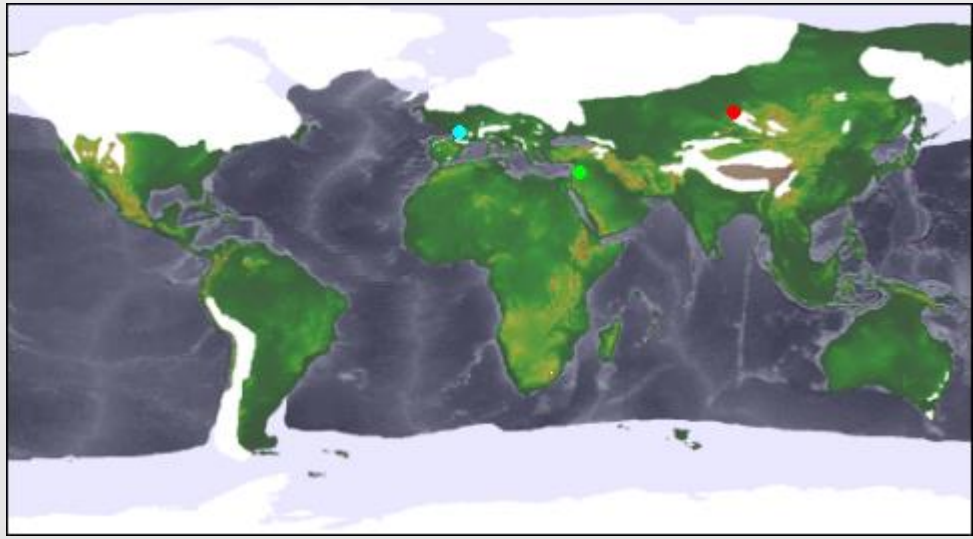
¿Climate Change?

The earth will not continue to offer its harvest, except with faithful stewardship. We cannot say we love the land and then take steps to destroy it for use by future generations.

John Paul II

Some definitions



- ‘Climate’ it refers to long-term atmospheric conditions.
- ‘Weather’ refers to short-term weather conditions that vary in a short period of time.
- Changes in climate are natural, during the last glaciation (occurred 11,500 years ago), global temperatures were 5 ° C lower than they are today.
- We are experiencing unprecedented changes (increases) in temperature in recent times.
- There is a consensus among scientists that this change is due to human activities.

Some definitions

Both, weather and climate are affected by many factors; in particular, climate is affected by:

Abiotic factors

Latitude

Altitude

Ocean currents

Topography

Solar radiation

Evaporation

Orbital variations

Volcanic activity

Biotic factors

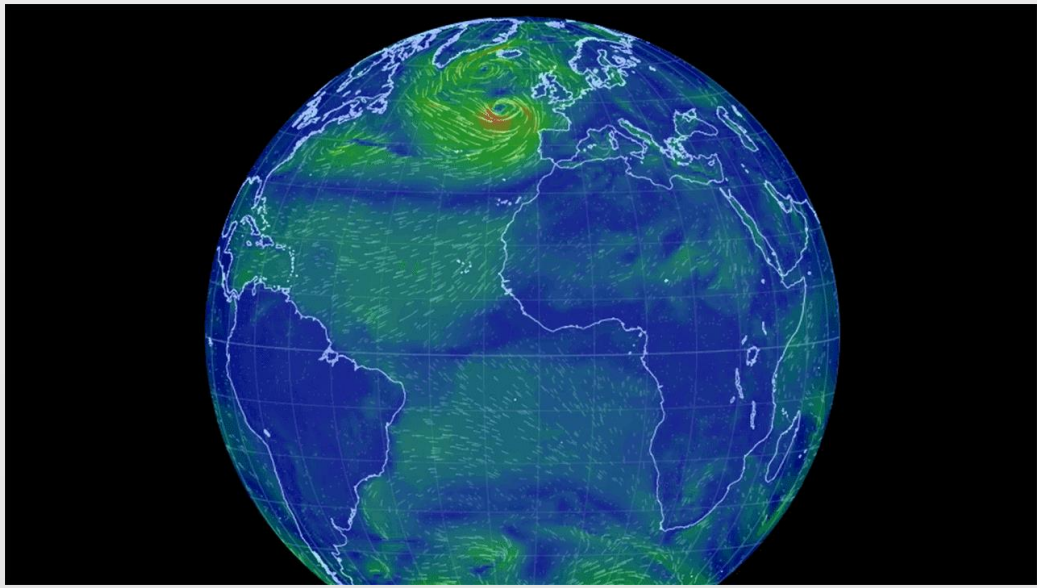
Transpiration

Respiration

Photosynthesis

Decomposition

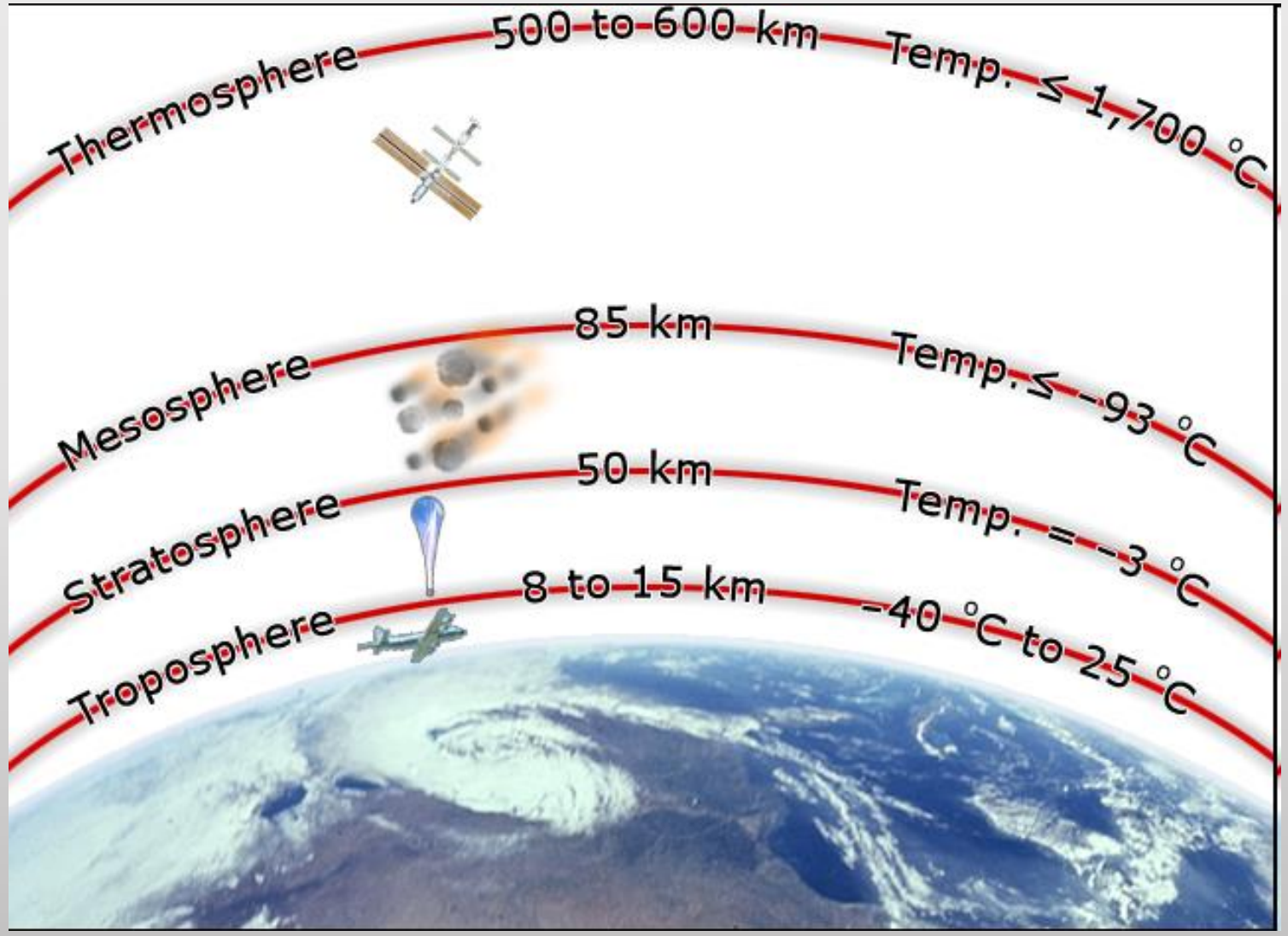
Digestion



https://gifer.com/en/Bj4h

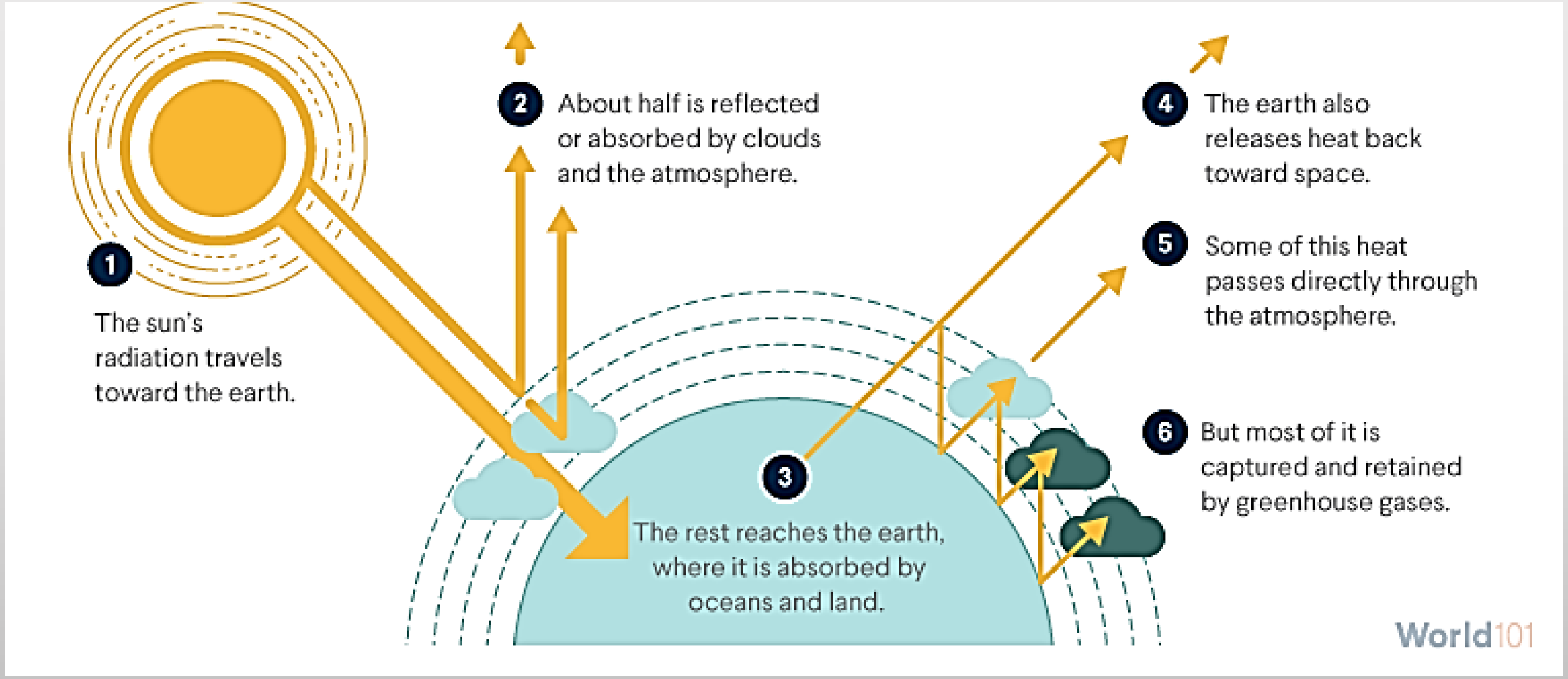
http://clipart-library.com/clipart/BTgraAXec.htm

Earth’s atmosphere: temperature ranges



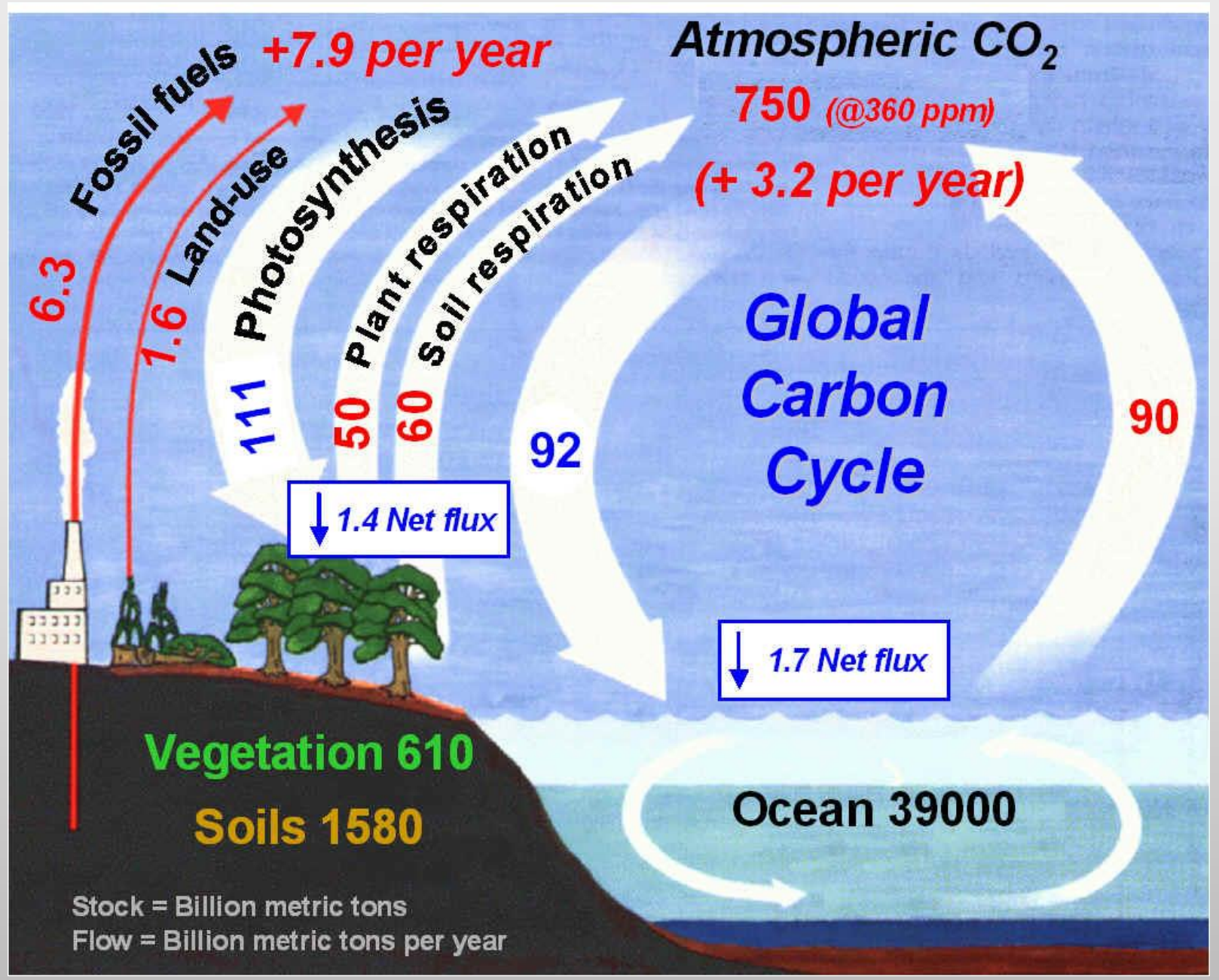
http://www.space.gc.ca/asc/img/spacesuit_2_2_2_A.jpg

Greenhouse effect



https://world101.cfr.org/climate-change/greenhouse-effect

Greenhouse effect



http://www.globalchange.umich.edu

Green House Gasses (GHG)

Carbon dioxide (CO_2)		Burning of coal, generation of energy by burning oil and gas, transport and air conditioning of buildings.
Nitrogen oxide (N_2O) Methane (CH_4)		Sanitary landfills, agriculture and livestock digestion.
Methane (CH_4)		Decomposition of organic matter (rice fields, wetlands, digestion of ruminants, forest fires, microbial activity in wastewater).
Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulfur hexafluoride (SF6)		Used in refrigeration systems, air conditioners and other industrial activities.

