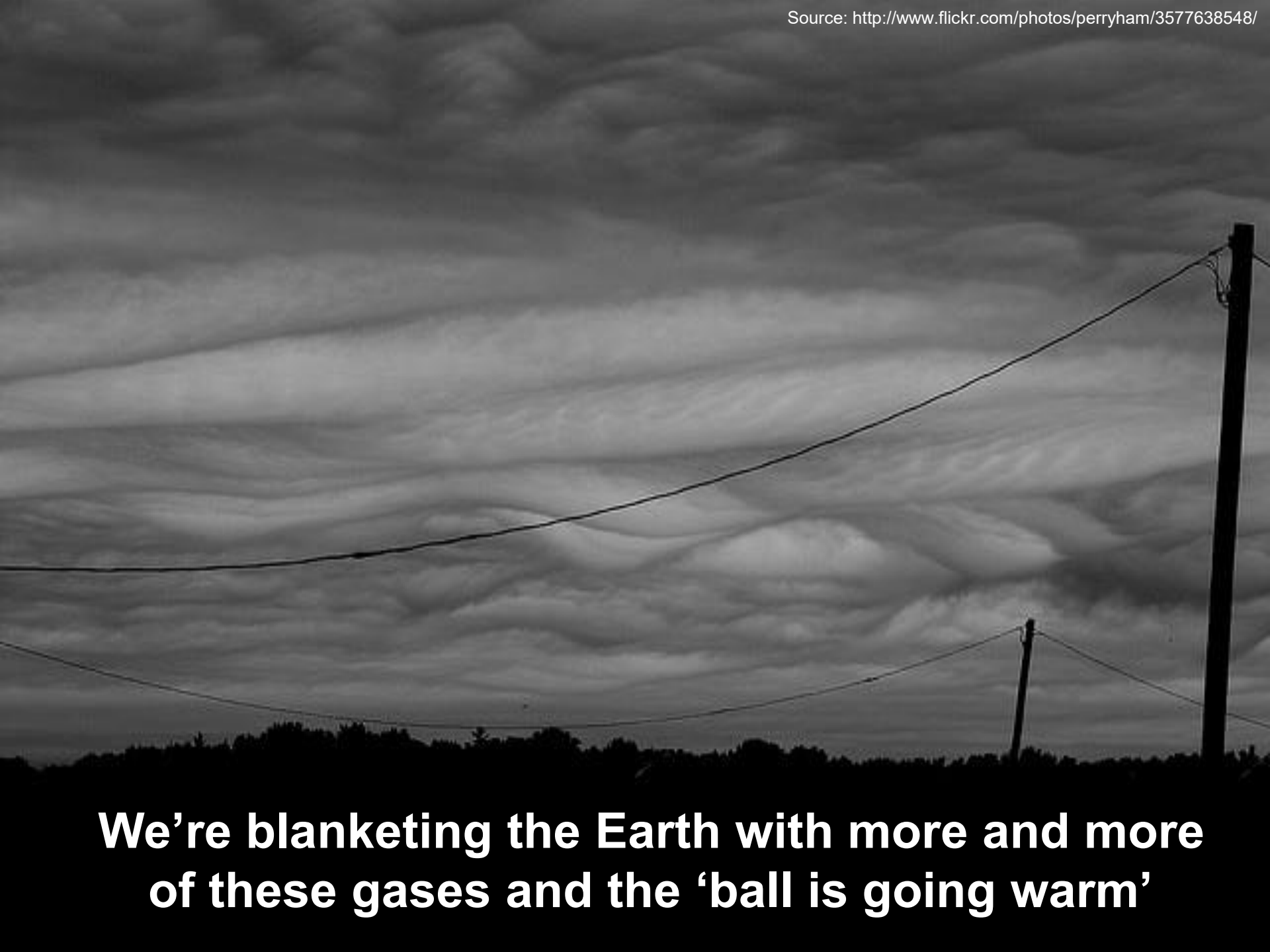
Figure: NOAA Earth System Research Laboratory

To learn more about the concentration of GHGs in the atmosphere before the era of instruments and measurements, scientists are analyzing gases trapped in ice



And we find that.....

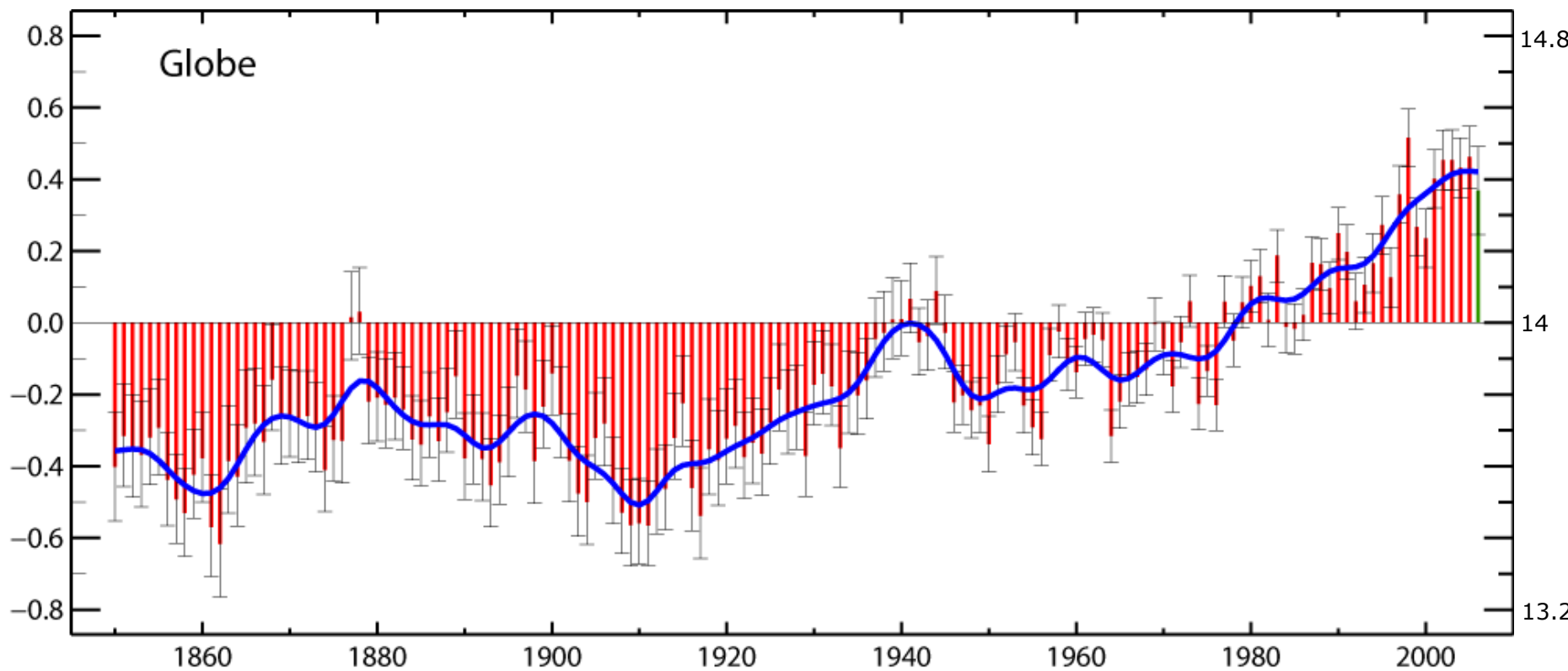


A black and white photograph of a cloudy sky. The sky is filled with soft, textured clouds. A power line runs diagonally across the frame from the left towards the right. A utility pole is visible on the right side, with another pole further back. The bottom of the image shows a dark silhouette of a treeline or forest.

