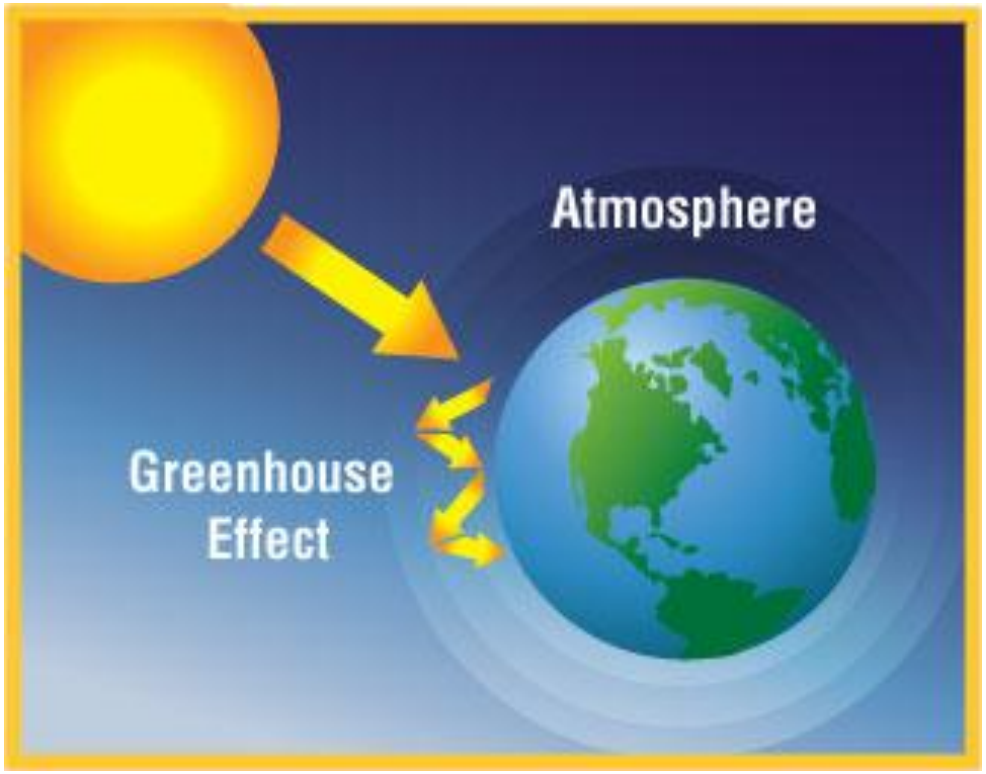
GREEN HOUSE



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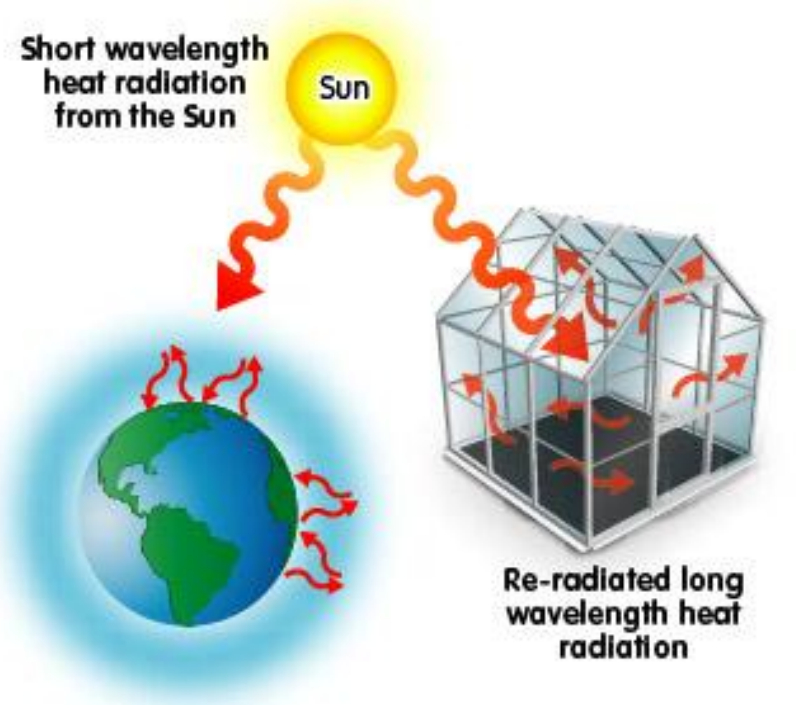
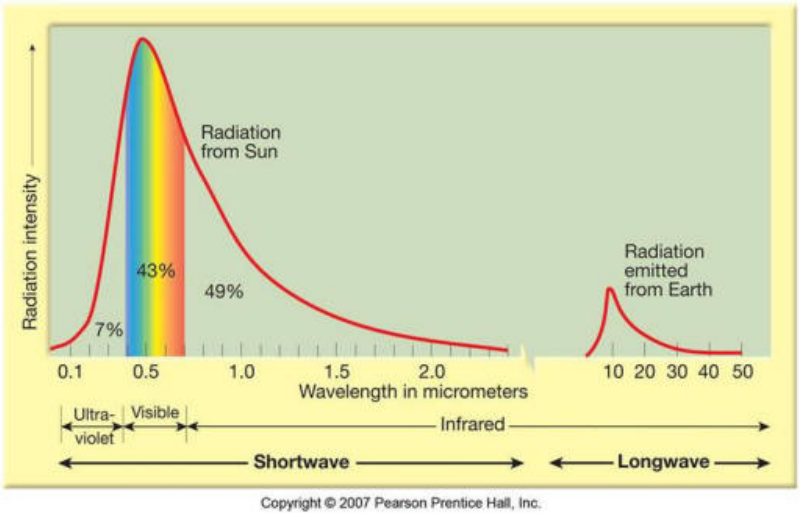
GREEN HOUSE

