Greenhouse Gases

Environmental Science

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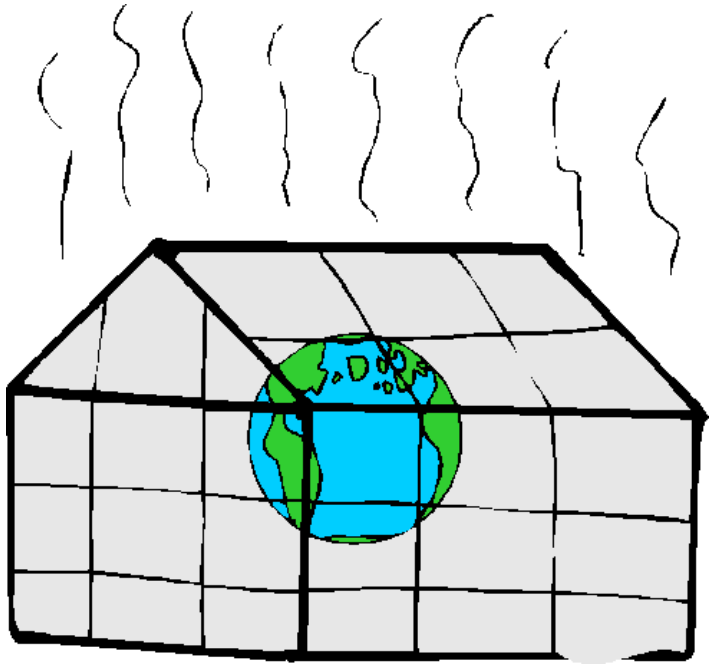


Resources:
https://en.wikipedia.org/wiki/Grain_Growers%27_Grain_Company
https://www.intechopen.com/books/greenhouse-gases/greenhouse-gas-emissions-carbon-capture-storage-and-utilisation
EDGAR v4.3.2 FT2015 (JRC/PBL 2016: IEA 2014 (suppl. with IEA 2016 for China, BP 2016, NBS 2016, USGS 2016, WSA 2016, NOAA 2016)
http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf
Center for alternative technology:
http://www.cat.org.uk/index.html
Zero Carbon Britain:
http://zerocarbonbritain.com/en/
GRAIN https://www.facebook.com/peoplenotprofit/

