CLIMATE CHANGE: THE PROBLEM AND THE WAYS OUT

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Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be a change in average weather conditions or the distribution of events around that average. The term "climate change" has become synonymous with anthropogenic global warming. Within scientific journals, global warming refers to surface temperature increases while climate change includes global warming and everything else that increasing greenhouse gas levels will affect.

Many factors are contributing to climate change, from fossil fuel use to the burning and clearing of tropical forests. We need a comprehensive approach to reduce the impacts of climate change - an approach that decreases emissions across all sectors and enhances the adaptive capacity of all nations. Reducing greenhouse gas (GHG) emissions and stabilizing atmospheric concentrations at 350-450 parts per million CO_2 equivalent (ppm CO_2e) is essential. The current GHG level is approximately 390 ppm CO_2e. Solutions are needed now. In addition, human communities need the knowledge and tools to effectively adapt to the impacts of climate change.

A greenhouse gas (sometimes abbreviated GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions.

Life on earth depends on energy from the sun. Nearly 30 percent of the sunlight that beams toward Earth is deflected by the outer atmosphere and scattered back into space. The rest reaches the planet's surface and is reflected upward again as a type of slow-moving energy called infrared radiation.

The heat caused by infrared radiation is absorbed by "greenhouse gases" such as water vapor, carbon dioxide, ozone and methane, which slows its escape from the atmosphere. Although greenhouse gases make up only about 1 percent of the Earth's atmosphere, they regulate our climate by trapping heat and holding it in a kind of warm-air blanket that surrounds the planet.

Levels of several important greenhouse gases have increased by about 40% since large-scale industrialization began around 150 years ago. During the past 20 years, about three-quarters of human-caused (anthropogenic) emissions came from burning fossil fuels. Concentrations of carbon dioxide in the atmosphere are naturally regulated by numerous processes collectively known as the "carbon cycle". The flux, or movement, of carbon between the atmosphere and Earth's land and oceans is dominated by natural processes, including plant photosynthesis. While these natural processes can absorb some of the net 6.2 billion metric tons (7.2 billion metric tons less 1 billion metric tons of sinks) of anthropogenic carbon dioxide emissions produced each year (measured in carbon equivalent terms), an estimated 4.1 billion metric tons are added to the atmosphere each year. This positive imbalance between greenhouse gas emissions and absorption results in the continuing increase in atmospheric concentrations of greenhouse gases.

To make countries to decrease their greenhouse gas emissions the Kyoto Protocol was adopted. The Kyoto Protocol took two initial steps toward the creation of a viable international emission permit trading scheme. These were:

- The definition of an overall cap for emissions in Parties, and the timeframe over which the cap will operate; thereby defining an environmental objective;
- The division of the cap into country targets, which amounts to the initial allocation of emission quotas among Parties.

Greenhouse gases can be removed from the atmosphere by various processes, as a consequence of:

- a physical change (condensation and precipitation remove water vapor from the atmosphere).
- a chemical reaction within the atmosphere. For example, methane is oxidized by reaction with naturally occurring hydroxyl radical, OH• and degraded to CO_2 and water vapor (CO_2 from the oxidation of methane is not included in the methane Global warming potential). Other chemical reactions include solution and solid phase chemistry occurring in atmospheric aerosols.
- a physical exchange between the atmosphere and the other compartments of the planet. An example is the mixing of atmospheric gases into the oceans.
- a chemical change at the interface between the atmosphere and the other compartments of the planet. This is the case for CO_2, which is reduced by photosynthesis of plants, and which, after dissolving in the oceans, reacts to form carbonic acid and bicarbonate and carbonate ions (see ocean acidification).
- a photochemical change. Halocarbons are dissociated by UV light releasing Cl• and F• as free radicals in the stratosphere with harmful effects on ozone (halocarbons are generally too stable to disappear by chemical reaction in the atmosphere).

To lessen those long-term effects from the climate change, many nations, communities and individuals are taking actions now to reduce greenhouse gas emissions and slow global warming by reducing dependence on fossil fuels, increasing the use of renewable energy, expanding forests, and making lifestyle choices that help to sustain the environment.

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