GLOBAL WARMING

and the

Greenhouse Effect

OBJECTIVES:

1. Explain the impact of the greenhouse effect on planet Earth
2. Describe greenhouse gases and their effects
3. Explain how human activities have contributed to global warming
4. Describe the effects of global warming on people and the land
5. Give examples of what people can do about the amount of greenhouse gases in the atmosphere.

Global Warming

What is it?

Earth has warmed by about 1 º F over the past 100 years. But why? And How?

Scientists are not exactly sure.

The earth could be getting warm on it's own.

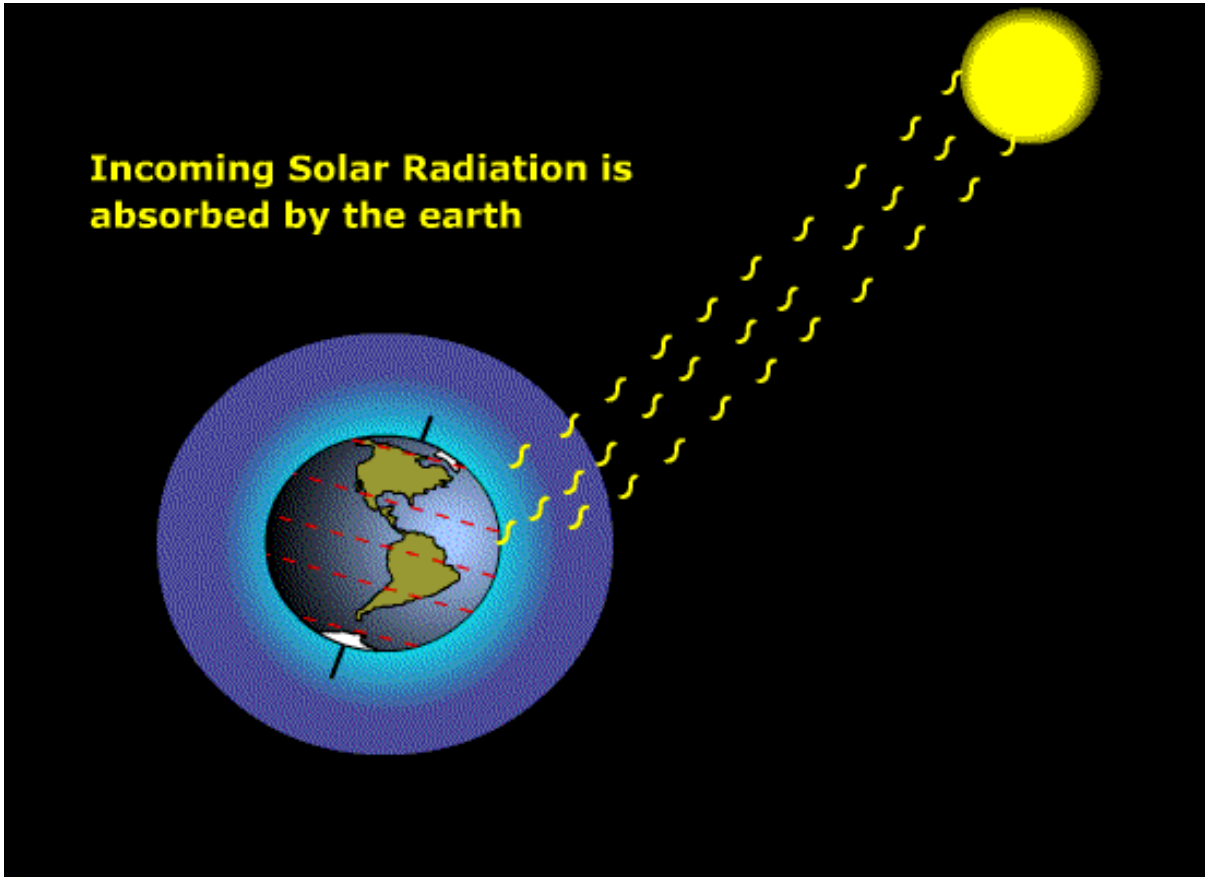
However ....

- **Many of the world's leading climate scientists think that things people do are helping to make the Earth warmer.**

- **Scientists are sure about the greenhouse effect. They know that greenhouse gases make the earth warmer by trapping energy in the atmosphere.**

What is the Greenhouse effect?

- **The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere trap heat from the Sun's rays.**



Have you seen a greenhouse?

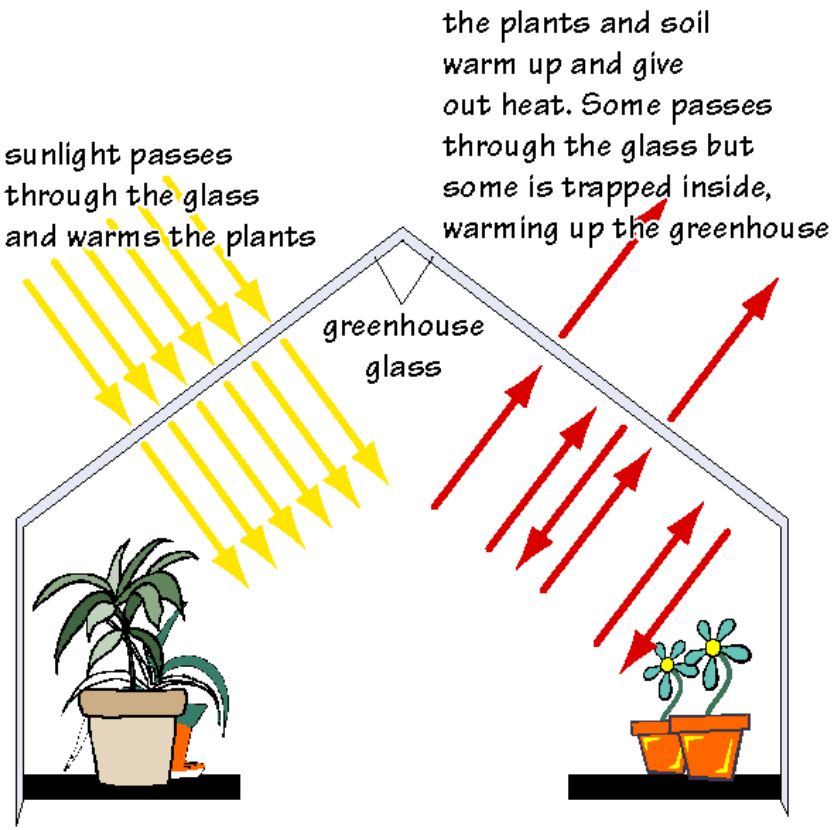
- Most greenhouses look like small glasshouses.