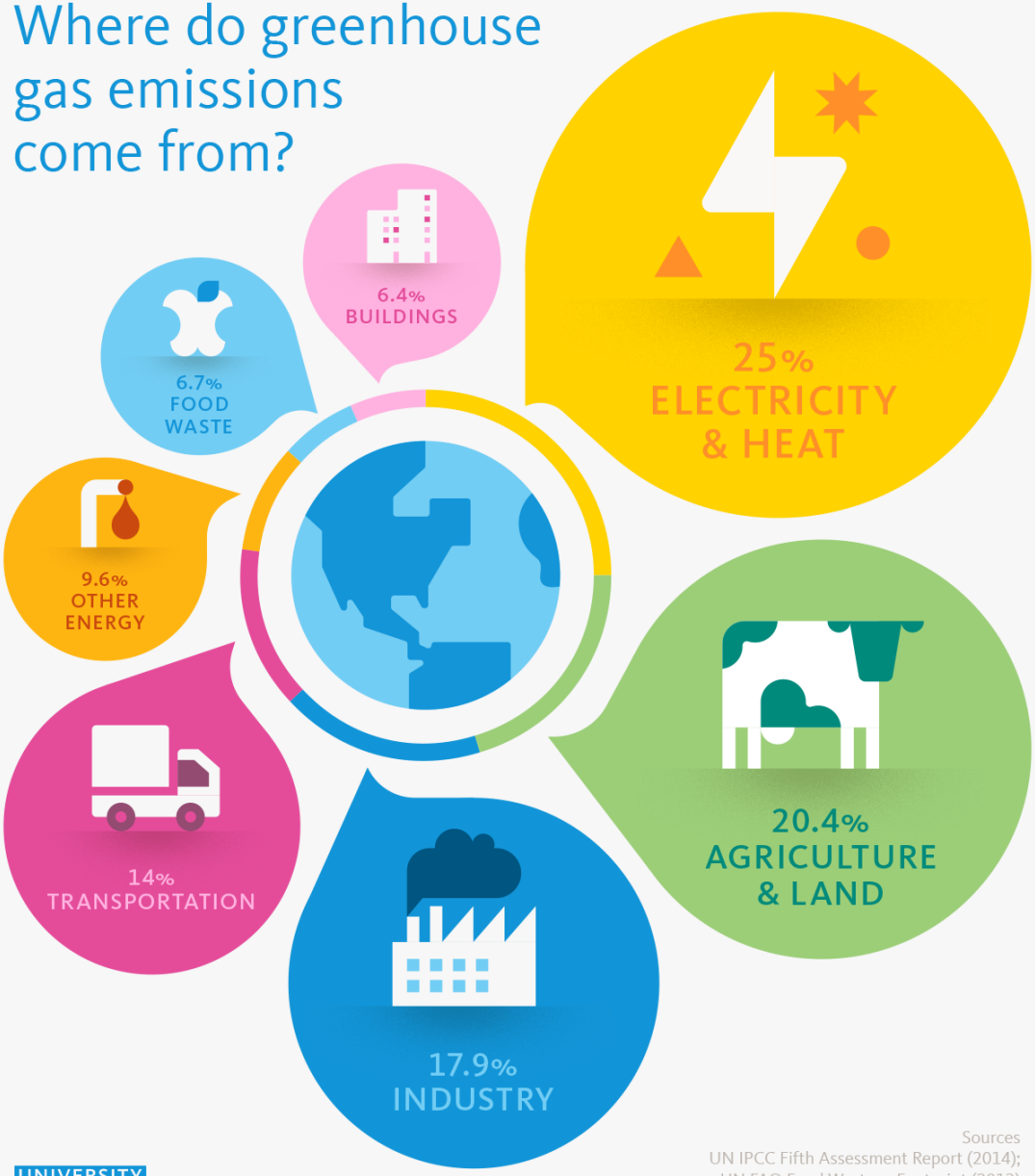
Key terms to define and review

1) Al Gore
2) CO_2
3) Permafrost
4) Greenhouse gases
5) Greenhouse Effect
6) Kyoto Accord/Treaty
7) Anthropogenic causes
8) Green technology & jobs
9) Carbon sinks
10) Antarctic Larsen B
11) Coral Bleaching
12) Carbon tax
13) Tar sands
14) Methane
15) N_2O
16) UNIPCC

Greenhouse gases

- The earth's atmosphere contains trace *gases*, some of which absorb heat. These *gases* (water vapor, carbon dioxide, methane, ozone, and nitrous oxide) are *referred to as "greenhouse gases."*
- Albedo (measure for reflectance or optical brightness) has an important influence on the earth's temperature.

Where do greenhouse gas emissions come from?