Vegetable are produced in glass house in the cold countries such as North America, Canada, North Europe, Siberia etc. But the house is made that sunlight has heat inside penetrating the glass during day time. But interesting matter is that the heat cannot be reflected or come out completely. So, that whole light remains quite hot even during tremendous cold. This house is called **GREEN HOUSE.**

Mechanism:

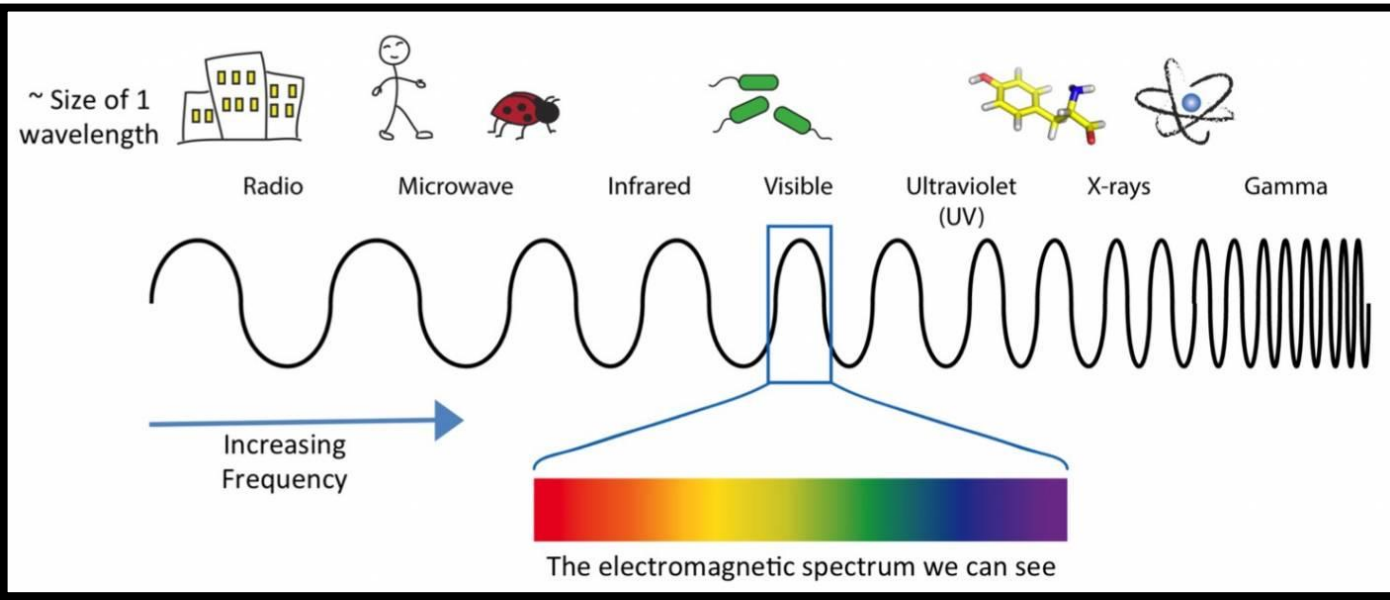
The short wave radiation (high frequency) of sun the sun passes through the glass & roof of the green house & heats the floor, plants and everything else inside. The warmed objects pass back as long wave radiation or ray (relatively low frequencies) the heat they have gained & as this tries to escape, most of the heat is blocked by the glass. As a result the heat inside builds up. The phenomenon is shown below:





Short wave solar radiations from the sun pass through the glass and heat is absorbed by everything present in the house.