Why is the balance important?

With no greenhouse gases in the atmosphere, scientist estimate that Earth's average atmospheric temperature would be about -18°C

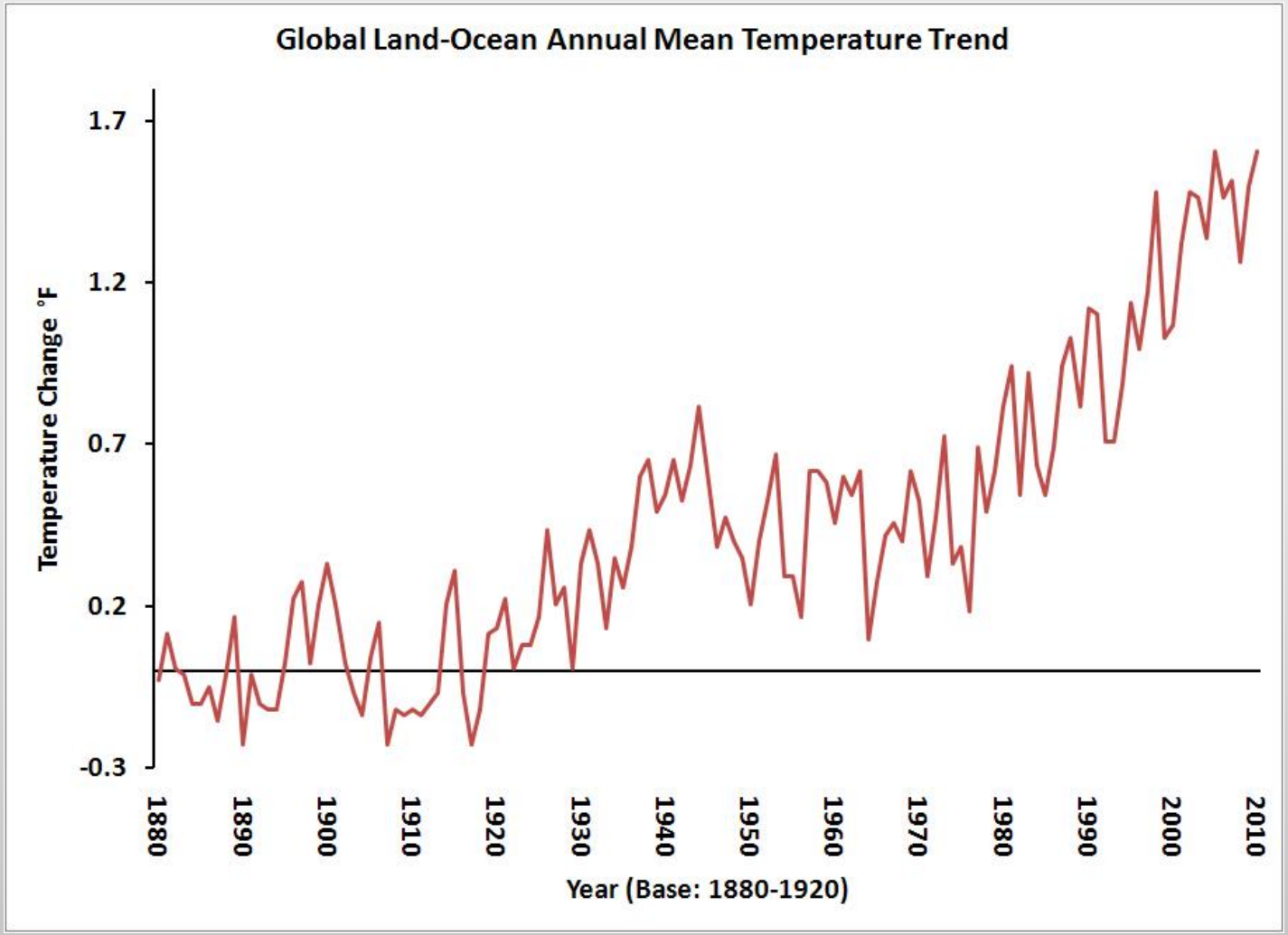
http://www.lifeboxset.com/nota/181766/hands-off-the-antartic-es-la-cancion-que-thom-yorke-escribio-para-apoyar-a-greenpeace-y-la-antartida/