- Green houses are used to grow plants, especially in the winter.

How do greenhouses work?

- **Greenhouses work by trapping heat from the sun.**

- **The glass panels of the greenhouse let in light but keep heat from escaping.**



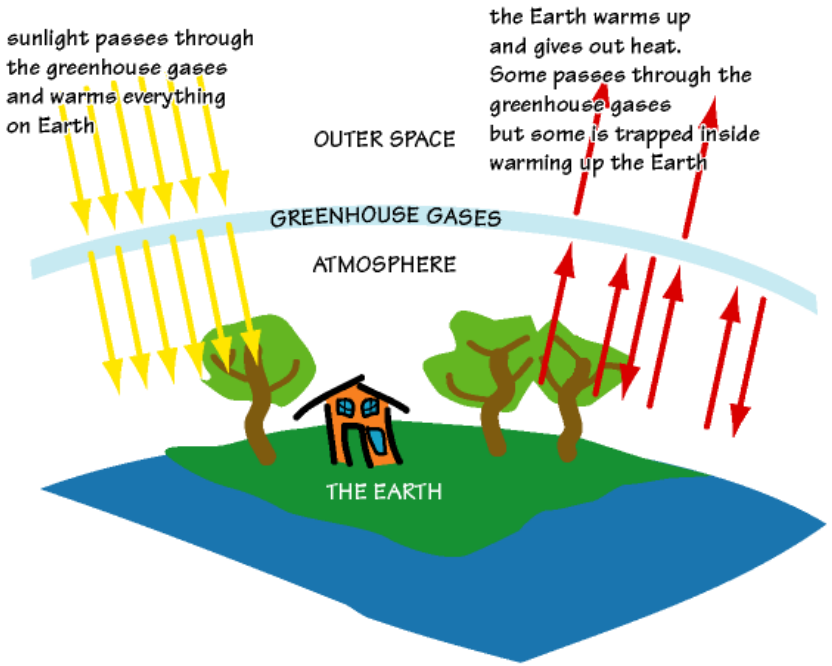
How do greenhouses work?

- **This causes the greenhouse to heat up much like the inside of a car parked in sunlight, and keeps the plants warm enough to live in the winter.**

The Greenhouse Effect

- **The Earth's atmosphere is all around us. It is the air we breathe.**

- **Greenhouse gases in the atmosphere behave much like the glass panes in a greenhouse.**

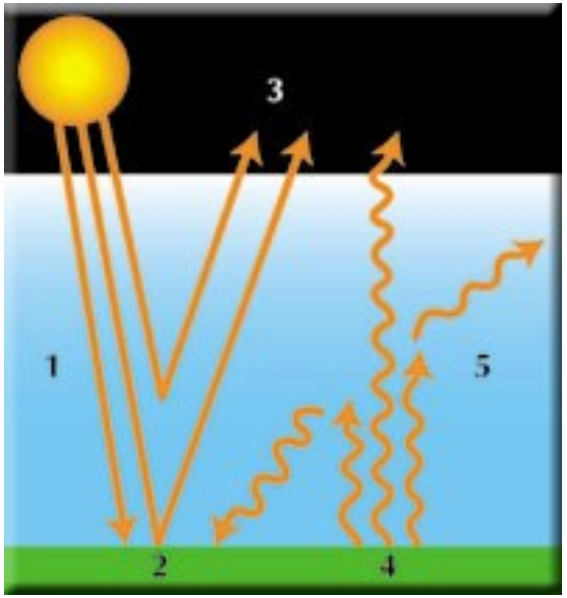


The Greenhouse Effect

- **Sunshine enters the Earth's atmosphere passing through the blanket of greenhouse gases.**
- **As it reaches the Earth's surface, land, water, and biosphere absorb the sunlight's energy! Once absorbed this energy is sent back into the atmosphere.**

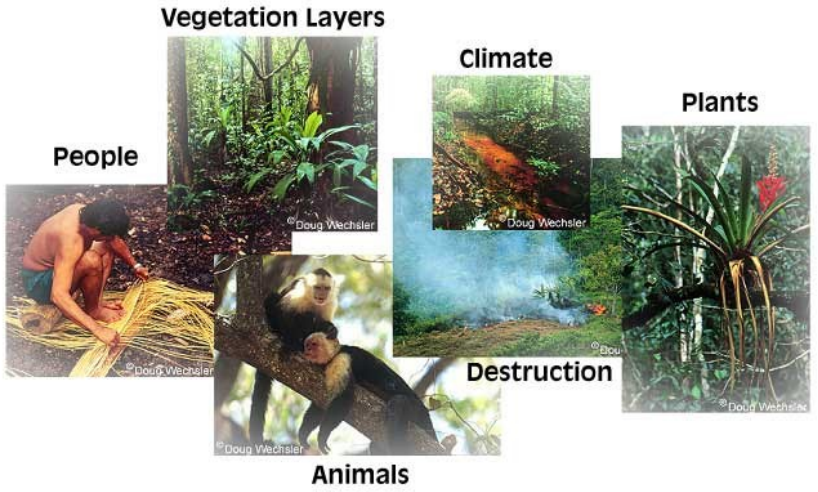
How do greenhouses work?