Long wave heats are radiated back. Maximum heat is reflected by the glass & temperature rise. A small amount of heat escapes or omitted.



The Electromagnetic Spectrum

Penetrates Earth Atmosphere?

Y	N	Y	N

Wavelength (meters)

Radio	Microwave	Infrared	Visible	Ultraviolet	X-ray	Gamma Ray
10^{3}	10^{-2}	10^{-5}	$.5 \times 10^{-6}$	10^{-8}	10^{-10}	10^{-12}

About the size of...

Buildings | Humans | Honey Bee | Pinpoint | Protozoans | Molecules | Atoms | Atomic Nuclei

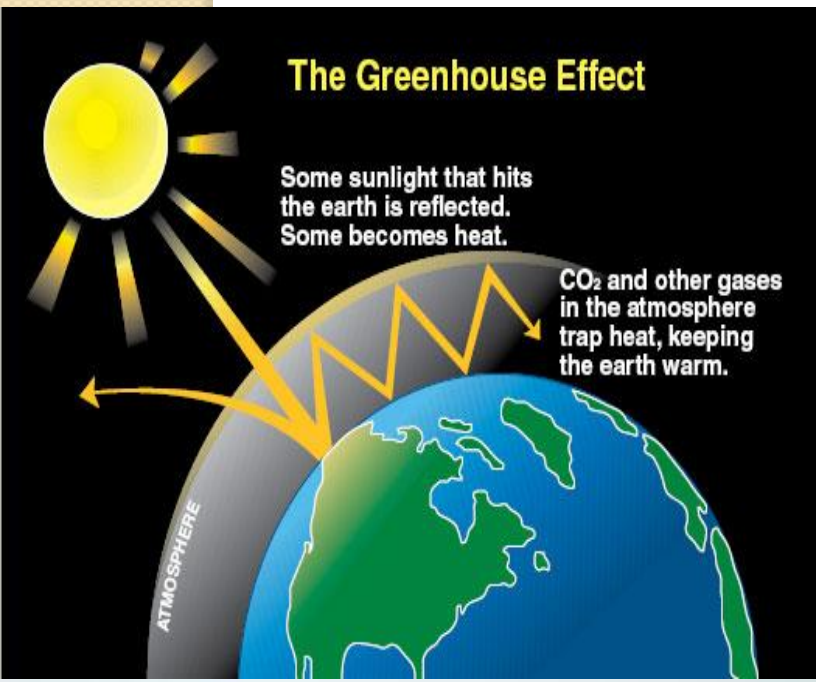
Frequency (Hz)

10^{4} 10^{8} 10^{12} 10^{15} 10^{16} 10^{18} 10^{20}

Temperature of bodies emitting the wavelength (K)