http://justfunfacts.com/interesting-facts-about-the-arctic/

Too much GHG

Planet Venus

Some relevant data

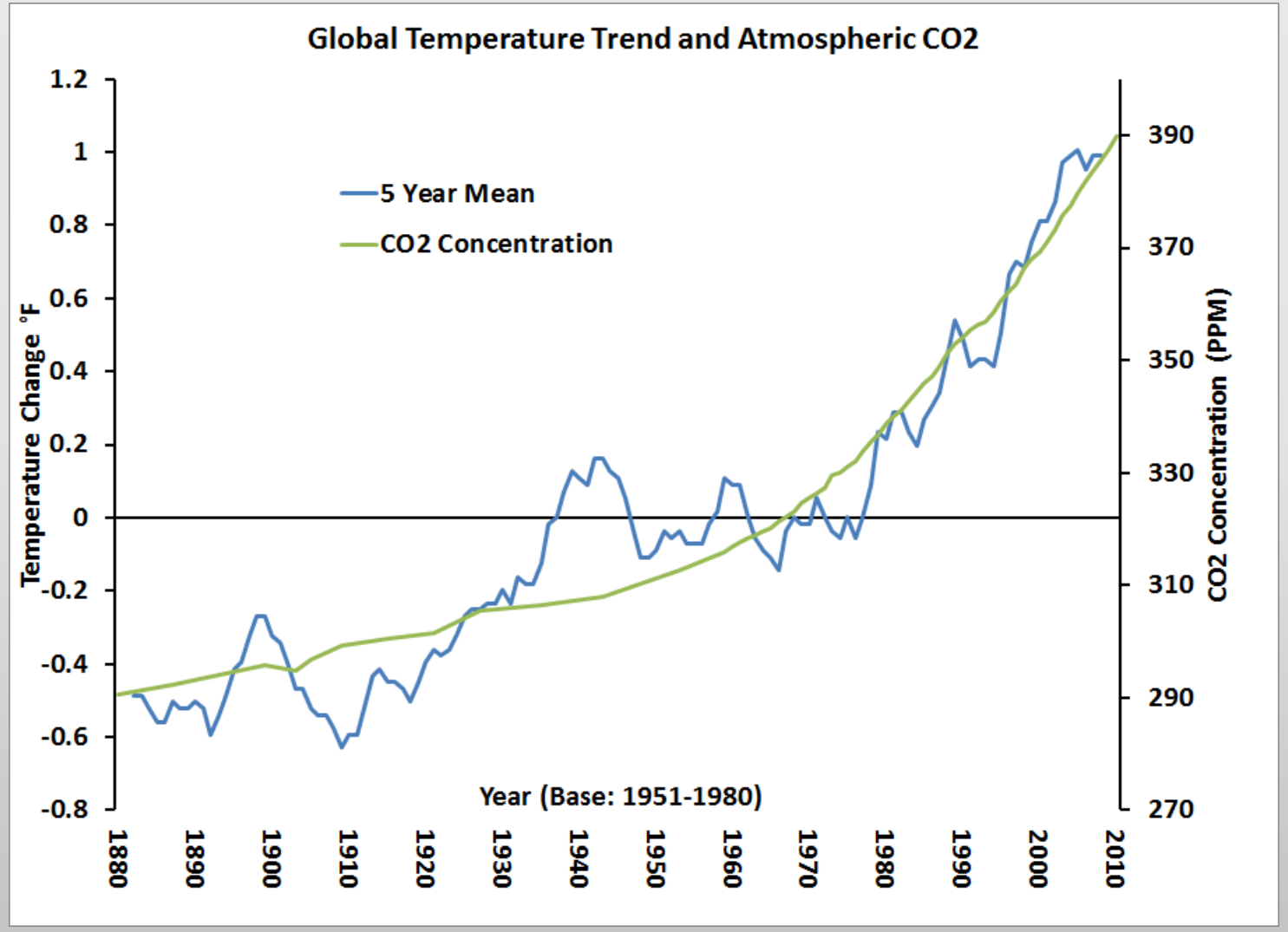


The global average surface temperature fluctuates over time, but recently it has increased dramatically. From 1920 to the present, the Earth's average surface temperature has increased by around 1.4 °F. The current warming trend is proceeding at a rate that is unprecedented in at least the past 1,300 years. (IPCC AR4)

The sharpest rise occurred between 1975 and 2010, when temperature rose steadily by over 1 °F. The graph below holds 1880-1920 as the baseline climate period and temperatures are expressed as the difference from that era.

http://www.c2es.org/facts-figures/trends

Some relevant data

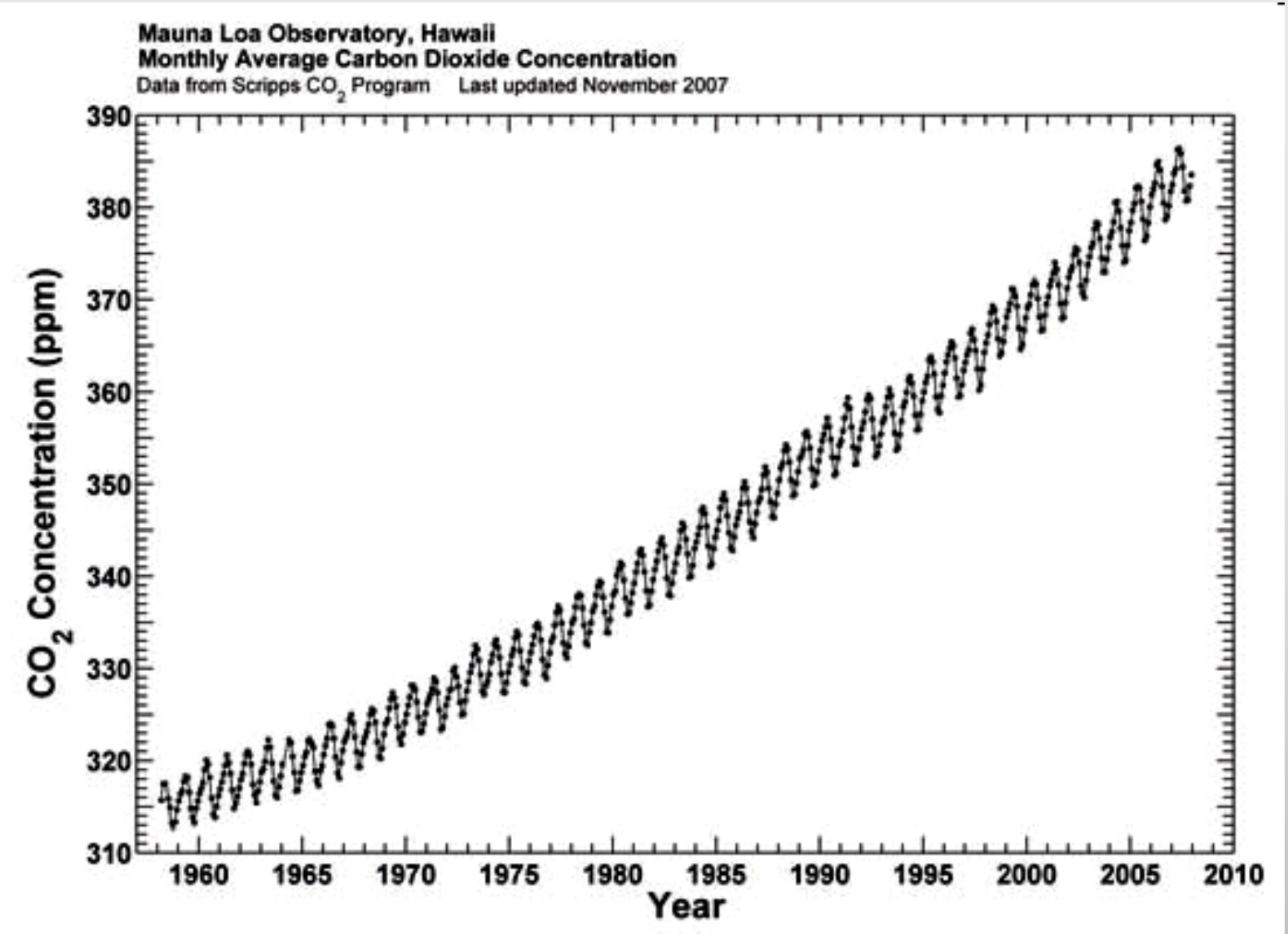


The recent increase in concentration of carbon dioxide in the atmosphere is the result of human activities, mainly the burning of fossil fuels. As the concentration of CO_2 in the atmosphere has increased, so has the average surface temperature of the Earth.

The relationship between atmospheric CO_2 concentration and surface temperature is shown here for the past 130 years.