**We're blanketing the Earth with more and more
of these gases and the 'ball is going warm'**

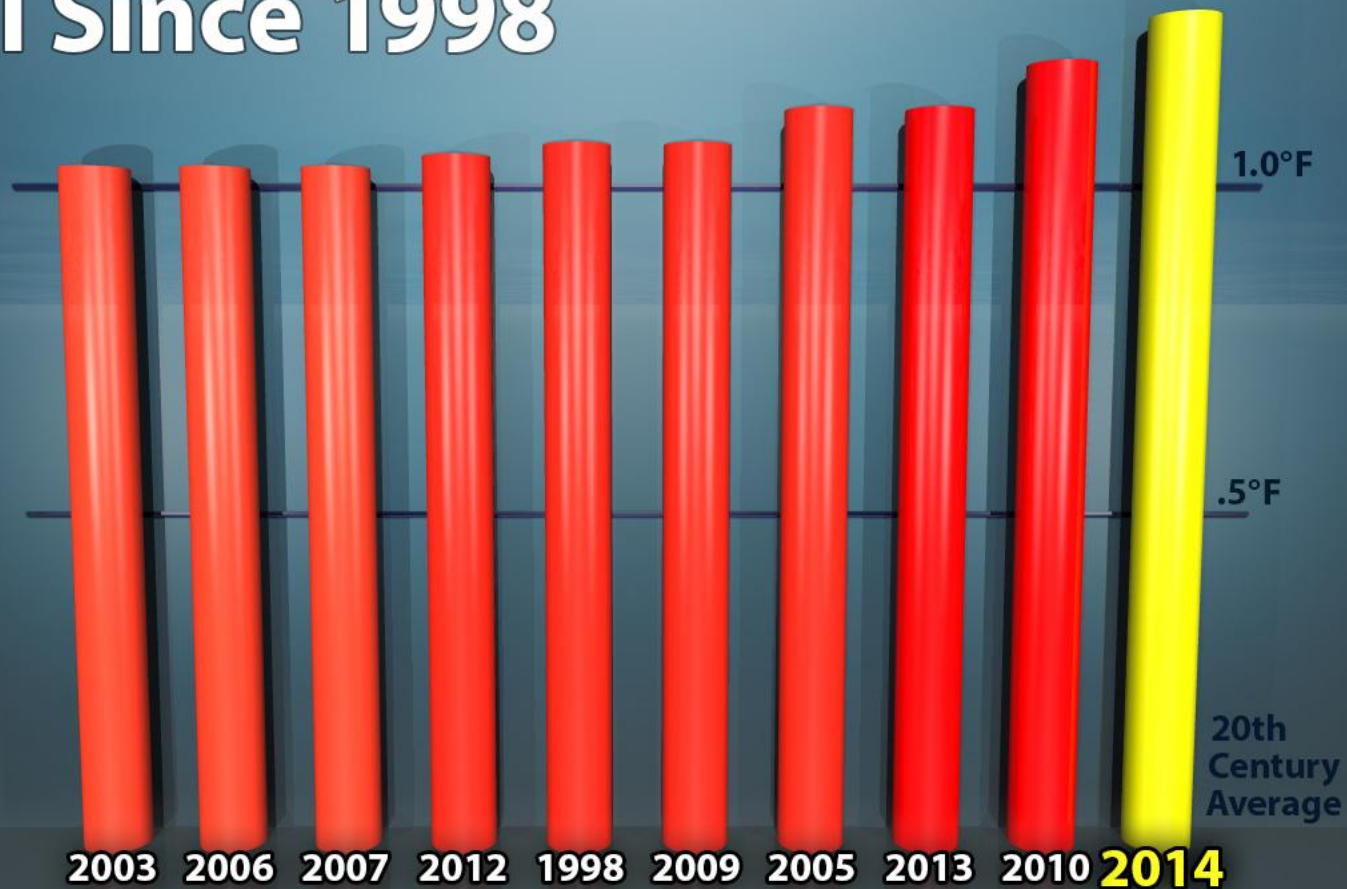
Difference ($^{\circ}\text{C}$) from 1961-90