- Some of the energy passes back into space.
- Much of it remains trapped in the atmosphere by the greenhouse gases, causing our world to heat up.



The greenhouse effect is important.

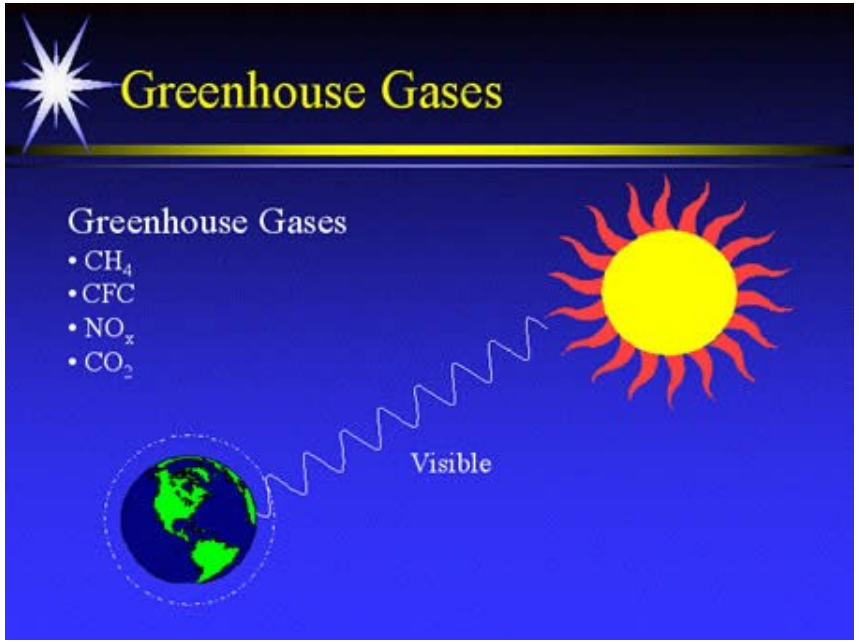
- **Without the greenhouse effect, the Earth would not be warm enough for humans to live.**
- **But if the greenhouse effect becomes stronger, it could make the Earth warmer than usual.**
- **Even a little warming causes problems for plants and animals.**



Greenhouse Effect

- **Without these gases, heat would escape back into space and Earth's average temperature would be about 60 º F colder.**

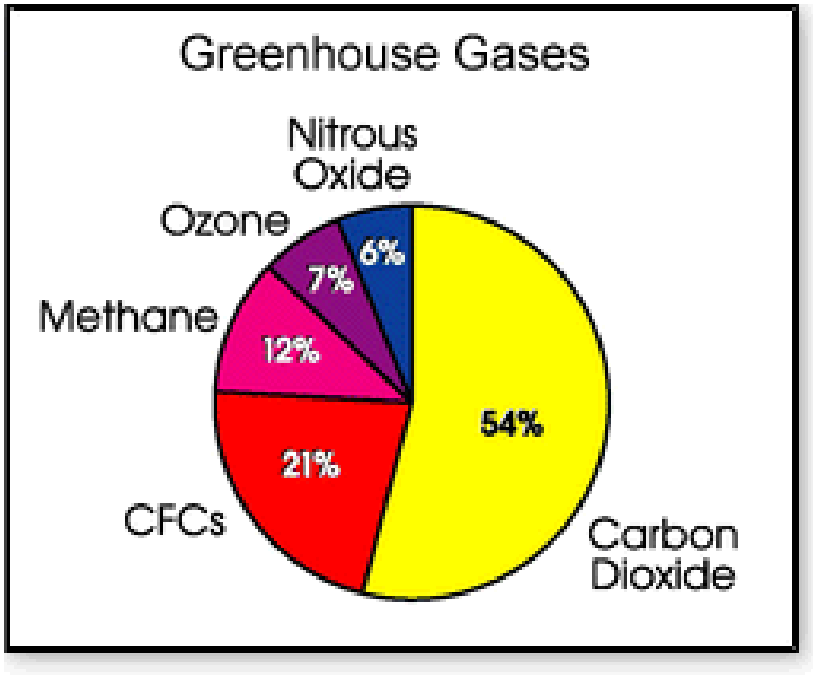
- **Because of how they warm our world, these gases are referred to as greenhouse gases.**



What are these gases?

- **The greenhouse gases are:**
  - **Water Vapour**
  - **Carbon dioxide**
  - **Nitrous Oxide**
  - **Methane**
  - **CFCs**

Figure 2



Water Vapour

- **There is more water in the atmosphere than carbon dioxide so most of the greenhouse heating of the Earth's surface is due to water vapour.**

- **The water vapour content in the atmosphere is constant which means it hasn't changed.**

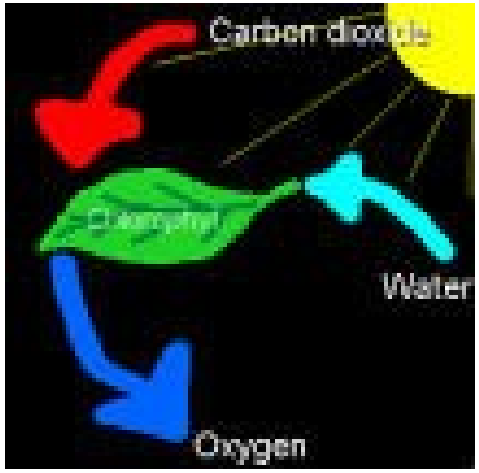
Water Vapour

- **Water vapour is the biggest contributor to the "natural greenhouse effect"**
- **Human activities have little impact on the level of water vapour.**

Carbon Dioxide

- **Our atmosphere contains many natural gases other than ozone. One of these natural gases is <u>carbon dioxide</u>.**

- **Our atmosphere needs a certain amount of this gas. It is carbon dioxide that helps to keep the Earth warm.**