http://www.c2es.org/facts-figures/trends

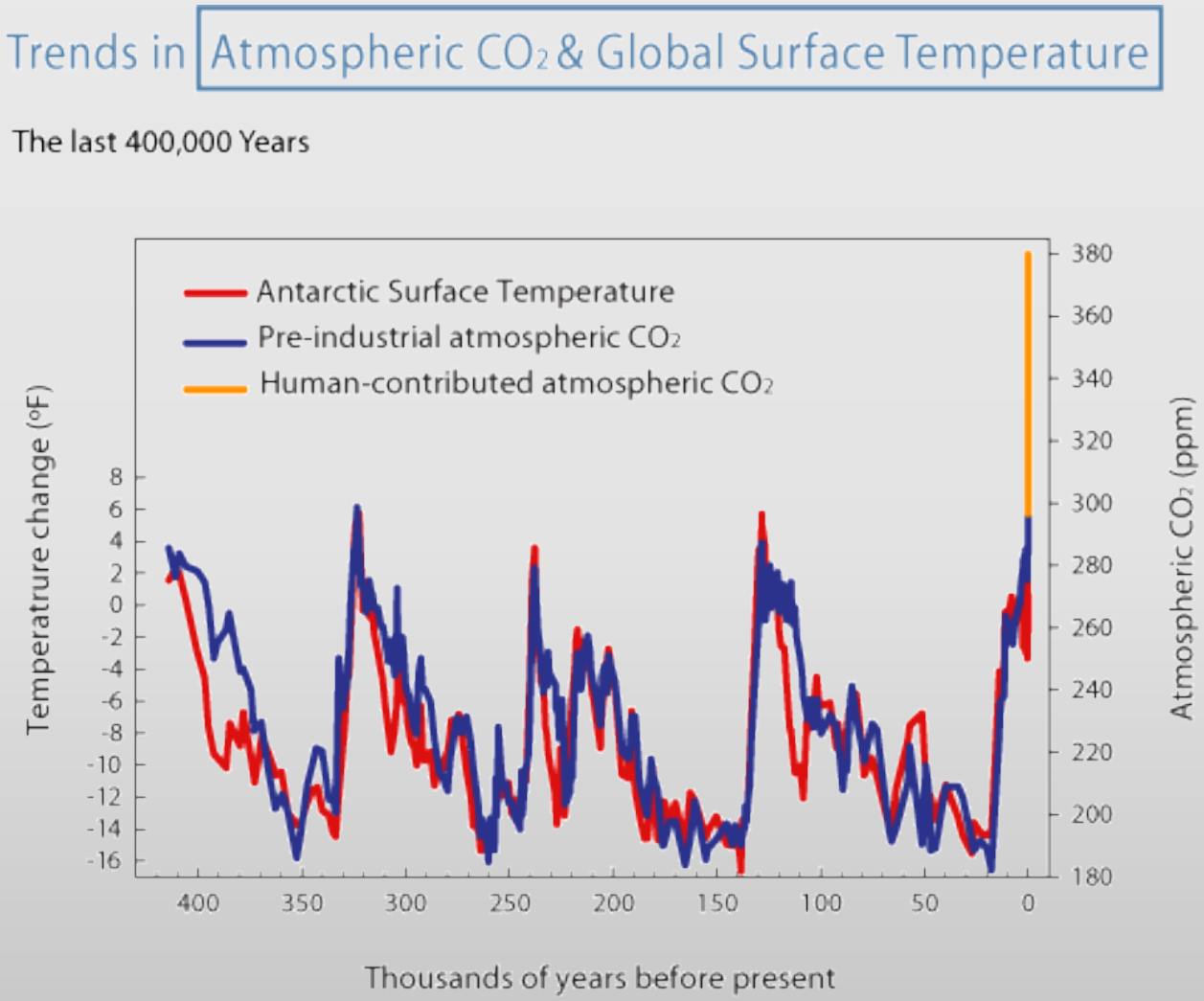
Some relevant data



Mauna Loa Observations of recent increases on atmospheric CO_2.
Note the trend of increasing concentration, and the effect of the seasonal changes of CO_2 assimilation by hemispheric vegetation.

http://www.c2es.org/facts-figures/trends

Some relevant data



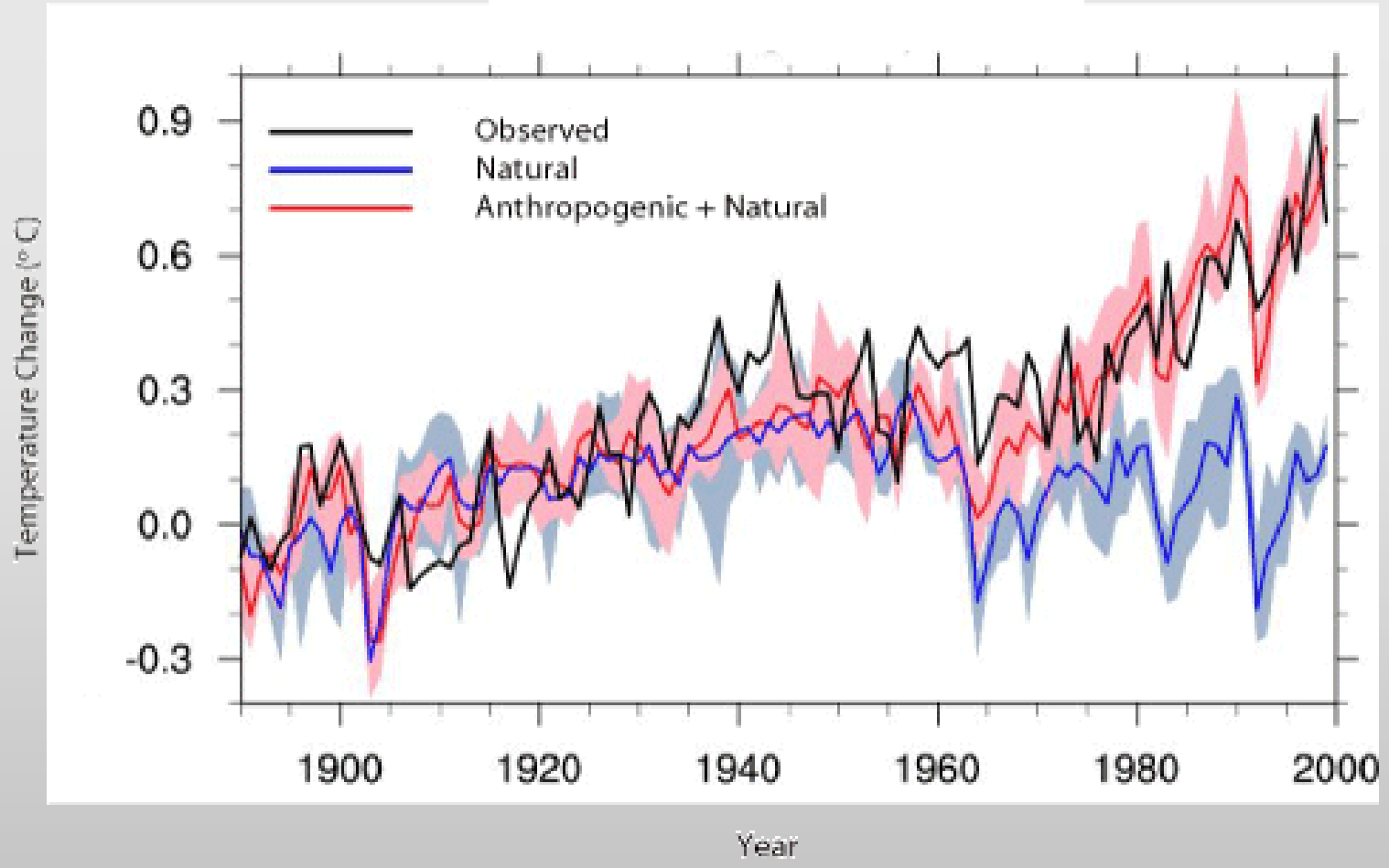
Throughout the millennia, there has been a clear correlation between carbon dioxide levels and average global surface temperatures. This provides strong evidence that CO_2 is a major driver of global temperatures. Scientists say the world is entering largely uncharted territory as atmospheric levels of greenhouse gases continue to rise. Today's carbon dioxide levels are substantially higher than anything that has occurred for more than 400,000 years.

