

Greenhouse gases and global warming

Controlling the build up of greenhouse gases is a priority we cannot neglect, says **S.Ananthanarayanan**.

The earth is a greenhouse

The temperature in outer space, even near a source of heat, like the sun, is just a fraction above absolute zero. This is because space is a near perfect vacuum and there is nothing to absorb heat. The sun-facing side of a body in space would be unbearably hot, but the opposite side, being in its own shadow, would cool to the fraction above absolute zero seconds after 'sunset'!

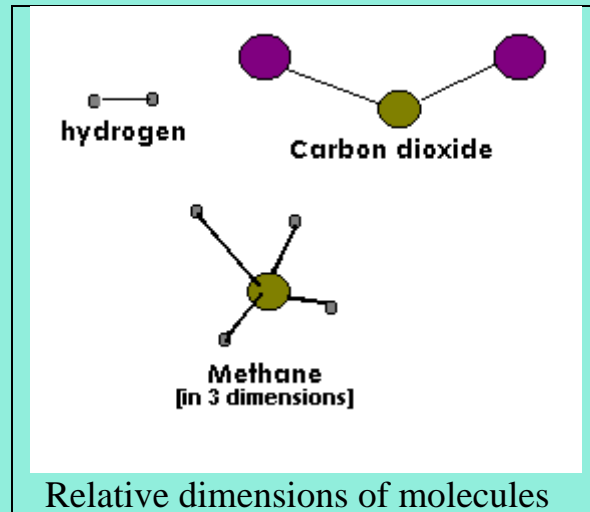
But things are more comfortable on earth because our atmosphere keeps us safe from the scorching direct heat in the day, and then acts as a warm blanket during night!

Greenhouse gases

The atmosphere is able to do this because it contains gases that can absorb and retain heat, appropriately named greenhouse gases.

In a simple gas like hydrogen, whose molecule has just two light atoms, the energy is almost all in the straight motion of the molecules. But in complex molecules like methane, any heat supplied has first to set up rotational motion, which consumes a good deal of energy. Methane thus takes in a lot of heat before warming up. And similarly, when it needs to cool down, it takes longer, to give up all the stored energy. Like an energy sponge!

This is also true of carbon dioxide, nitrous oxide, which are simple molecules, but consisting of heavy atoms, making them behave like flywheels!



Is the earth getting warmer?

In the natural state there is a balance of production and breakdown of greenhouse gases. But with the industrial revolution and the burning of fossil fuels, these gases began to build up.

The result is that the earth now gains more and loses less heat. Studies show that in the last century the mean temperature of the earth has risen by about a degree C. The effect on rainfall has been an increase of about 1%, with increase in the higher latitudes and decrease in the tropics.

Another effect is that the polar icecaps have begun to melt and the water has begun to raise the sea level. Apart from the rise due to the expansion of seawater on getting warmer. The last century has seen a rise of 6 to 8 inches in the sea level and this continues at about 3.3 mm per year.

One new approach

Emission from powerhouses and motor vehicles, reduction of the earth's green-cover and less methane from decomposition of organic wastes are the prime culprits. Another cause is the extraction of natural gas from gas-fields in the seabed. The natural gas needs to be 'scrubbed' of CO₂ impurity before it is piped.

A recent, novel method to deal with this last cause is to simply store the carbon dioxide wastes under the sea! Statoil, a firm that mines natural gas in the North Sea

purifies the natural gas right there and then pumps the CO₂ into a sandstone formation 1 kilometre beneath the bottom of the sea.

The solution has great potential, because just 1% of the sandstone formation that Statoil is using could take the full CO₂ emissions from all Europe's power plants for three years!

