

Lesson 7 - Enhanced Greenhouse Effect and Climate Change

- The natural greenhouse effect keeps our planet warm by absorbing some of the **Thermal energy** radiated by the earth's **surface**.

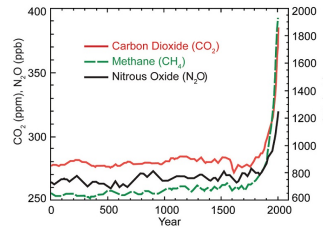
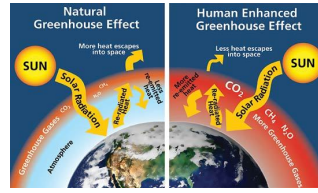
- Greenhouse gases occur naturally, but also can be added to as a result of human activity.

- The addition of greenhouse gases by humans creates the **enhanced greenhouse effect**

- Ice core samples from Greenland and Antarctica have shown increases in greenhouse gas concentration over the last 300 years.

- Increases in these gases could change the **net radiation budget** of Earth.

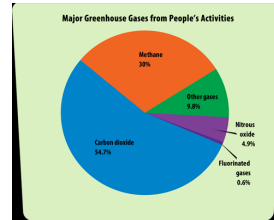
- Less thermal energy is released back into space and as a result, the **average temperature** at Earth's surface could increase.



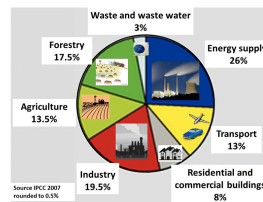
Greenhouse Gases and Human Activity

1. Fill in the following chart by listing the type of greenhouse gas produced as a result of the specific human activity.

| Human Activity | Greenhouse Gas Produced |
|--------------------------------------|-------------------------------|
| Producing fossil fuels | Methane, carbon dioxide |
| Burning fossil fuels | Carbon dioxide, nitrous oxide |
| Deforestation / Forest Fires | Carbon dioxide |
| Agriculture | Nitrous oxide, methane |
| Landfill | Methane |
| Coolants (Fridges, Air Conditioners) | Halocarbons |



Global human sourced GHG emissions by sector



- Define a "carbon source" and a "carbon sink"? Give an example of each.

Carbon source: releases carbon dioxide into air
ex. chart above

Carbon sink: any process that removes carbon dioxide from the air
ex. photosynthesis, oceans and lakes

- Besides absorbing a lot of thermal energy in the atmosphere, halocarbons such as CFC's pose another severe threat to earth. What is this threat?

Destroy the ozone layer which allow more radiation (UV rays) into earth

- Define "enhanced greenhouse effect".

Change in earth's net radiation budget as a result of human produced greenhouse gasses.

- Define "global warming".

Observed increase in Earth's average temperature.

Earth has experienced many periods of global warming in its 4.5 billion years of existence

- List 4 evidences of global warming.

Flowers blooming 26 days earlier in N. Hemisphere

Changes in frequency and severity of storms

Snow and ice cover has reduced

Oceans increasing in temperature in certain areas

Climate Change

History of Earth's temperature change since 1880



What is Climate Change?

- Climate change is the change in the climate of a region over time (usually a min of 30 years)
- Earth has experienced many periods of climate change in its history (4.8 billion years)

What evidence is the idea of Climate Change based on?

- There are two types of evidence scientists use to identify climate change
 - Scientific Evidence
 - Anecdotal Evidence
- **Anecdotal Evidence** relies on reports from people and how they interpret weather events over time
 - § Often biased and is not suitable for forming a scientific conclusion.
 - § Anecdotal evidence of climate change can include old peoples thoughts on weather
- **Scientific Evidence** is evidence that is collected in a manner that is without bias
 - § Collected by trained scientists
 - § Scientific climate change evidence comes from
 - ice core data or tree rings for time periods long ago
 - recording weather data for long periods of time

<http://climate.nasa.gov/evidence/>



Impacts of Climate Change on Alberta (pg. 427)