http://www.c2es.org/facts-figures/trends

Some relevant data

Comparison of Modeled and Observed Temperature

1890 - 2000

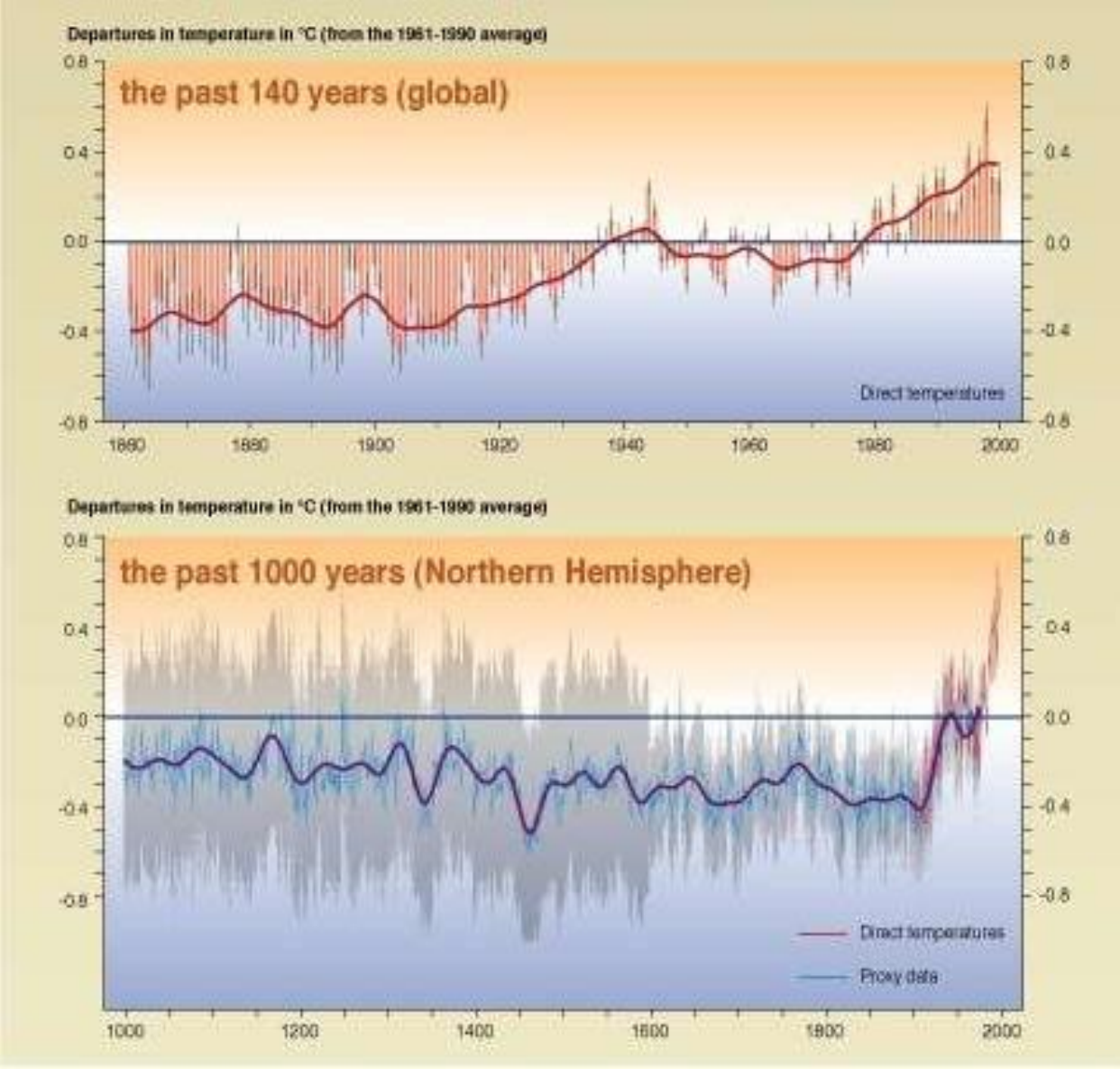


Graph Source: Meehl, G. A., W.M. Washington, C. M. Ammann, J. M. Arblaster, T. M. L. Wigley, and C. Tebaldi. 2004.

http://www.c2es.org/facts-figures/trends

Comparison of the Earth's past temperature variations (shown by the black line) with computer model simulations of past temperature variations (shown by the red and blue lines) in order to determine whether the major changes in temperature were caused by natural or human-caused factors

Temperature

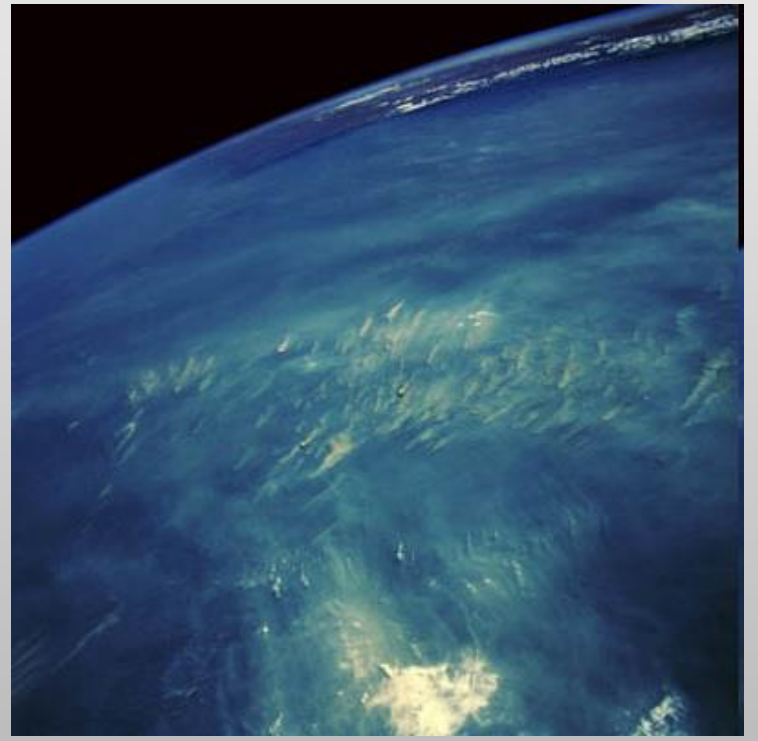


Variations of temperature of the surface of the planet in the last 140 years

Variations of temperature of the surface of the Northern hemisphere in the last 1,000 years

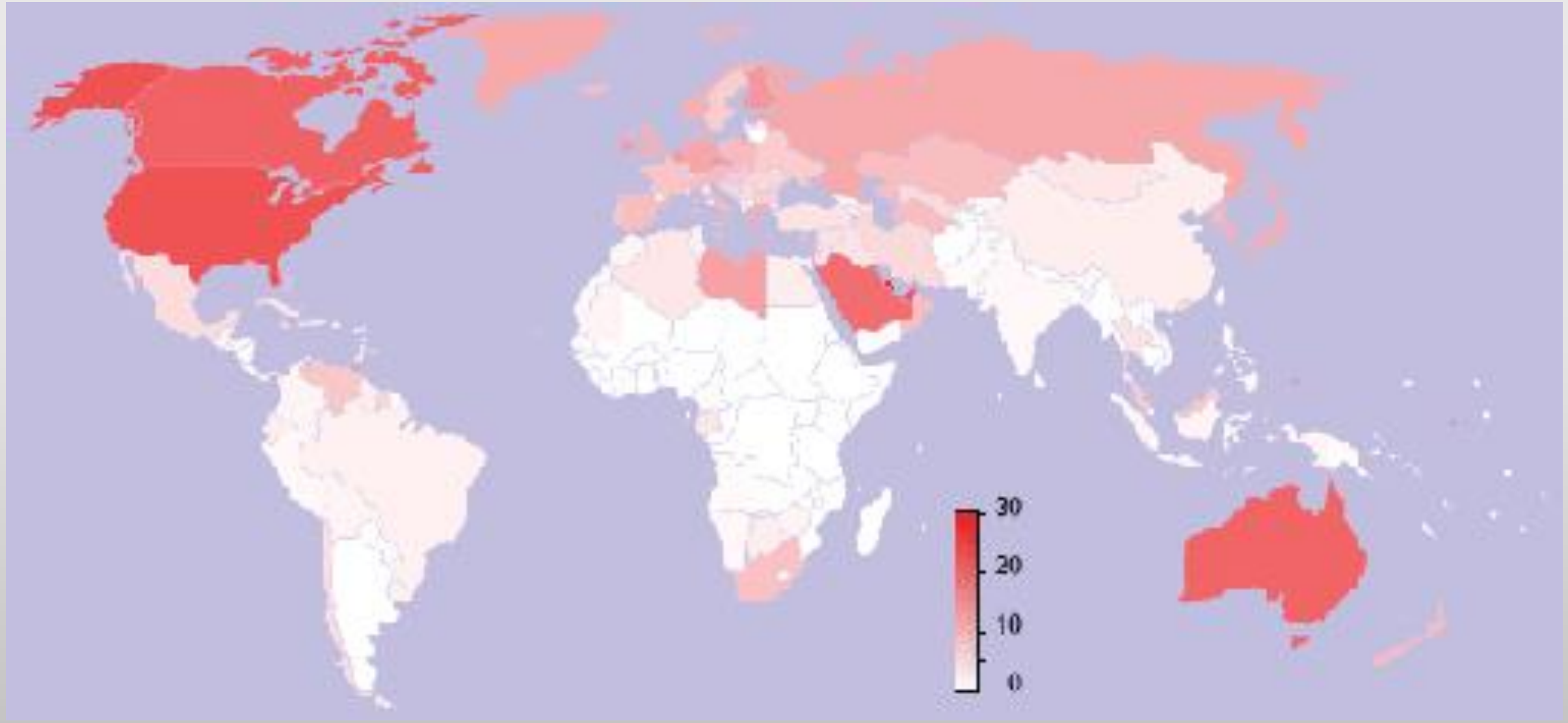
http://www.global-greenhouse-warming.com/climate.html