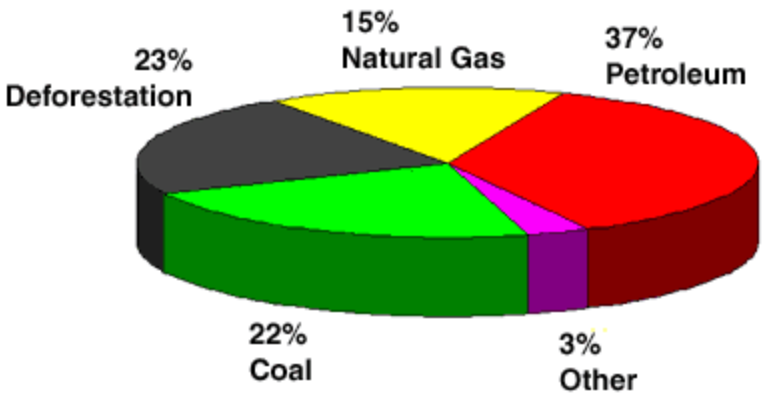
Carbon Dioxide

- **This gas holds in just enough heat from the sun to keep animals and plants alive.**
- **If it held in more heat than it does the climate on Earth would grow too hot for some kinds of life.**
- **If it held in less heat, Earth's climate would be too cold.**

Carbon Dioxide

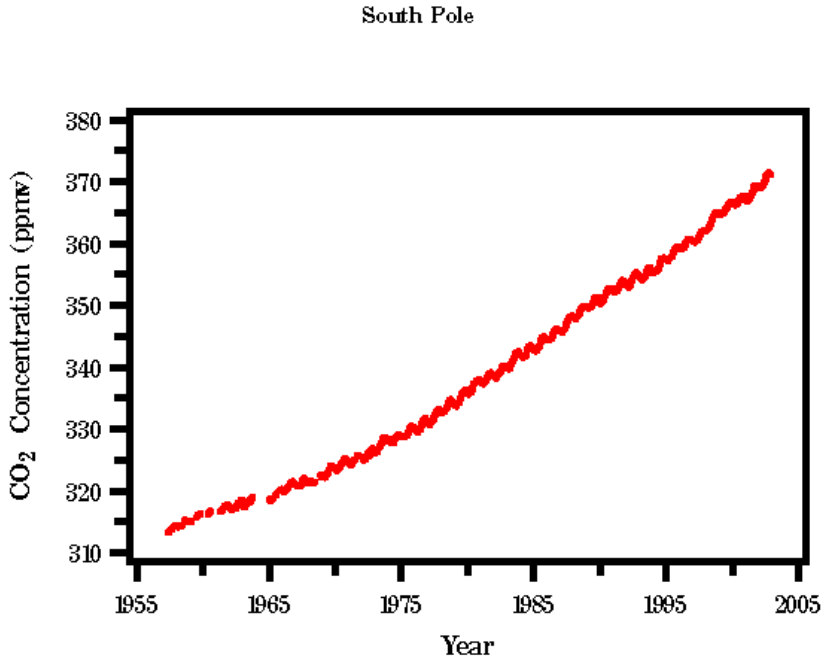
- **Carbon Dioxide is probably the most important of the greenhouse gases and is currently responsible for 60 % of the 'enhanced greenhouse effect'**
- **Enhanced**
  - **Human activities, not natural.**

Global carbon dioxide emissions



Carbon Dioxide

- **For the past 100 years, the amount of carbon dioxide in our atmosphere seems to have been increasing.**
- **Why is this happening?**
- **What is it doing to the Earth's atmosphere?**



Source: Dave Keeling and Tim Whorf (Scripps Institution of Oceanography)

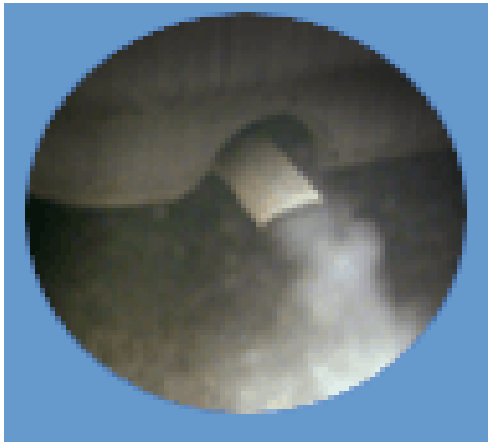
Where do all the carbon dioxide gases come from?

- Carbon dioxide
  - Human respiration.
  - Industrialization
  - Burning of fossil fuel to generate electricity
  - Burning of forest (lesser trees)
  - CO2 is now $^{1}/_{3}$ more than before Industrial Revolution

Carbon Dioxide

- **Burning fossil fuels release the carbon dioxide stored millions of years ago.**

- **We use fossil fuels to run vehicles (petrol, diesel, and kerosene), heat homes, businesses, and power factories.**