Globe



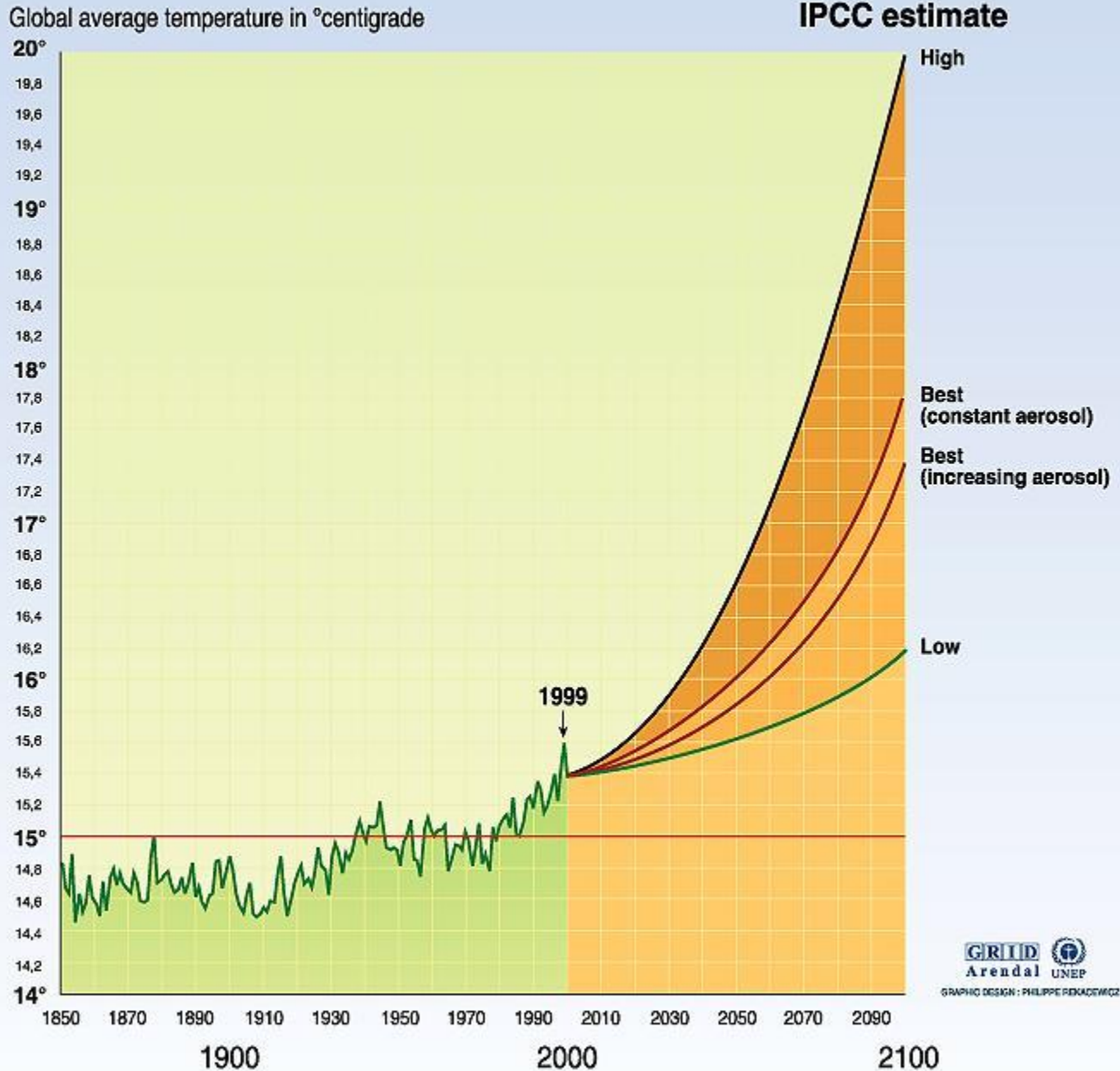
10 Hottest Years Globally

All Since 1998



Columns represent difference from 20th century average.
Data as of September 23, 2015. Subject to change based on NCEI revisions.
Source: NOAA/NCEI

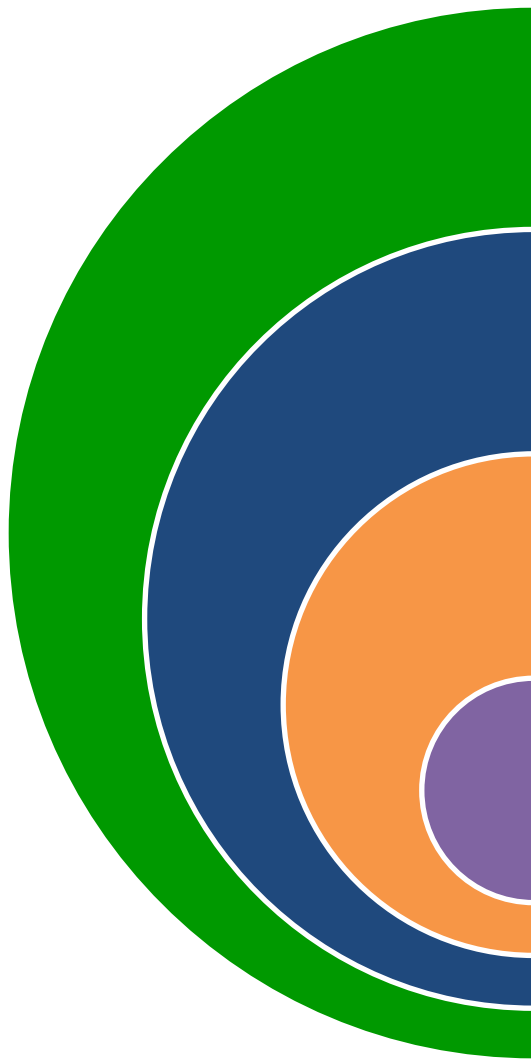
Projected changes in global temperature: global average 1856-1999 and projection estimates to 2100



A hot future awaits us

Global mean surface temperature could rise between 1-4.5 °C by 2100

**Will we be
impacted?**



Food

Water

Health

The Economy

Each one of us will be affected



Net cereal production in South Asian countries is projected to
decline at least between 4 to 10% by the
end of this century



The risk of **hunger**
is likely to remain very high in
India. Food **costs** will
increase

Melting of glaciers could seriously affect
500,000,000 people served by
the Himalaya-Hindu-Kush region



Groundwater – it's finite!

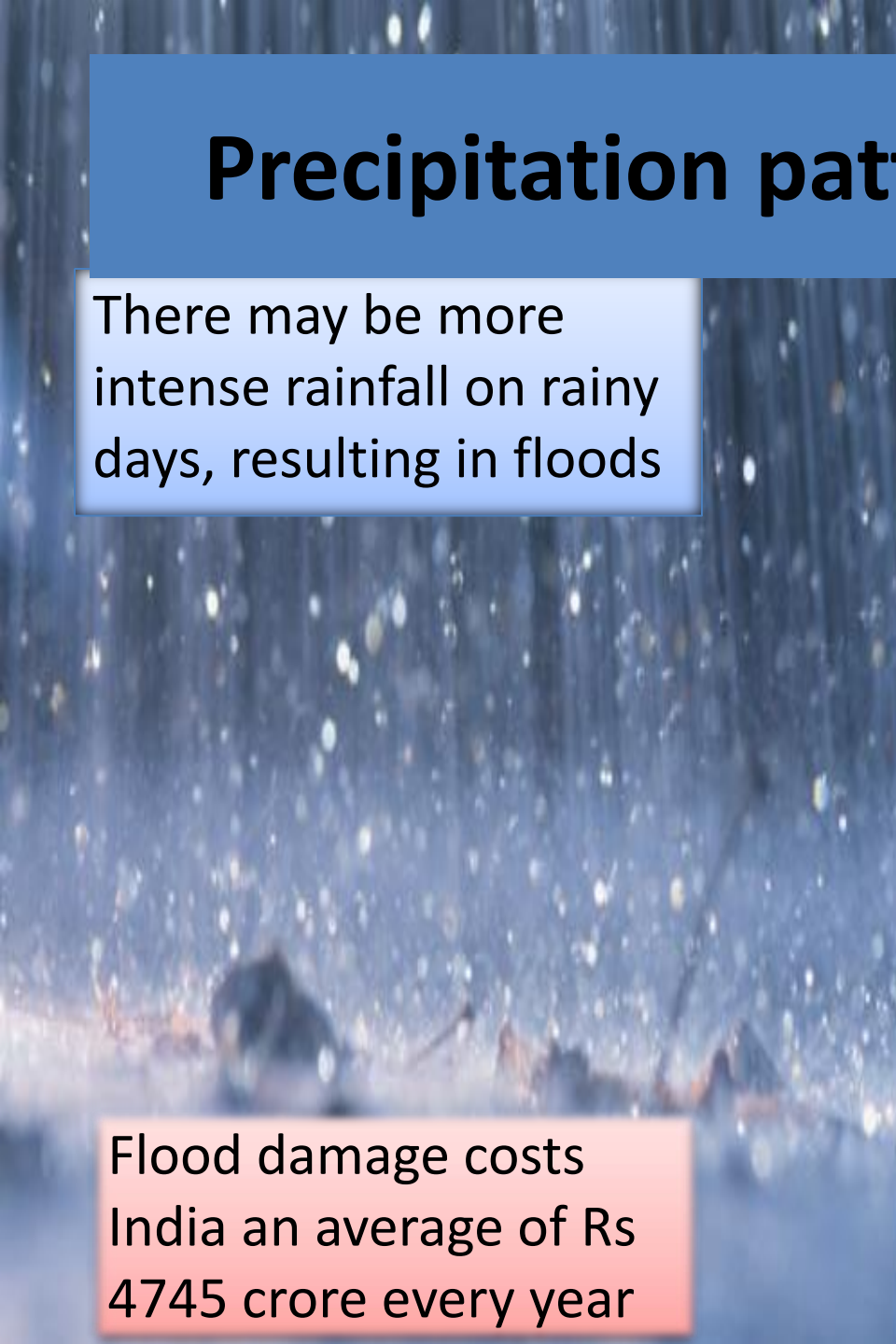
7 out of 9 districts in Delhi
are over-exploited (extraction >
recharge) with respect to dynamic
groundwater resources