CO_2 Emissions



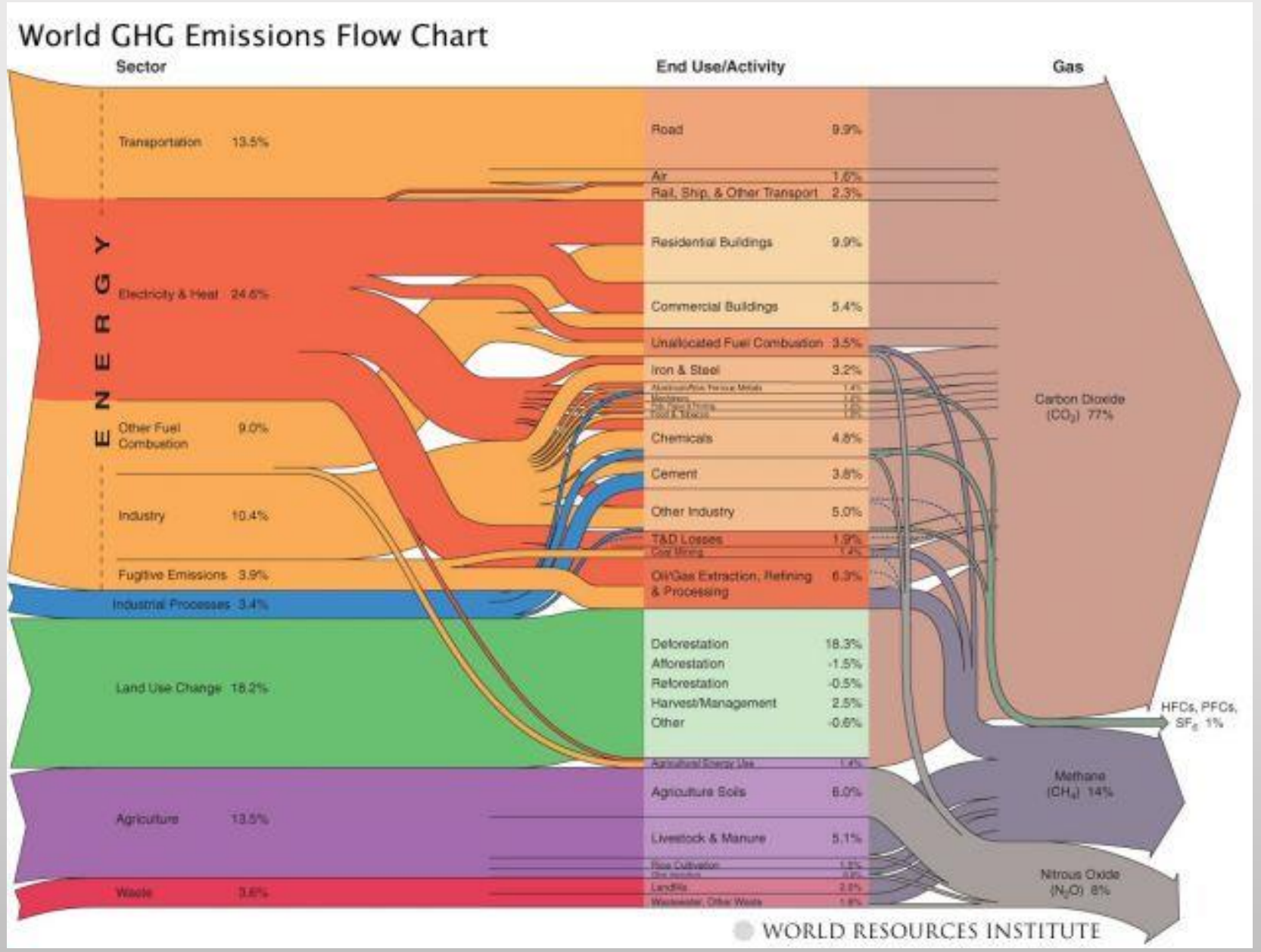
http://www.eco-logic-systems.com/ELS/images/Amazon_burning.jpg
http://www.nasaimages.org/luna/servlet/detail/nasaNAS~10~10~68377~173316:Fires-in-Central-South-America

CO_2 Emissions (Tons per capita per annum)



http://www.global-greenhouse-warming.com/greenhouse-gas.html

Where do they come from?



https://www.wri.org/resources/charts-graphs/world-greenhouse-gas-emissions-2000

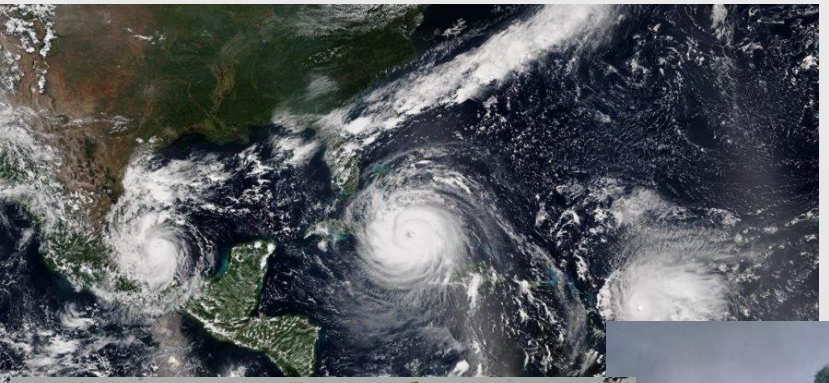
Vulnerability

Degree to which systems are susceptible to adverse impacts and unable to cope.

Vulnerability

Exposition	Sensibility	Adaptive capacity
Speed and magnitude of change	Determined by the state of development	Adaptation can reduce sensitivity

What is expected from climate change?



Changes	Confidence in the projected changes
Temperature increase	Highly probable
Changes in the rainfall patterns	Highly probable
More intense rainfall events	Probable
Increase in hurricane intensity	Probable
Increase in dry summer conditions with the risk of long intense droughts	Probable

https://inhabitat.com/mit-engineers-devise-algorithm-to-identify-warning-signs-of-extreme-weather-events/
https://www.sciencenews.org/article/these-weather-events-turned-extreme-thanks-human-driven-climate-change
https://www.ecowatch.com/scientists-find-extreme-weather-events-fueled-by-climate-change-1881957644.html

Risk is the combination of a threat (climate change) and vulnerability. The recent history shows that we are very vulnerable to extreme weather conditions

Threat
Natural processes
Probability that an event occurs in time and space, with sufficient intensity

Vulnerability
Degree of exposition and fragility, economic value
Probability that, due to the intensity of the event and the fragility of the exposed elements, will damage the economy, human life and the environment

Risk
f(tv)
Combined probability of the occurrence of both Threat and Vulnerability