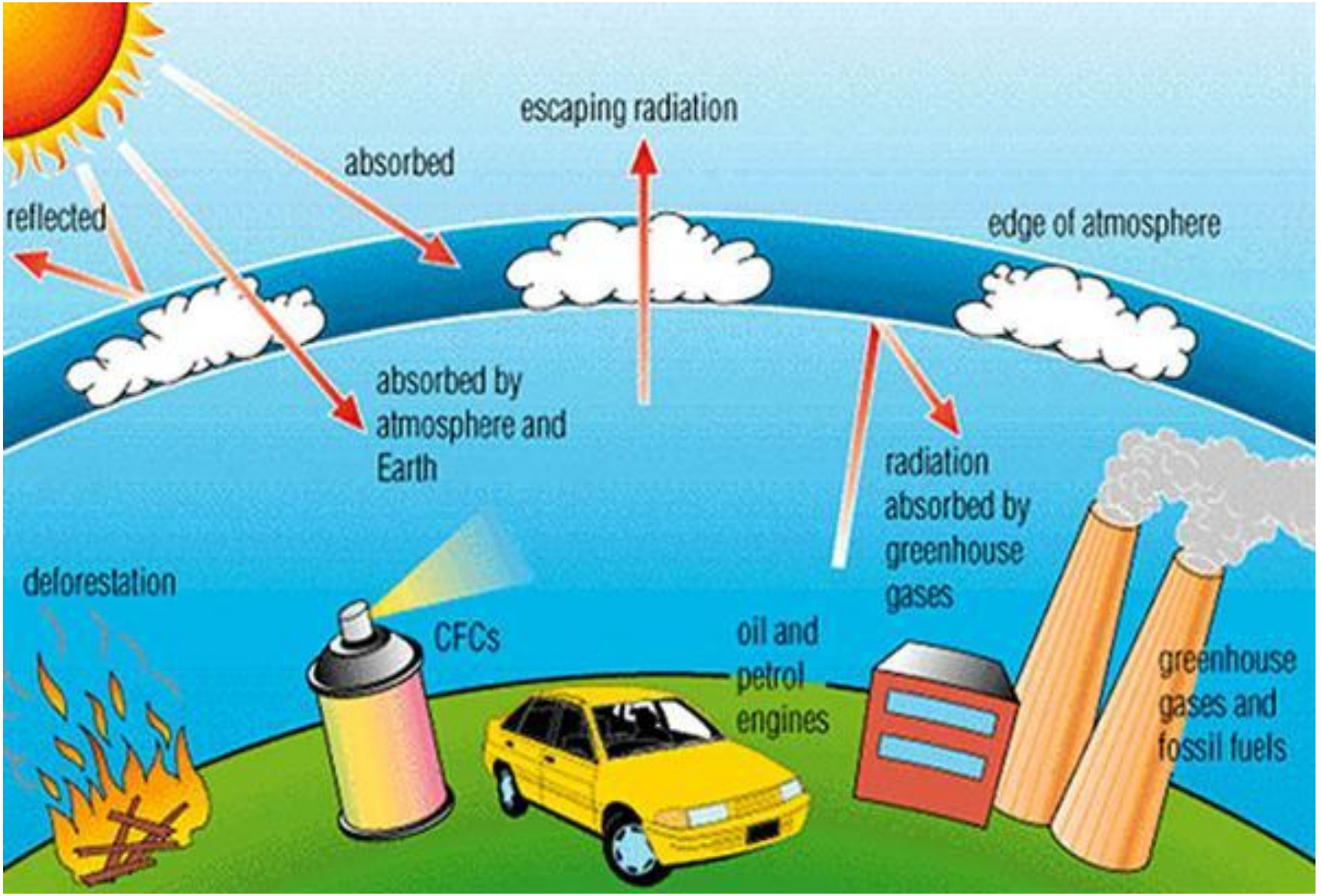
1 K | 100 K | 10,000 K | 10 Million K

Green house effect & its mechanism



- If the change in the climate of the earth is being explained by something called the green house effect. Then something similar must be happening on the earth to what happens in the real green house. Many of gases like CO_2, NOx, CFC, and HC are increasing directly or indirectly in the atmosphere to make human life more comfortable & happier. At a certain altitude on the earth the gases from a layer.
- The rays or energy from the sun comes to the earth penetrating the layer. Of these rays 30% is directly back radiated & remaining 70% is first absorbed & then latter released by the hills, mountains, river, lakes, animals, plants & buildings. But this outgoing heat energy is being hindered by those gases just like green house. For this reason the earth gradually becomes hotter. CO_2 is the main culprit among green houses gases for green home effect and CFC was got high heat absorbing power.

Green house effect & its mechanism



Green house gases

Green house gases are those gases which can trap infrared radiation given by the sun to produce green house effect leading to heating up of the environment.

Green house gases	Relative contribution
Carbon di-oxide	**50%**
Water vapor	**2%**
Methane	**19%**
Ozone	**8%**
Chlorofluorocarbon	**17%**
Nitrous oxide	**4%**

Thus only $C0_2$ contributes largely to the green house effect because CO_2 is more uniformly distributed in atmosphere. Ozone & water vapor do not contribute much because ozone present only in the upper part of the atmosphere whereas water vapor is found only near the earth surface.

The potential of a green house gas to cause greenhouse warming is expressed by Global Warming Potential (GWP), originally defined by United Nations intergovernmental panel on climate change, which is a function of both the infrared sorption characteristics and the life time of the gas. The greenhouse gases can be arranged in GWP as follows:

$$\underset{\text{CFC}}{\overset{10000x}{}} > \underset{N_2O}{\overset{150x}{}} > \underset{CH_4}{\overset{25x}{}} > CO_2$$

In other words, CFC is 38 million times stronger, N_2O 3800 times and CH_4 25 times stronger than CO_2 in terms of GWP.