India will reach a state of water stress before 2025



**This will impact food security,
human health and economic activity**

Precipitation patterns will change



There may be more intense rainfall on rainy days, resulting in floods

Flood damage costs India an average of Rs 4745 crore every year



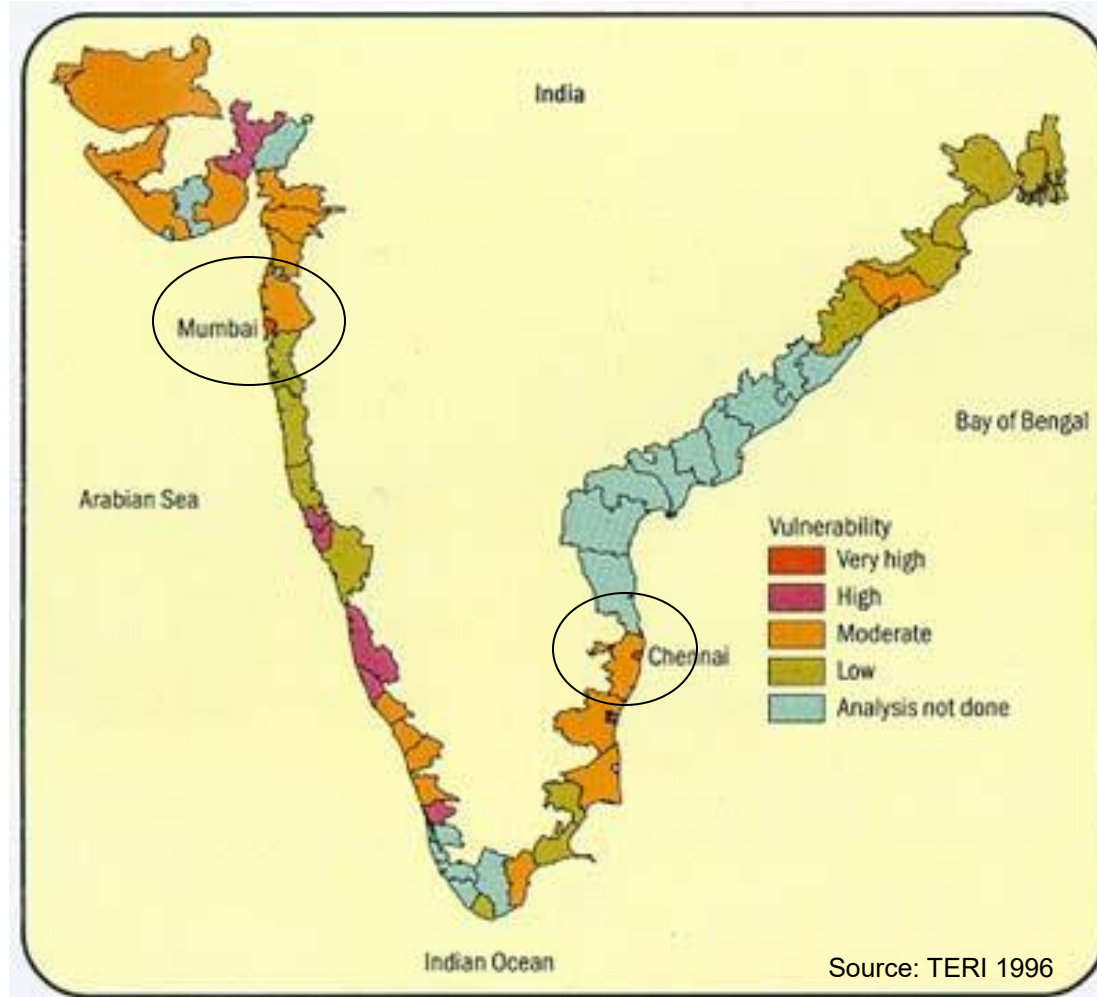
and more dry days in a year, causing drought

350 million Indians have been affected badly due to drought in a decade

Deaths due to heat waves, water borne diseases and vector borne diseases like dengue are expected to increase



Sea level will be a minimum of **40 cm higher** than today by the end of 21st century



11 % of Bangladesh's coastal land is likely go underwater, creating 7 to 10 million climate refugees



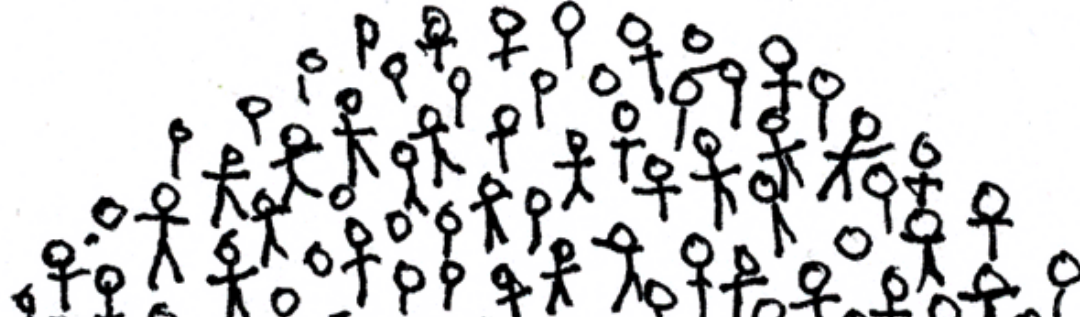
But, are we to blame?