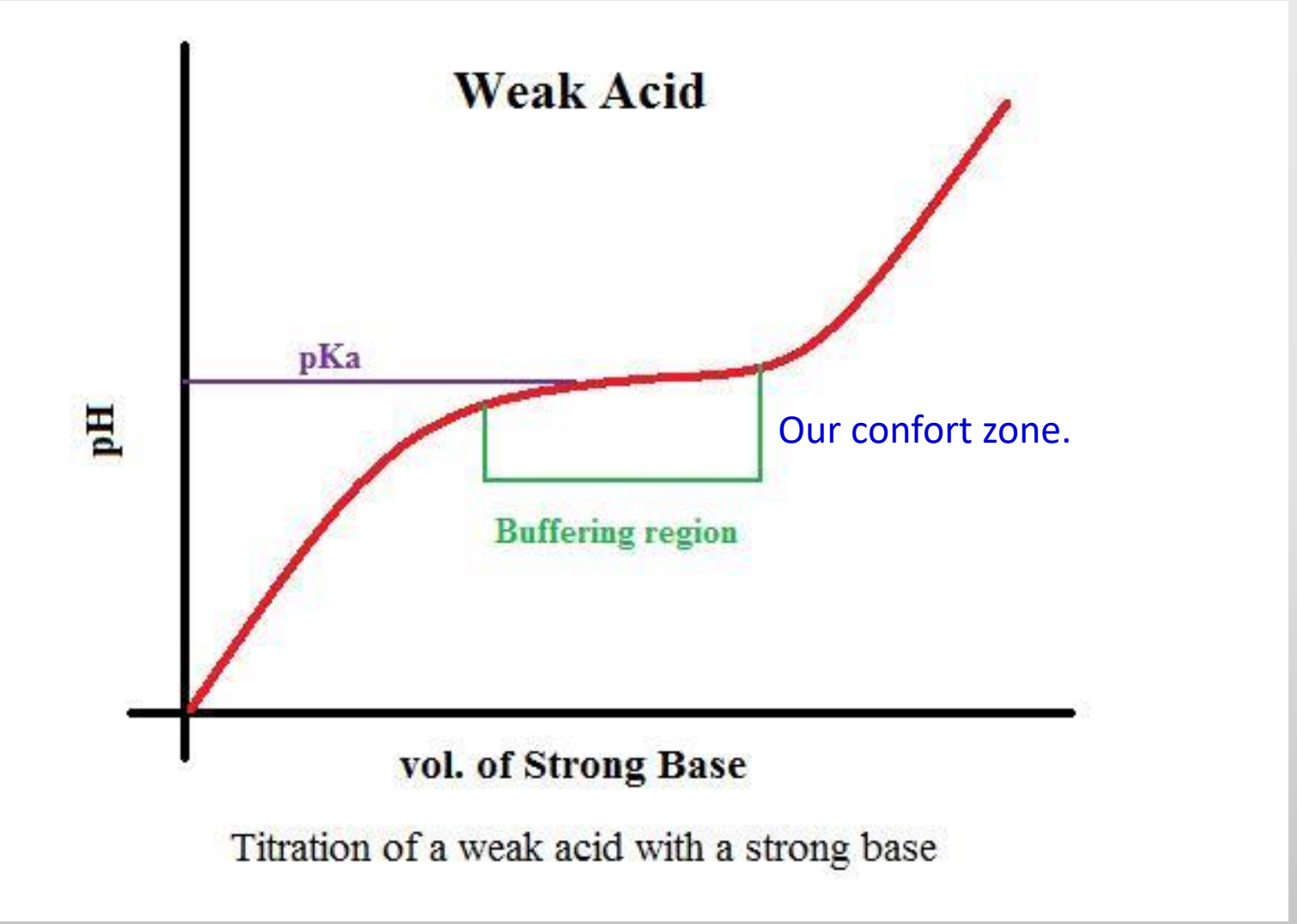
Who is vulnerable to climate change?

Who?	To what?	Why?
Agriculture	Droughts and flooding	Dry land agriculture, eroded soils, scarce economic supports
Urban populations	Heat waves, water availability	Aging of the population, water deficit
Ecosystems	Climate change, wildfires, pests	Slash and burn agriculture, deforestation, desertification
Coastal areas	Increase in sea level, hurricanes	Coastal urbanization, poor planning
Tourism	Hurricanes	Changes in beaches

Sector	Event	Impact
Forests	Drought 1997-1998	New record of wildfires
Water	Dry period during the 90's	Water conflicts in the northern border
Agriculture	Delay of rains during 2005	Lost of agricultural revenue (13%)
Tourism	Hurricanes Stan & William in 2005	Economic losses estimated in around 30,000 million pesos

https://www.google.com/search?q=extreme+weather+events&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjljKGdzrvgAhVgHTQIHXkICWIQ_AUIDigB&biw=1562&bih=874#imgrc=sjjpyW2XL5EY9M:
http://hardenup.org/climate-change/extreme-weather-events.aspx

The buffer experiment…



Titration of a weak acid with a strong base

https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Acids_and_Bases/Buffers/How_Does_A_Buffer_Maintain_Ph%3F

What can be done?

First we must recognize that climate change is everyone's problem. No agency, government, or scientist can "fix it" for us. We are all in this together.

We are here because of our lifestyle, so that is what need to change.

What can you do?

Small actions can have a significant effect!

Heating and cooling?

- ✓ Install programmable thermostats.
- ✓ Check and repair weather striping on doors and windows.
- ✓ Adjust your clothing instead of the thermostat.
- ✓ Keep the AC filters clean.
- ✓ Install insulated drapes.
- ✓ Plant deciduous trees on the sunny side of your home.

✓*More ideas??*

Water?

- ✓ In the average home, 17% of energy is used to heat water.
- ✓ Take shorter showers.
- ✓ Install low flow shower heads.
- ✓ Insulate hot water pipes.
- ✓ Wash laundry in cold water.
- ✓ Install low water consumption WC's.
- ✓ Only run the dishwasher if it's full.
- ✓ Fix leaky faucets.
- ✓ *Any other ideas?*

In the car?

- ✓ Plan ahead, do several errands in a single trip.
- ✓ Walk or bike, it's healthier anyway.
- ✓ Clean out the trunk of your car. Lighter cars get better mileage.
- ✓ Make sure your engine is properly tuned.
- ✓ Keep your tires properly inflated.
- ✓ Carpool or ride the school bus.
- ✓ Support public transportation.
- ✓ Consider a smaller car or a hybrid for your next vehicle.

- ✓ *Any other ideas?*

Electricity?

- ✓ Unplug chargers for cell phones and other appliances when not in use.
- ✓ Get in the habit of turning lights and appliances off.
- ✓ Vacuum the coils on the back of the fridge monthly.
- ✓ Change to compact fluorescent bulbs, or better yet to LED.
- ✓ Make your next computer a laptop.
- ✓ Install timers or motion sensors on outdoor lights.

- ✓ *Any other ideas?*

Waste?

- ✓ Recycle and buy recycled products.
- ✓ Choose products that have less packaging.
- ✓ Reuse, repair, or donate.
- ✓ Don’t buy it unless you really need it.
- ✓ Carry cloth bags when shopping.
- ✓ Use a refillable travel mug or water bottle.
- ✓ Give your time instead of material gifts, or donate to a charity in the recipient’s name..

- ✓ *Any other ideas?*

Nature?

- ✓Plant a tree, or better yet, many trees.
- ✓Clean your mess, or nature will have to clean it for you!
- ✓ Composte your organic waste

- ✓*Any other ideas?*

Climate Change & Human Rights

Mary Robinson served as president of Ireland from 1990 to 1997, and as UN High Commissioner for Human Rights from 1997 to 2002. She now leads a foundation devoted to climate justice.

https://www.ted.com/talks/mary_robinson_why_climate_change_is_a_threat_to_human_rights?referrer=playlist-climate_change_oh_it_s_real#t-358476

21 minutes

Recommended films

An Inconvenient Truth 2006 Directed by Davis Guggenheim, presented by US Vice-president Al Gore

Before the flood 2016 Directed by Fisher Stevens, presented by Leonardo DiCaprio, Netflix.