Sources of CO_2

Carbon dioxide is produced mainly from six processes:

1. From combustion of fossil fuels and wood;
2. As a by-product of hydrogen production plants, where methane is converted to CO2;
3. As a by-product of fermentation of sugar in the brewing of beer, whisky and other alcoholic beverages;
4. From thermal decomposition of limestone, CaCO3, in the manufacture of lime, CaO;
5. As a by-product of sodium phosphate manufacture;
6. Directly from natural carbon dioxide springs, where it is produced by the action of acidified water on limestone or dolomite.

Natural sinks of CO_2

- About half of CO_2 is utilized by plant life.
- Uptake by the ocean water (5.5 billion tons per year) part of which is incorporated in marine organisms.
- Uptake by CO_2 fertilization (7.3% tons per year) which includes part of CO_2 taken up by plants gets deposited in dead vegetation & humans, CO_2 in the form of organic plant parts is eaten by herbivorous animals & deposited in the soil.

Role of CO_2 in green house effect

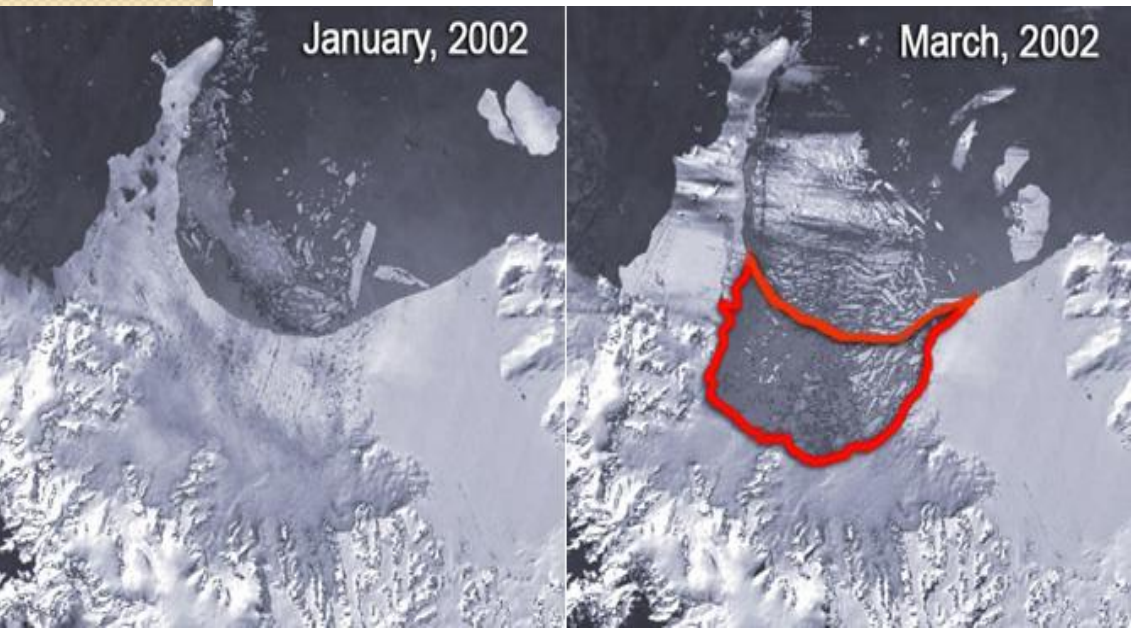
- Carbon dioxide is a naturally occurring greenhouse gas. At present concentrations, it helps maintain global temperatures at a level that is comfortable for humans and other animals that have adapted to the present climate. Increases in carbon dioxide levels in the atmosphere can result in global warming, by trapping more heat.

Fortunately nature is normally in balance and carbon dioxide concentrations remained around 260-280 parts per million (ppm) In the very long term, concentrations have fallen below these levels, but always coinciding with Ice Ages. A very good demonstration of this come from an ice core two kilometres long and equivalent to 150,000-year record of warmth, cold and warmth, that a French-Soviet drilling team at Vostok Station in central Antarctica produced in 1985, a complete ice age cycle. The CO_2 levels in the Vostok Station record got as low as 180 parts per million (ppm) in the cold periods and reached 280 in the warm periods, but never higher. But in the atmosphere over the ice, the level of the gas had already reached 350, far above anything seen in this geological era, and is now around 380 ppm.