Aren't the culprits industry and
the government?

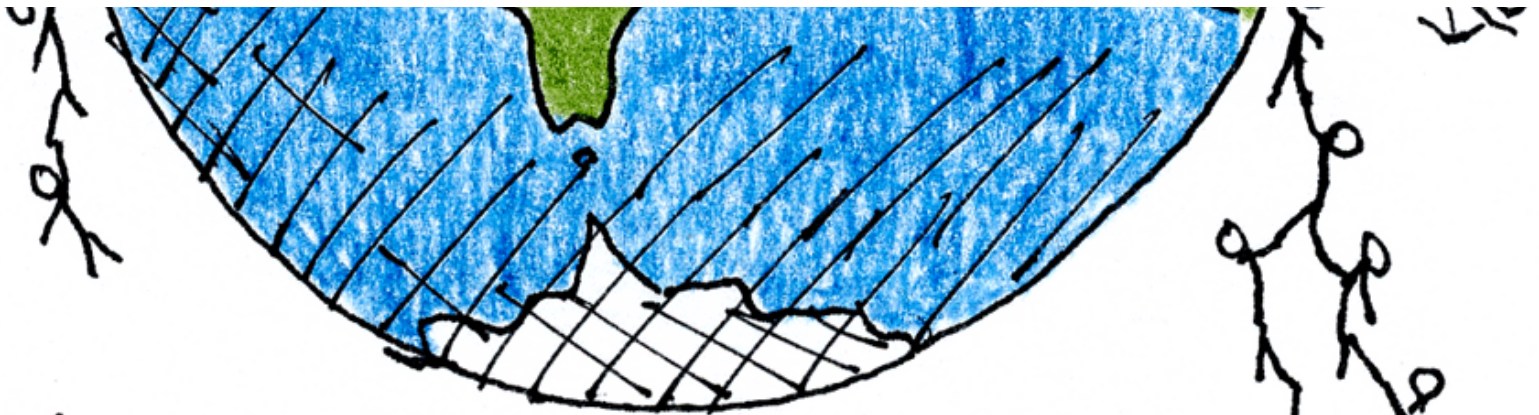
The underlying causes

1940 – 2.3 billion

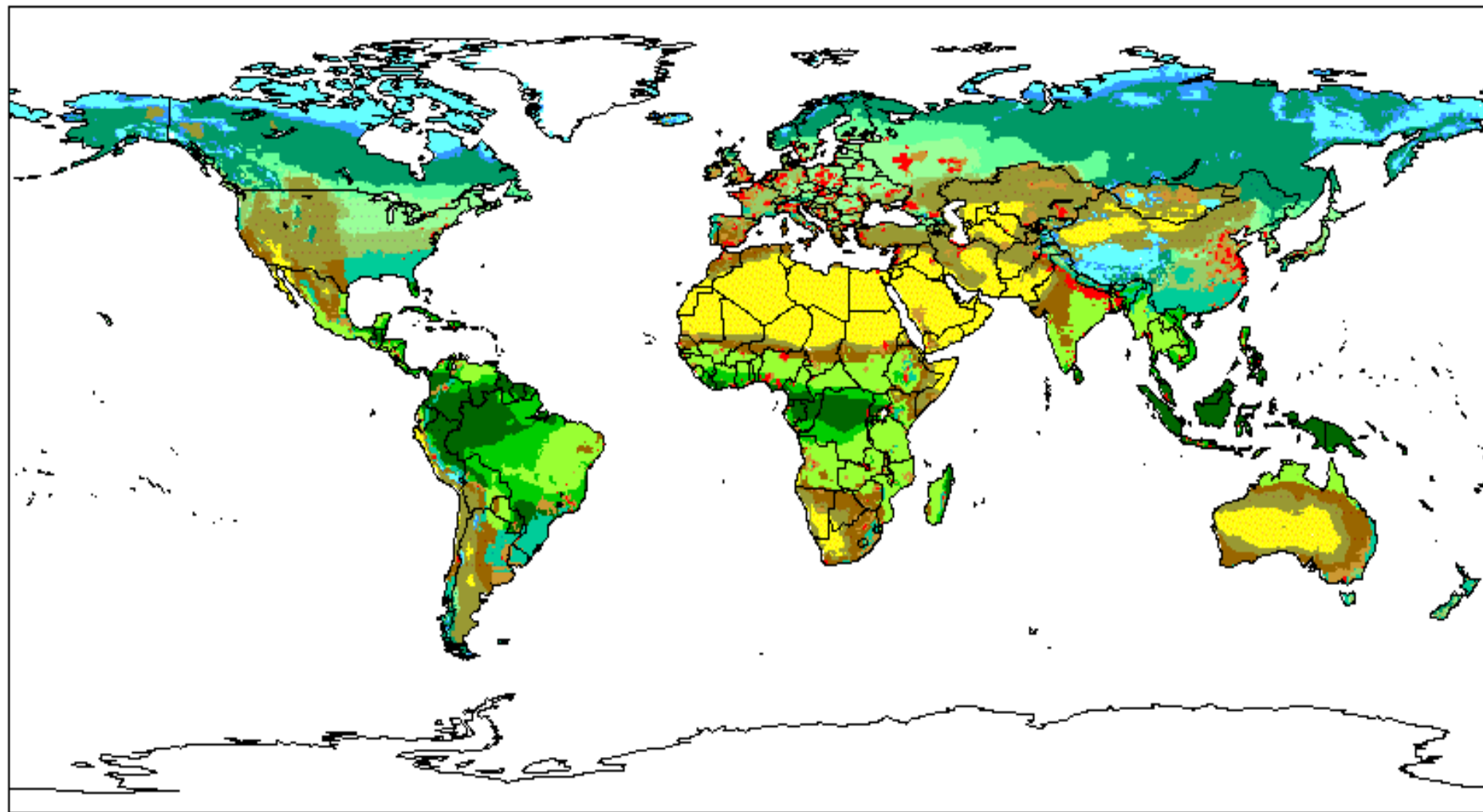
2050 – 9.2 billion



**Population is increasing
but natural resources are
NOT!!**