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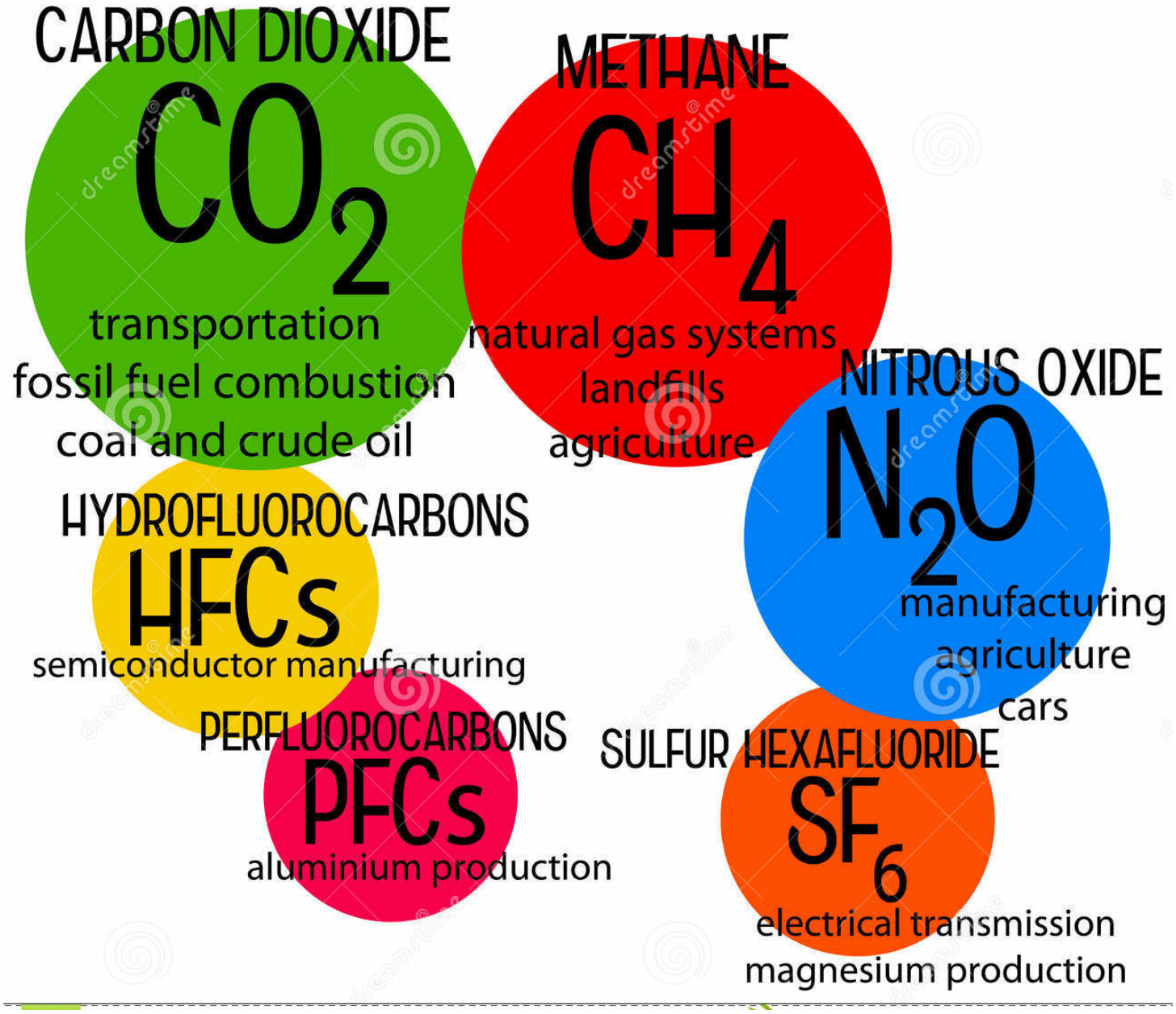
Learn more at
climate.universityofcalifornia.edu

Sources
UN IPCC Fifth Assessment Report (2014);
UN FAO Food Wastage Footprint (2013)

Percent of global greenhouse gas emissions.