From the time of the Industrial Revolution, things began to change, slowly at first, then gradually more quickly, especially after 1970. As the concentration of atmospheric carbon dioxide increased, so did average global temperatures, just as climate models indicate they should. Globally, most of the warmest years on record have occurred during the last ten years.

Adverse effects of green house effect:

1. Most scientists believe that the increase in global temperatures will cause the polar ice caps and glaciers to begin to melt. This will cause sea levels to rise. In the past 100 years ocean levels have already risen about one foot. Because we have built our cities right on the coastlines, many of them would be in peril of serious flooding – if not outright collapse.



2. The rise and expansion of the sea would also allow storm surges and hurricane waves to precede further inland, causing more damage.

3. Temperature increases can also lead to changes in weather patterns, precipitating more frequent and severe storms. The costs to protect ourselves from flooding and storm damage could be enormous.

4. Many aquifers which provide our drinking water could become contaminated with salt water, thus decreasing the available supply.

Adverse effects of green house effect:

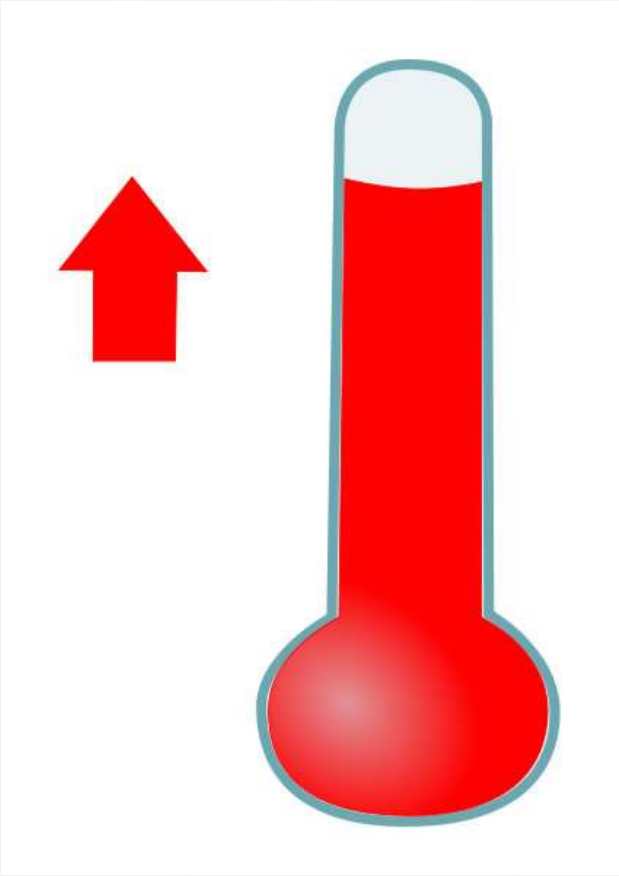
5. Weather patterns will definitely be changed by this process. Some areas will become drier while others will become wetter. While some areas will be able to increase (or begin) crop production, some major crop producing areas could fail due to less favorable growing conditions.
6. If too much drying occurs in areas, droughts could follow. This could lead to more disasters like the Dust Bowl days in the prairie states of the United States earlier in our history.
7. The rise in temperature is occurring relatively quickly. Many animal species cannot adapt to this sudden fluctuation. It is possible that many species will become extinct because of this stress. Some ecosystems like coral reefs, which are already living at the upper edge of their temperature tolerances, are very susceptible to temperature changes. These ecosystems could suffer severe damage or simply die out altogether.
8. Diseases which are currently restricted to tropical areas could spread to other areas as they become warmer and more receptive to the agents which carry the diseases.

Control of greenhouse effect

- The following steps should be adopted to control the green house effect:
- CO_2 level can be decreased by drastic cut in the combustion of fossil fuels in the highly developed & industrialized countries like USA, UK, Canada etc.
- The developed countries should give sufficient economic aid to the under developed countries to generate solar energy on commercial level.
- Bio-gas is another alternative source of conventional energy for domestic use.
- Consumption of fire wood should be lowered.
- Increase in forestation will certainly reduce the CO_2 level.

EFFECTS OF GLOBAL WARMING DUE TO UNBALANCE OF GREENHOUSE GASES

Increased Temperature



Rising Sea Level

Habitat Damage and Species Extinction

More Severe Storms

Droughts


The End