year 1700

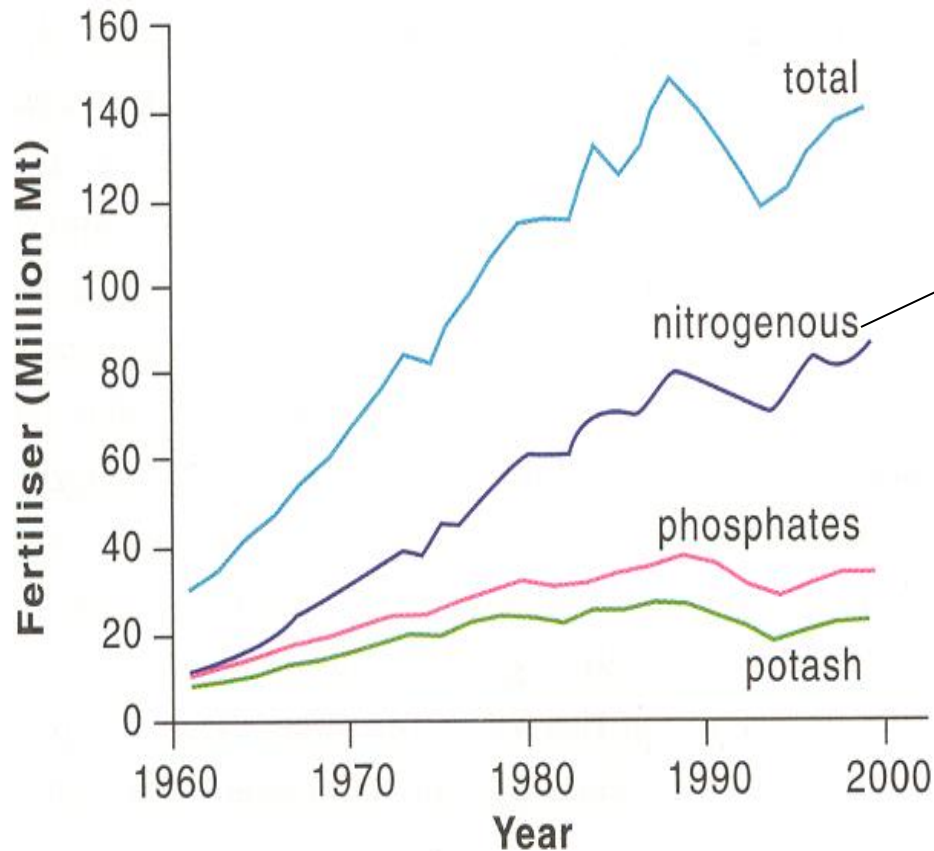


Forests are becoming
croplands to feed our
growing millions.

Fewer trees, more carbon
dioxide in the atmosphere

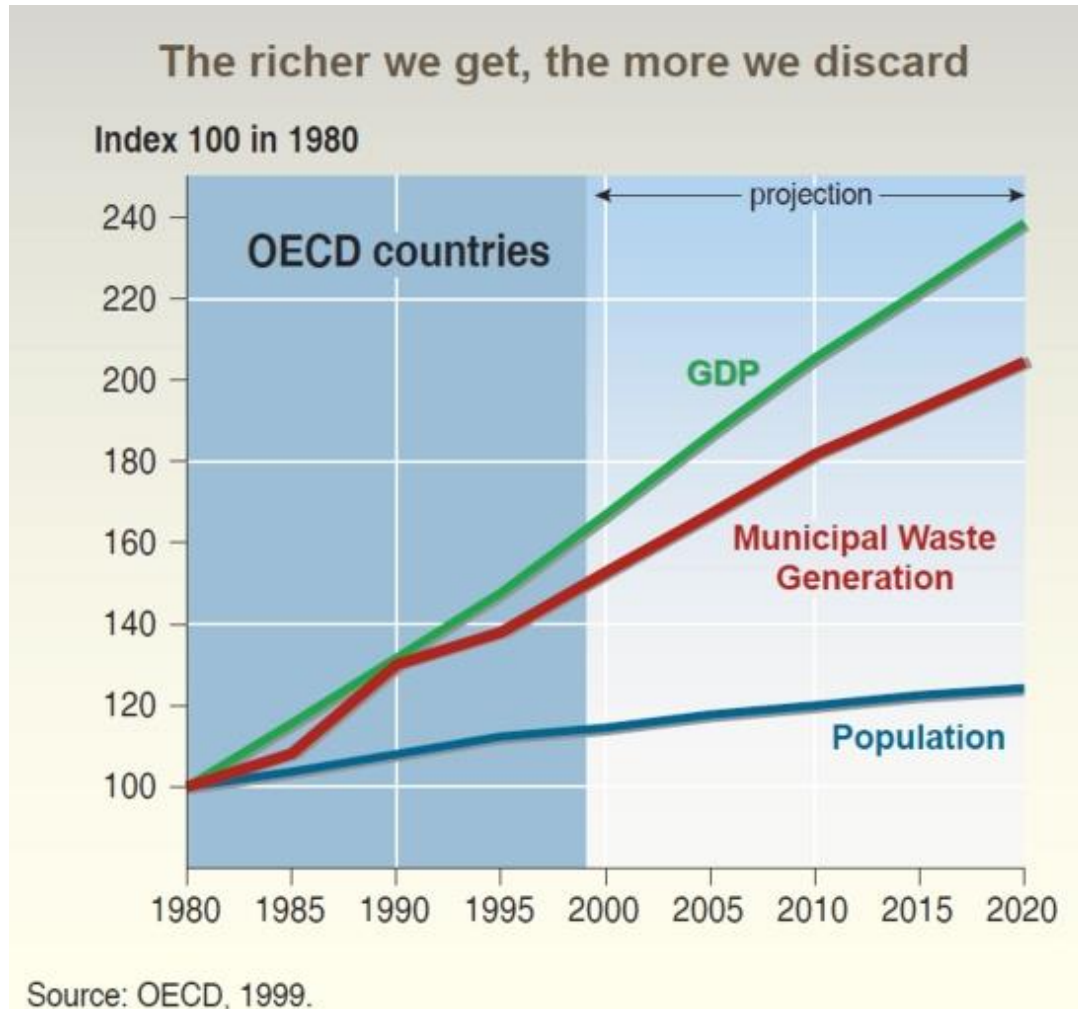
Intensification of agriculture to feed the growing millions