Greenhouse Gases



Greenhouse Gases

- Carbon Dioxide – colourless and odorless; made by burning carbon, respiration, transportation
- Methane – colourless; manure, land fills, agriculture, animal and human flatulence
- Nitrous oxide – colourless and sweet; produced by heating ammonium, manufacturing, cars
- Hydrofluorocarbons – semi conductor manufacturing
- Perfluorocarbons – aluminium production
- Sulfahexafluoride – electrical transmission, magnesium production

CO_2 emissions from fossil-fuel use and cement production in the top 6 to 10 emitting countries

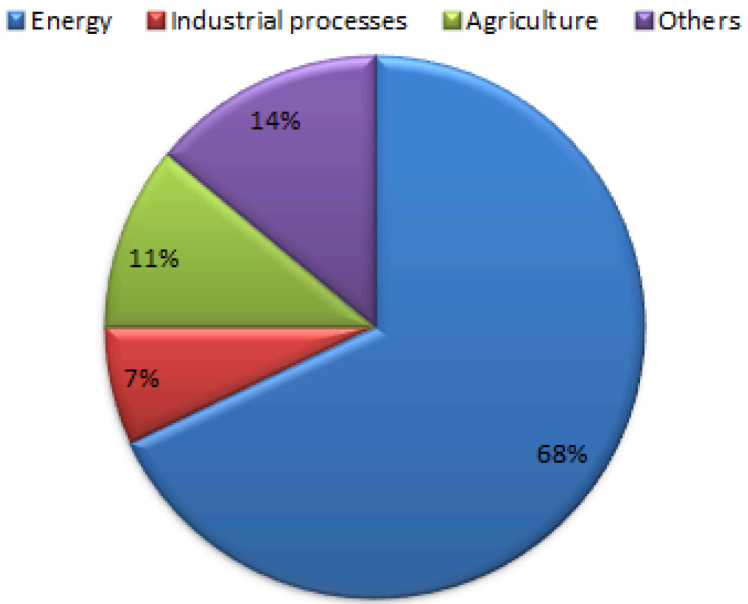
From 2003 – 2015

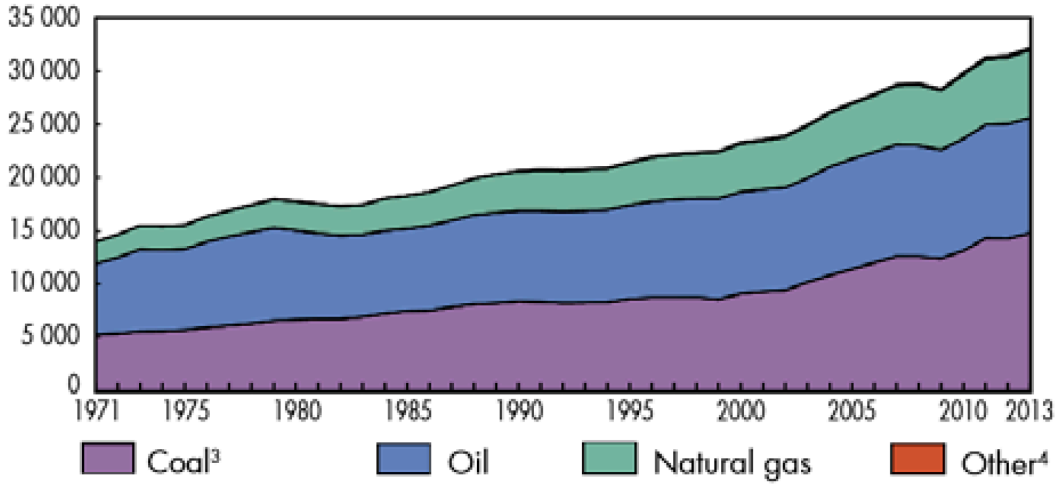
1,000 million tonnes CO_2

	Emissions
1) Canada	0.8 – 0.7 million tonnes
2) Saudi Arabia	0.5 – 0.6 million tonnes
3) South Korea	0.5 – 0.6 million tonnes
4) Brazil	0.4 – 0.55 million tonnes
5) Indonesia	0.3 – 0.5 million tonnes

Source: EDGAR v4.3.2 FT2015 (JRC/PBL 2016: IEA 2014 (suppl. with IEA 2016 for China, BP 2016, NBS 2016, USGS 2016, WSA 2016, NOAA 2016)
http://edgar.jrc.ec.europa.eu/news_docs/jrc-2016-trends-in-global-co2-emissions-2016-report-103425.pdf