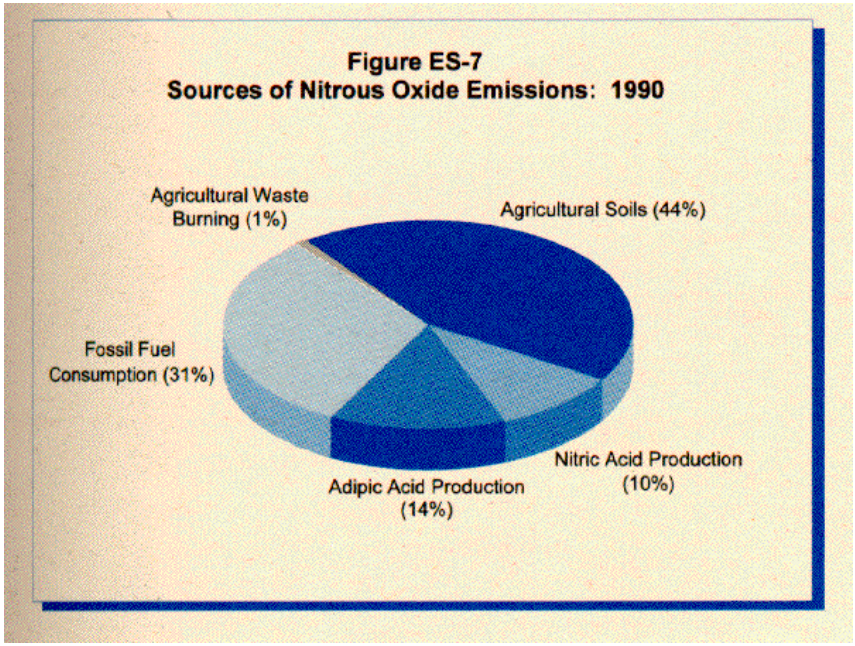
Nitrous Oxide

- **Nitrous oxide makes up an extremely small amount of the atmosphere – It is less than one-thousandth as abundant as carbon dioxide.**

- **However it is 200 to 300 times more effective in trapping heat than carbon dioxide.**

Nitrous Oxide

- **Nitrous Oxide has one of the longest atmosphere lifetimes of the greenhouse gases, lasting for up to 150 years.**



- **Since the Industrial Revolution, the level of nitrous oxide in the atmosphere has increased by 16%.**

Nitrous Oxide

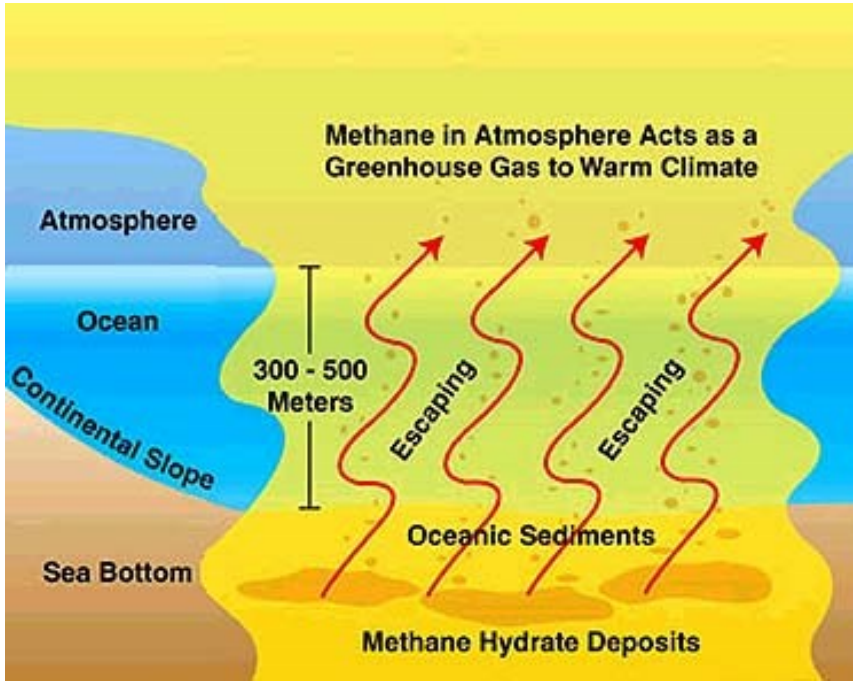
- **The impact of human activities**
  - **Burning fossil fuels and wood**
  - **Widespread use of fertilizers**
  - **Sewage treatment plants**

Where do all nitrous oxide gases come from?

- **Nitrous Oxide**
  - **Vehicle exhaust**
  - **Nitrogen based fertilisers**

Methane

- **The importance of methane in the greenhouse effect is it's warming effect.**
- **It occurs in lower concentrations than carbon dioxide but it produces 21 times as much warming as carbon dioxide.**

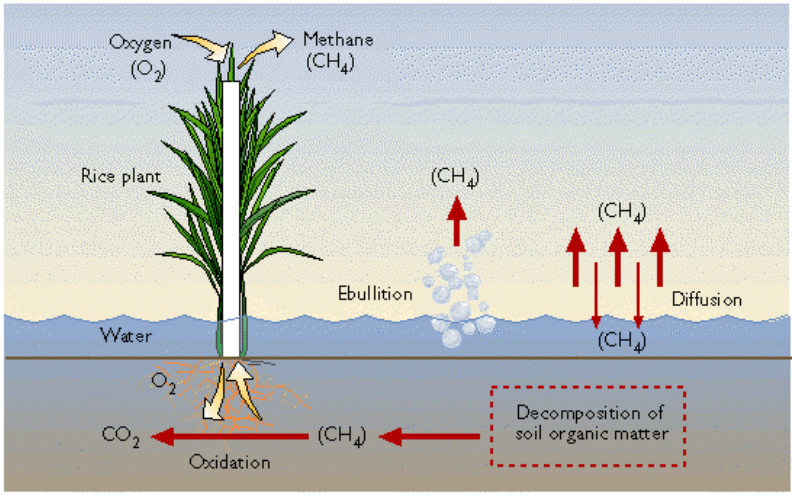


Methane

- **Methane accounts for 20%of the ‘enhanced greenhouse effect’.**
- **It remains in the atmosphere for 10-12 years. (Less than other greenhouse gases)**

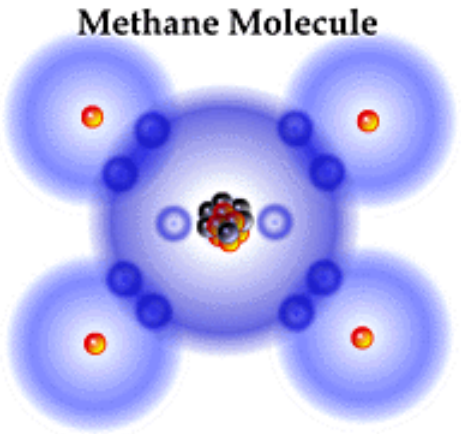
Methane

- **Human Activities**
  - **An increase in livestock farming and rice growing has led to an increase in atmospheric methane. Other sources are the extraction of fossil fuels, landfill sites and the burning of biomass.**
  - **Methane concentration in the atmosphere has more than doubled during the last 200 yr. Some of this methane is produced by ricefields**



Where do all the methane gases come from?

