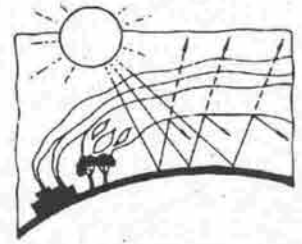


The Role of Greenhouse Gases



Number 8/2

Fact Sheet

The atmosphere has many minor gases. Some of these are the so-called greenhouse gases (GHGs), which absorb infrared radiation. These heat up the atmosphere, and cause global warming.

Climate Change

Introduction

The atmosphere is full of minor gases. Some of these are the so-called **greenhouse gases** (GHGs), which absorb infrared radiation and some heat up the atmosphere. Some gases don't (non-GHGs). Some GHGs absorb infrared radiation more than others.

It is not easy to tell exactly what a GHG is and what is not. However, it is vital to know what are the most important GHGs.

There are two ways of increasing GHGs in the atmosphere:

- increase sources (emitters of GHGs) - much of this is man-made.
- decrease sinks (absorbers of GHGs) - much is also man-made.

Important GHGs

Water vapour is the main GHG for our climate. Levels in the lower atmosphere are determined by the balance between evaporation and rainfall. It is not directly affected by human activity.

Carbon dioxide (CO₂) is a very important GHG. Higher concentrations in the atmosphere are a direct result of man-made activities such as emissions from fossil fuel (coal, gas and oil). In the atmosphere, CO₂ is very stable and lasts for many decades. About 40% of CO₂ released into the atmosphere is absorbed by the oceans - these are a sink. Some are absorbed in the process of photosynthesis by vegetation on land and by planktons in the sea. However, as plants and plankton decay, CO₂ is released again into the atmosphere and so only a small amount of CO₂ is permanently removed.

So, CO₂ in atmosphere is well above its natural levels, so changing normal carbon cycles. This is further affected by forest destruction, and by global warming effects associated with chemical and biological processes in oceans.

Methane (CH₄) is another important GHG which increases in concentration because of man activities - by converting land into agriculture, by deforestation, and by coal mining and extracting natural gas. Effects of global warming can increase GHGs more when CH₄ is released from frozen tundra and ice of the arctic regions into the atmosphere.

CH₄ is short lived compared to CO₂, with about 10 years life in the atmosphere. It is destroyed by chemical reactions with other atmospheric substitutes.

Chloro-fluoro carbons (CFC) 11, 12 and 13 are not natural gases. These are man-made, and are emitted from aerosol cans, propellants, refrigerants, foam production and solvents. Their effects last for decades. While levels are rapidly rising it is expected that concentrations should reduce, with the Montreal Protocol requiring Parties to reduce the use of substances that deplete the ozone layer. However, CFC also affect the climate in ways that are still not fully understood.

Ozone (O₃) and **nitrous oxides** (NO) are important GHGs, which are increasing indirectly because of human activity. Ozone in the stratosphere, which protects human beings from the sun's ultraviolet radiation, are being destroyed, so causing an "ozone hole". This is due to reactions, for example, with carbon monoxide (CO) and NO (from car exhaust fumes), CH₄ and other hydrocarbons. NO is also increasing but for reasons not well understood.

Other GHGs include **hydro-chloro-fluoro carbons** (HCFCs), **hydrocarbons**, and **halons**. Although these gases are less significant, they are becoming important as industrial processes change. HCFC levels are expected to increase rapidly as a result of the Montreal Protocol as it replaces CFC.

CO₂ increases have dominated the enhanced greenhouse effect to date, but the combined effects of the other gases now contribute to over 40% of the greenhouse effect.