Global Greenhouse emissions, 2016



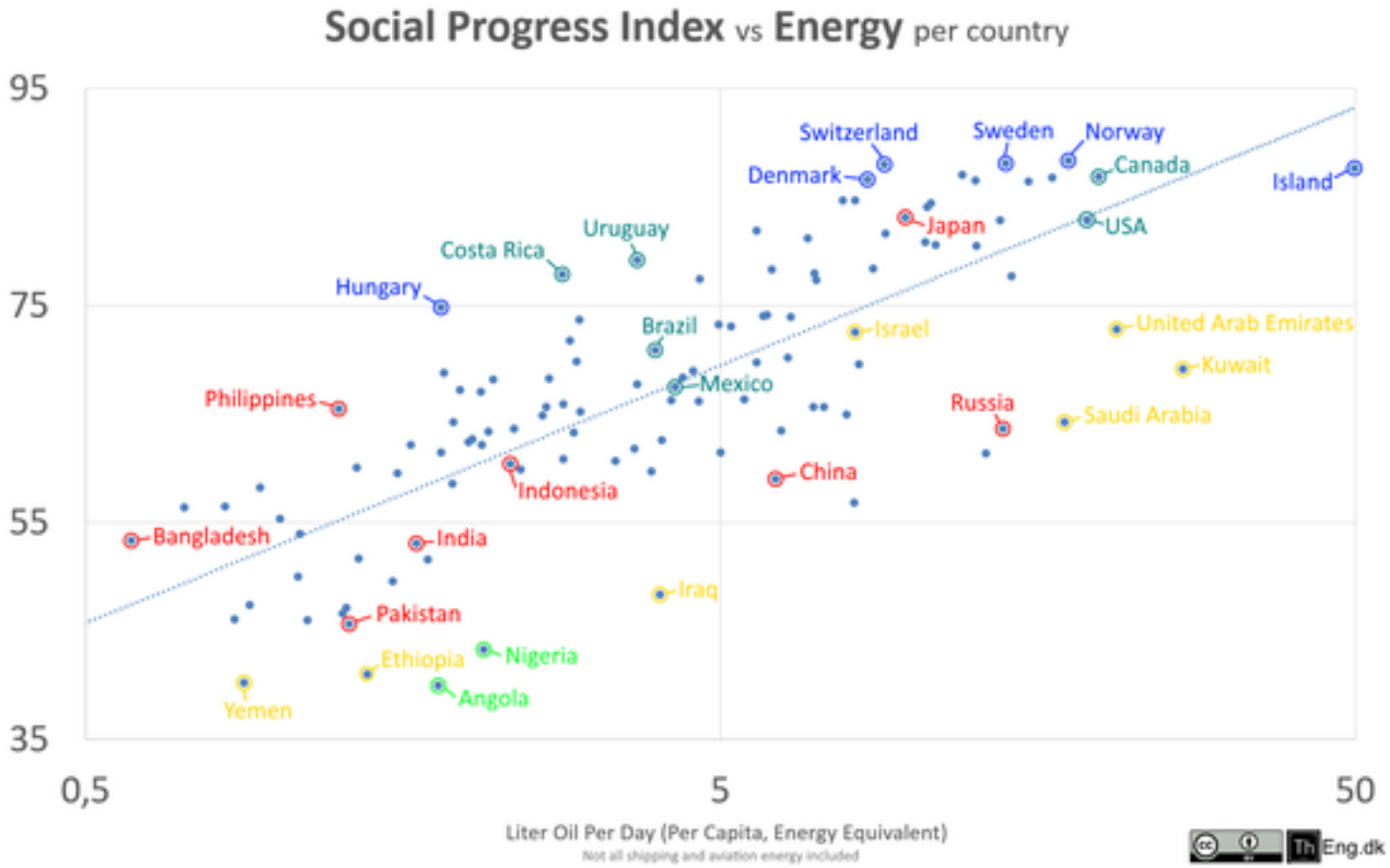


Can we live on less energy?