Global fertilizer consumption



More nitrous oxide released

Changing lifestyles

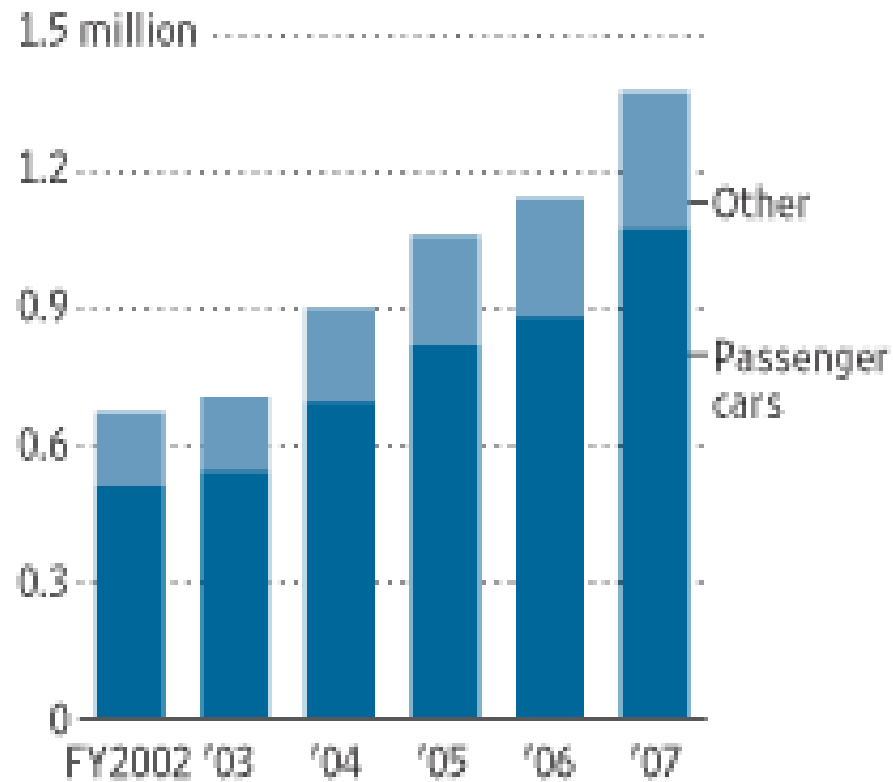


More methane generated by anaerobic decomposition of wastes in landfills

Changing lifestyles

On the Road

India's domestic passenger vehicle sales



Note: Fiscal year ends March 31

Source: Society of Indian Automobile Manufacturers

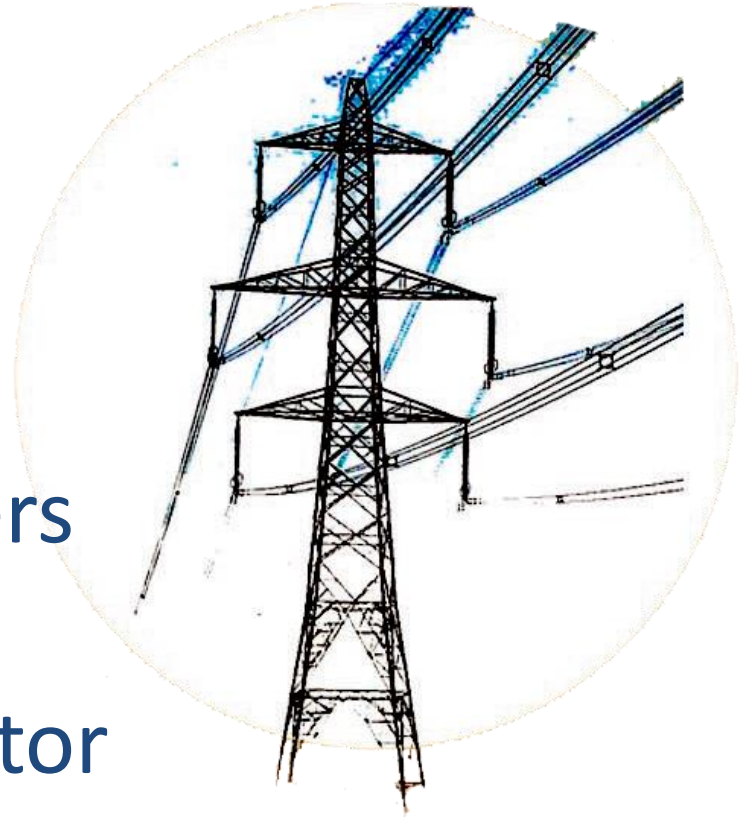


Increasing industrialization to meet our growing demands



Increased demand for electricity

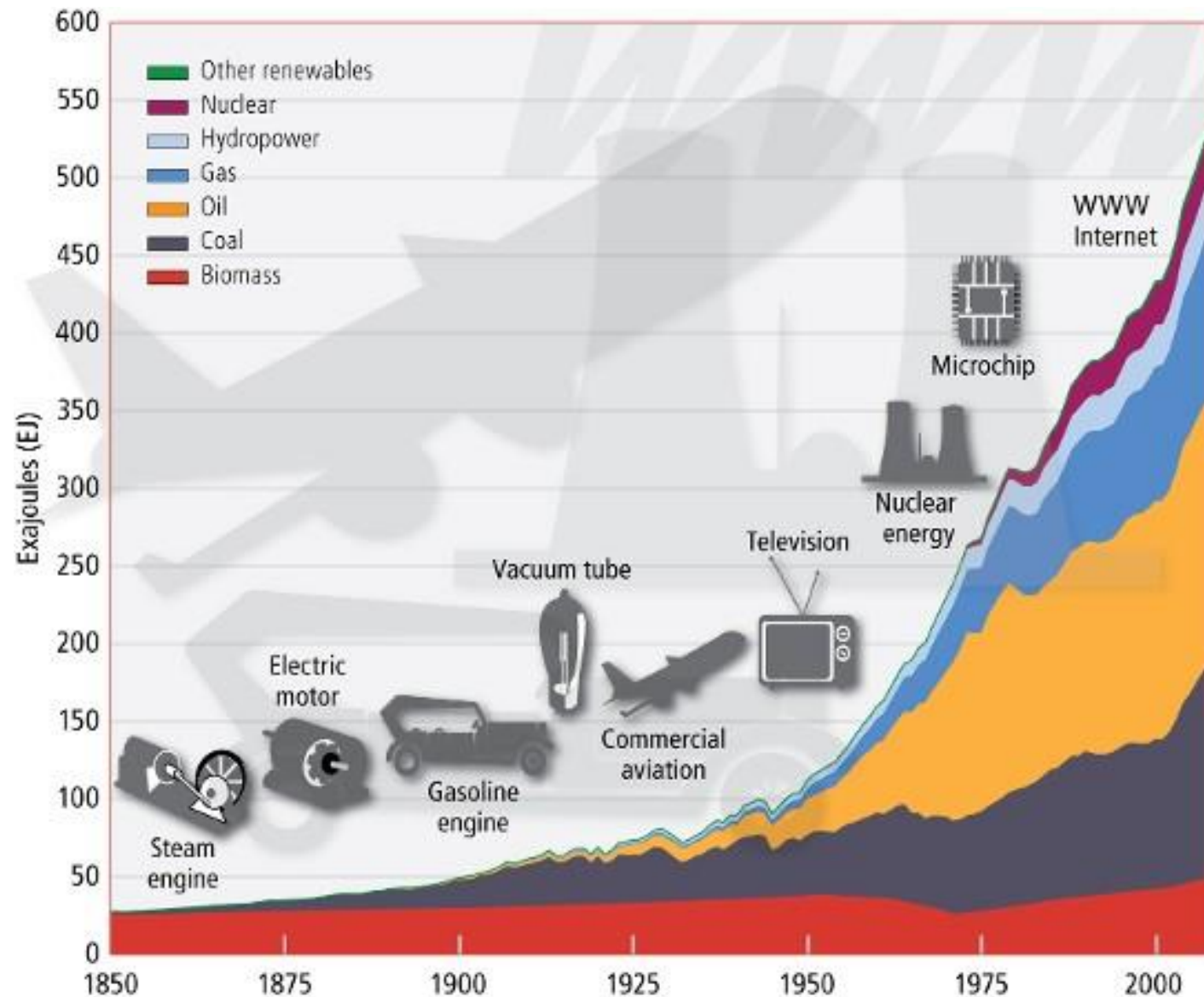
From domestic consumers
From industries
From the agriculture sector