- **Methane**
  - ➢ **Produced by bacteria living in swampy areas.**
    - **Wet rice cultivation**
  - ➢ **Waste in landfills**
  - ➢ **Rearing of livestock**
    - **When cows belch (burp)**
  - ➢ **Each molecule can trap 20 times as much heat as a CO_2 molecule.**



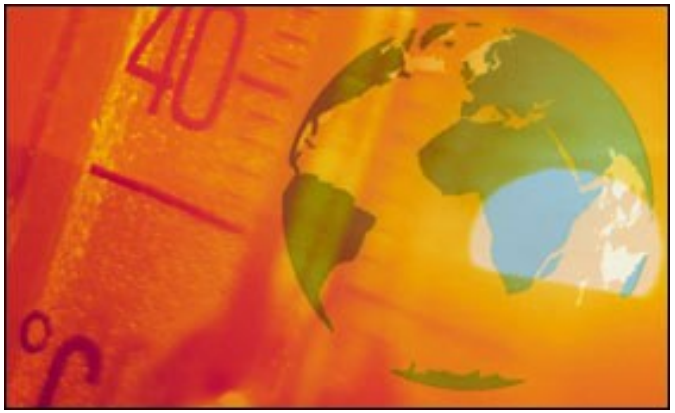
Where do all the CFCs come from?

- CFCs (Chlorofluorocarbons)
  - Aerosol sprays
  - Making foam packaging
  - Coolants in fridge and air cons
  - Cleaning solvents
  - ➢ Each CFC molecule can trap as much heat as 100 000 CO_2 molecule.
  - ➢ Can remain in the atmosphere for a long time (up to 20 000 years)

Global Warming

- **The average global temperature has increased by almost 1º F over the past century.**

- **Scientists expect the average global temperature to increase an additional 2º to 6º F over the next hundred years.**



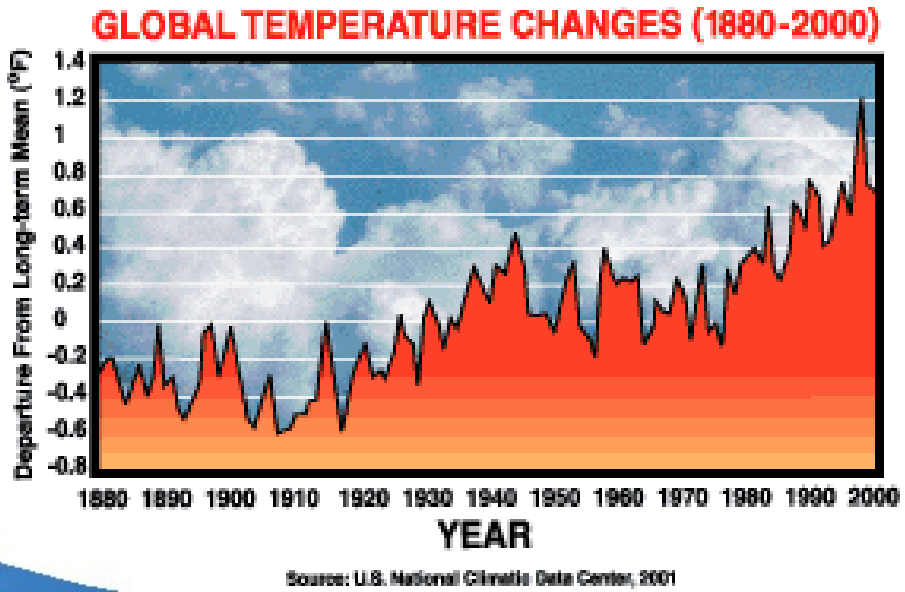
Global Warming

- **At the peak of the last ice age (18, 000 years ago) the temperature was only 7 º colder than it is today, and glaciers covered much of North America.**

Global Warming

- **Even a small increase in temperature over a long time can change the climate.**

- **When the climate changes, there may be big changes in the things that people depend on.**



Global Warming

- **These things include the level of the oceans and the places where we plant crops. They also include the air we breathe and the water we drink.**

A girl fills a bucket with water from a community standpipe in the town of Duckensfield, Jamaica

Global Warming

- **It is important to understand that scientists don't know for sure what global warming will bring.**

- **Some changes may be good.**
  - **Eg. If you live in a very cool climate , warmer temperatures might be welcome.**

Global Warming

- **Days and nights would be more comfortable and people in the area may be able to grow different and better crops than they could before.**

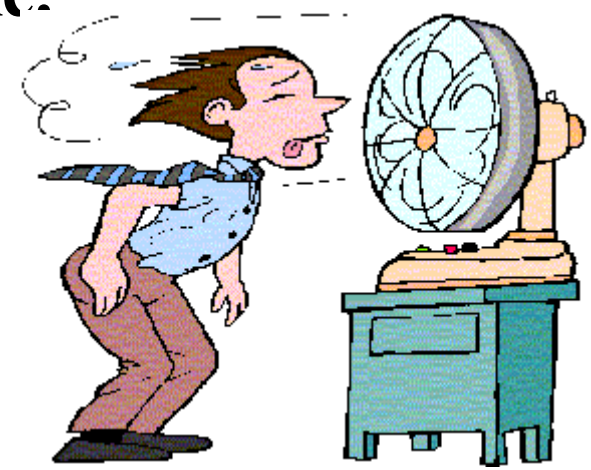
Global Warming

- **Changes in some places will not be good at all.**
  - **Human Health**
  - **Ecological Systems (Plants and animals)**
  - **Sea Level Rise**
  - **Crops and Food Supply**

Human Health

- **Heat stress and other heat related health problems are caused directly by very warm temperatures and high humidity.**

- **Heat stress – A variety of problems associated with very warm temperatures and high humidity eg. Heat exhaustion and heat stroke.**



Ecological Systems

- **Plants and animals**
  - **Climate change may alter the world's habitats.**

    All living things are included in and rely on these places.