- According to the *Centre for Alternative Technology* it is possible to live a comfortable lifestyle on just 15,000 kWh of energy per person per year
- This could be met from existing renewable technologies according to *energy expert David Mackay* - who calculated that with huge renewables building effort Europe could produce over 30,000 kWh/person/year

Country's energy consumption per capita

This is all the energy needed as input to produce fuel and electricity for *end-users*. It is known as Total Primary Energy Supply (TPES), a term used to indicate the sum of production and imports subtracting exports and storage changes.



Can we live on less energy?

- It has been suggested that the US could reach 22,500 kWh/person on wind, hydro and geothermal alone
- The *Zero Carbon Britain* report recommends building over 130,000 offshore wind turbines to power the UK, each up to 100 meters tall, covering an area of ocean the size of Wales

Food revolution

- The food industry is responsible for between 1/3 to 1/2 of global emissions
- This includes the manufacturing of chemicals and fertilizer, carbon loss from soils, farm energy use, transport, processing, refrigeration, and the clearing of forests to create agricultural land
- All of these effects are heavily associated with large-scale industrial farming and not with small scale organic or peasant farming

Food revolution

- *GRAIN* has estimated that global shift towards traditional management of the world's agricultural land could draw 3,750 million tonnes of CO_2 per year out of the atmosphere and back into soil over the next 10 years (2008 source) - equivalent to almost 10% of current global emissions.

Definitions

1) Al Gore – Albert Arnold Gore Jr is an American politician and environmentalist who served as the 45th vice president of the US from 1993-2001

2) CO_2 – Carbon dioxide is a greenhouse gas; carbon dioxide is a colourless gas composed of one carbon atom that is covalently double bonded to two oxygen atoms

3) Permafrost – a thick subsurface of soil that remains frozen throughout the year, occurring chiefly in polar regions

4) Greenhouse gases – a gas that contributes to the greenhouse effect by absorbing infrared radiation

Definitions (continued)

5) Greenhouse Effect – Greenhouse gases act like a blanket, absorbing infrared radiation and preventing it from escaping into outer space

6) Kyoto Accord/Treaty – an international treaty among industrialized nations that sets limits on greenhouse gas emissions

7) Anthropogenic causes – caused or influenced by humans

Definitions (continued)

8a) Green technology - technology whose use is intended to mitigate or reverse the effects of human activity on the environment. A continuously evolving group of methods/materials from techniques for generating energy to non-toxic cleaning products

8b) Green jobs is work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute(s) substantially to preserving or restoring **environmental** quality.

9) Carbon sinks – a natural or artificial reservoir that absorbs more carbon than it releases as carbon dioxide

Definitions (continued)

10) Antarctic Larsen B (ice shelf) – The Antarctic Larsen B ice shelf collapse occurred in the northwest part of the Weddell Sea. In 2002, a large part of the ice front broke off the glacier

11) Coral Bleaching – when a change in temperature nutrients or sunlight causes coral to release algae living within them causing stress to the coral and eventually killing the coral

12) Carbon tax – a tax on fossil fuels intended to reduce the emission of carbon dioxide

13) Tar sands – a deposit of sand impregnated by bitumen; the sand can be processed and yield oil

Definitions (continued)

14) Methane – a greenhouse gas; a colourless odorless flammable gas that is the main constituent of natural gas

15) N_2O – Nitrous oxide is a greenhouse gas; a colorless non-flammable gas, with a slightly metallic scent and taste, known as laughing gas.

16) UNIPCC (International Panel on Climate Change) – a scientific and intergovernmental body under the auspices of the UN, set up at the request of member governments, dedicated to providing the world with an objective, scientific view of climate change and its political and economic impacts