1. What would the effects of climate change be on the following categories of life in Alberta?

| <u>Alberta's Issue</u> | <u>Effects of Climate Change</u> |
|---------------------------------|---|
| Crops | Crop yields could drop Change in crops to adjust to drought |
| Agriculture in Northern Alberta | Some crops grown further north Increased yields b/c of longer growing seasons Insect species could be more abundant/diverse |
| Forests | Drier condions could mean less forest growth Drier condions could mean more forest fires Insects could appear more and cause damage |
| Plant Species / Animal Species | If change was too great, some species may not be able to adapt and die off Wetlands dry up and some species die off |
| Health of Albertans | Air polluon could get worse in heat waves Insects that need warm weather could move north and bring disease (cks – Lyme disease) |

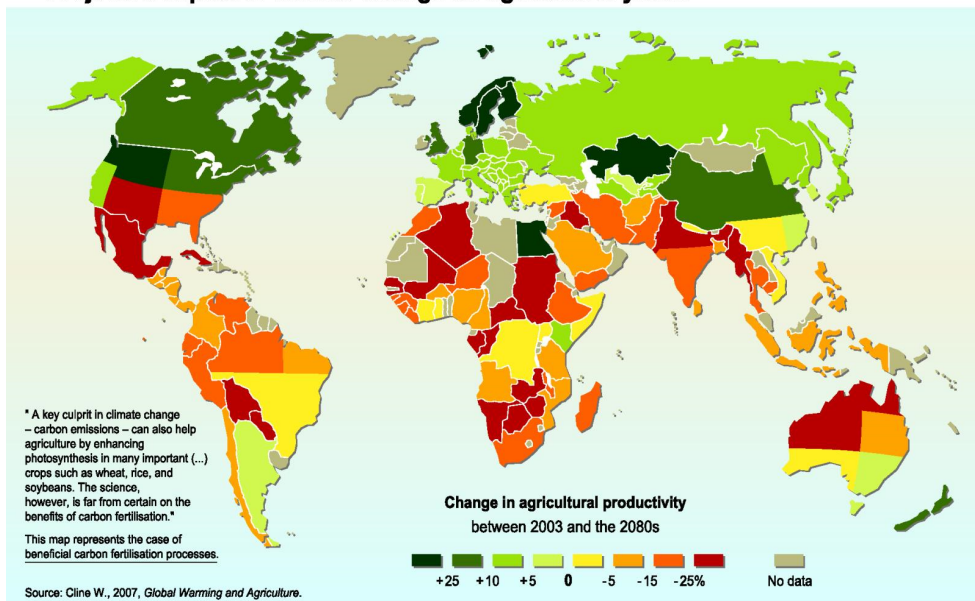
What can be done to address climate change/reduce greenhouse gases?

| <u>Sector</u> | <u>% Greenhouse Emissions</u> | <u>Acons to Reduce Greenhouse Gases</u> |
|--|-------------------------------|---|
| Transportaon | 25% | |
| Energy – oil, gas and electricity producon | 35% | |
| Buildings | 10% | |
| Agriculture / Forestry | 10% | |
| Industry | 10% | |

<http://video.nationalgeographic.com/video/way-forward-climate>



Projected impact of climate change on agricultural yields



Practice Questions:

1. What is the difference between the natural and enhanced greenhouse effect?

2. Identify the following statements as anecdotal or scientific evidence for climate change.
 - a. Rocky mountain glaciers are measured to be smaller than 100 years ago.

 - b. Inuit people say that Arctic ice flows are breaking up earlier than normal in the spring

 - c. Farmers are saying that their crops now ripen earlier in the growing season than in the past

 - d. The average temperature of Earth increased by 0.6 °C over the 20th century

3. Give 2 examples of a carbon source (not mentioned in notes)

4. Give 2 examples a carbon sink (not mentioned in notes)

5. Identify 3 realistic ways that you could help fight climate change (reduce greenhouse gases). Explain how each will reduce greenhouse gas emissions.

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