  - **Most past climate changes occurred slowly, allowing plants and animals to adapt to the new environment or move someplace else.**

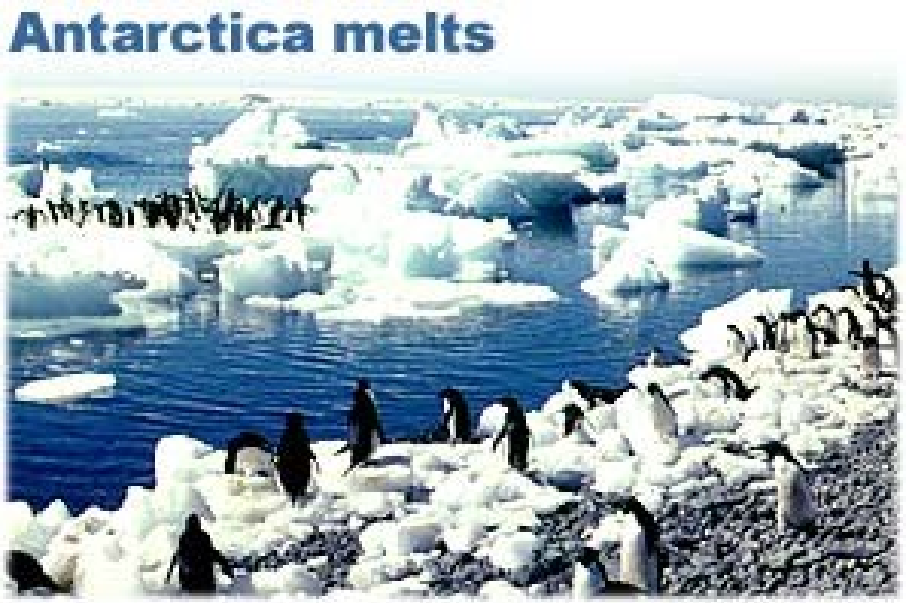
  - **Plants and animals may not be able to react quickly enough to survive if future climate changes occur as rapidly as scientists predict.**

Sea Level Rise

- **Global Warming may make the sea level become higher. Why?**
- **Warmer weather makes glaciers melt.**
- **Melting glaciers add more water to the ocean.**
- **Warmer weather also makes water expand.**
- **When water expands in the ocean, it takes up more space and the level of the sea rises.**

Rising Sea Levels

- When earth's temperature rises, sea level is likely to rise too:
  - Higher temperature → sea water to expand in volume
  - Ice caps at poles to melt



Sea Level Rise

- **Sea level may rise between several inches and as much as 3 feet during the next century.**
- **Coastal flooding could cause saltwater to flow into areas where salt is harmful, threatening plants and animals in those areas.**
- **Oceanfront property would be affected by flooding.**
- **Coastal flooding may also reduce the quality of drinking water in coastal areas.**

Crops and Food Supply

- **Global warming may make the Earth warmer in cold places.**
- **People living in these areas may have the chance to grow crops in new areas.**
- **But global warming might bring droughts to other places where we grow crops.**

What Might Happen?

- **This warming trend is expected to bring droughts and flooding of low lying coastal areas as the polar ice caps melt and raise sea level.**
- **The expected negative impact of the greenhouse effect on human life has been assessed by some scientists to be second only to <u>global nuclear war</u>.**

Climatic Change

- Global warming will lead to an increase in the evaporation of water → more water vapour.
- With more water vapour, more rain fall is expected.
- But it is not evenly distributed:
  - Dry areas → severe drought condition, water shortage and heat waves occurs
  - Wet areas → floods and avalanches (landslides)

Climatic Change

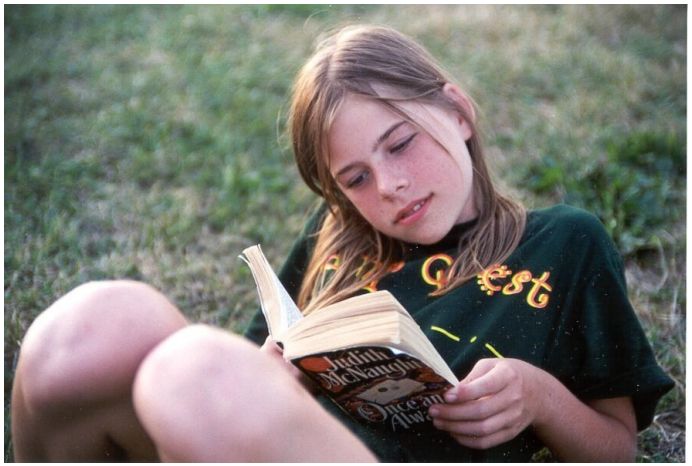
- **Other problems may arise:**
  - **Destroy food crop → rice, wheat and corn**
  - **Affect animals → need to migrate**
  - **Encourage growth of weed and pests → may lead to diseases like dengue fever, cholera which are deadly.**

What can we do about it?

- **There are many little things that we can do to make a difference to reduce the amount of greenhouse gases that we put into the atmosphere.**
- **Many greenhouse gases come from things we do every day.**
- **Driving a car or using electricity is not wrong. We just have to be smart**
  - **Eg. Try carpooling**

Ways you can help make our planet better.

- **<u>Read</u> – Learning about the environment is very important.**



- **<u>Save Electricity</u> – Whenever we use electricity, we help put greenhouse gases into the air.**
  - **Turn off lights, the television and the computer.**

Ways you can help make our planet better.

- **<u>Bike, Bus and Walk-</u>**
  You can saves energy by sometimes taking the bus, riding a bike or walking.