0.82 kg of CO₂ produced for every unit of electricity generated from coal.

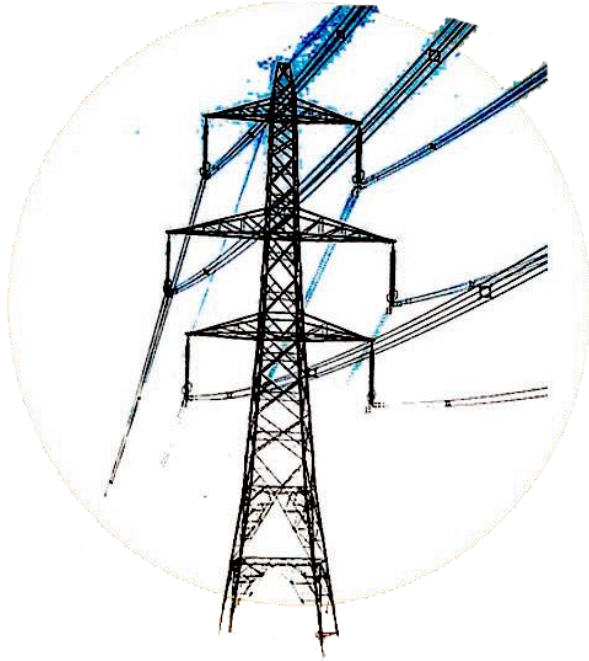
That's approx. 1 kg of CO₂ produced for every unit of electricity we use.

Energy use



It's time to adopt a low carbon lifestyle....

**Reduce use of
electricity**



Conserve fuel



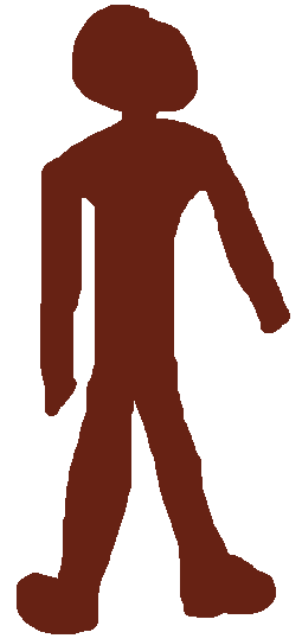
**Do not
waste water**

**Reduce, Reuse,
Recycle**

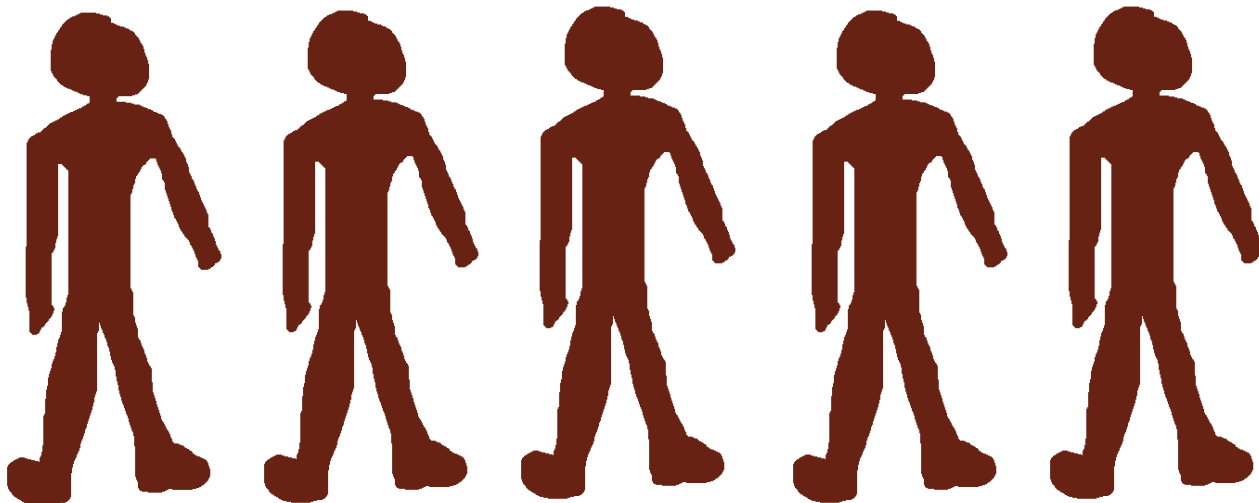


But can I make a difference? I am just one person

Each one adopt at least
two low-carbon actions

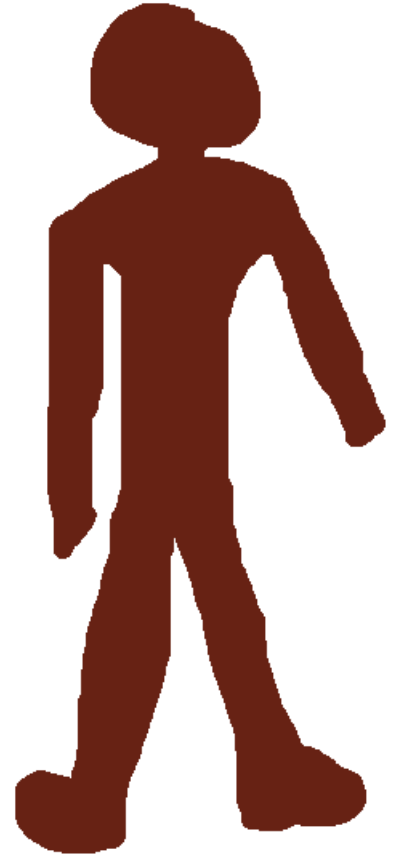


Each one influence at least 5 others
to adopt two low-carbon actions
and spread the message



Will it help?

The impact of millions of people who choose to make changes in personal lifestyles cannot be undermined



“Whatever you may do may seem insignificant to you, but it’s most important that you do it”.

- Mahatma Gandhi