- **<u>Talk to Your Family and Friends</u> – about global warming. Let them know what you've learned.**

Ways you can help make our planet better.

- **<u>Recycle</u> – When you recycle, you send less trash to the landfill and you help save natural resources like trees and elements such as aluminum.**

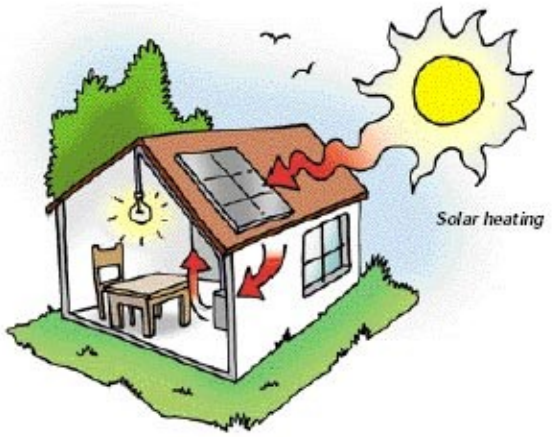
  - **Recycle cans, bottles,**

    plastic bags and newspapers.

Ways you can help make our planet better.

- **When You Buy, Buy Cool Stuff**
  - **Buy Products that don't use as much energy**
  - **Buy recyclable products instead of non-recyclable ones.**

- **Solar Energy – can be used to heat homes, buildings, water and to make electricity.**



Ways you can help make our planet better.

- **Cars – cause pollution and release a lot of greenhouse gases into the air.**
  - **Some cars are better for the environment – They travel longer on a smaller amount of fuel. They don't pollute as much.**
  - **Using these cars can help reduce can help reduce the amount of greenhouse gases in the air.**

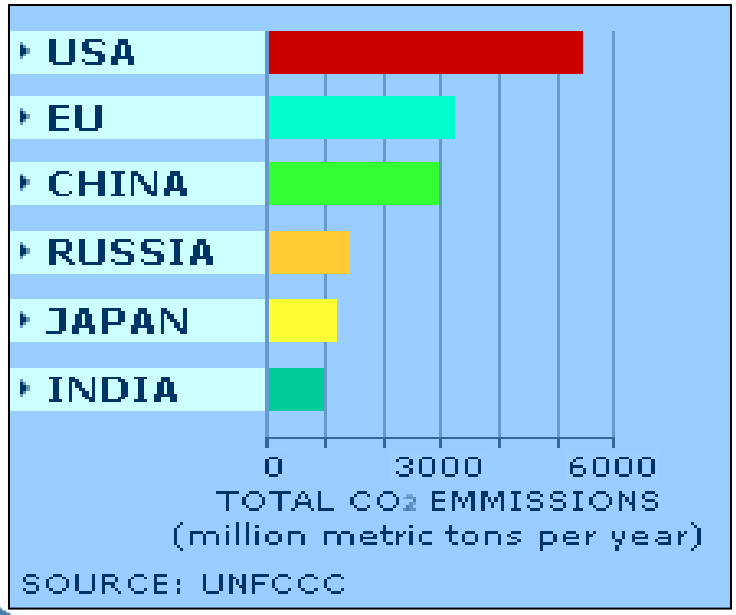
Song of the Air

- **Hey, you guys, don't gimme smoke and gas.**
  I'm a tough guy, how can I last?
  Not hard to see damage you've done.
  Irritate your eyes, blacken your lungs.
  Let's get smart, find a solution
  to stop right now all that pollution.
  Oh man… nasty stuff.
  All right now, check me out on this one.
  All around the earth, listen for my sound.
  Wherever you go, I'll be hangin' 'round.
  You can't see me, I can see you.
  Air's what you want, I do it for you.

Play song by clicking the button here.

What else can we do?

- To reduce the emission of greenhouse gases
- <u>International efforts</u>:
  - ➢ Kyoto treaty (1997) → was started to reduce emission of greenhouse gases by 5% of 1990s levels by 2012.



World's major polluters

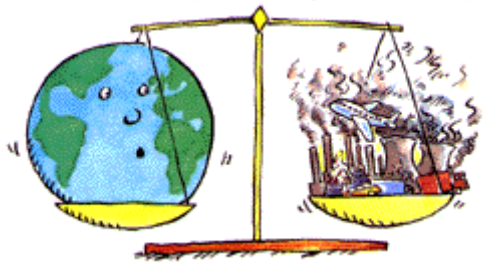
Animation on Global Warming

- **Read all directions before proceeding.**

- **To recap what we've learned in this lesson, click on the button on the bottom right , read the directions and watch the animation on Global Warming.**

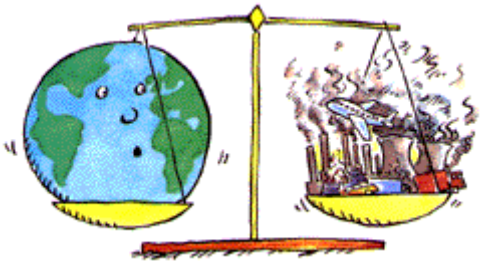
- **Please be patient while the program loads. When it's completed be sure to take the globe warming quiz by clicking on the green button on the animation screen. Then exit the browser and return to this presentation.**

Summary / Conclusion



- **Environmental Crisis will affect us:**
  - **Health**
    - **Air pollution → asthma or other respiratory problems**
    - **Water pollution → poison our food source e.g fish**
    - **Destruction of forest → lost of possible medical solutions**
  - **Property**
    - **Floods → property lost**
    - **Pollution → destroy streets and beaches**
    - **Soil erosion → desertification, lost of farm lands**

Summary / Conclusion



- **Environmental Crisis will affect us:**
  - **Economic Costs**
    - **Lost in terms of monetary values, industry and businesses.**
    - **Money need to be spent to restore the original**
    - **Public Health Services need to be provided by the government.**

Can we not be concerned?


Thank you