GREENHOUSE EFFECT

Greenhouse Effect: History

Svante Arrhenius (1859-1927) was a Swedish scientist who was the first to claim in 1896 that fossil fuel combustion may eventually result in enhanced global warming. He proposed a relation between atmospheric carbon dioxide concentrations and temperature. He and Thomas Chamberlin calculated that human activities could warm the earth by adding carbon dioxide to the atmosphere. This was not actually verified until 1987; in 1988 it was finally acknowledged that the climate was warmer than any period since 1880. The greenhouse effect theory was named and the Intergovernmental Panel on Climate Change (IPCC) was founded by the United Nations Environmental Programme and the World Meteorological Organization. This organization tries to predict the impact of the greenhouse effect according to existing climate models and literature information. Read more

The Natural Greenhouse Effect

The greenhouse effect is the rise in temperature that the Earth experiences because certain gases in the atmosphere (water vapor, carbon dioxide, nitrous oxide, ozone, methane, for example) trap energy that comes from the sun. These gases are usually called greenhouse gases since they behave much like the glass panes in a greenhouse. The glass panels of the greenhouse let in the light but keep heat from escaping and this is similar to the effect these gasses have on earth.

Sunlight enters the Earth's atmosphere, passing through the 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. Some of the energy passes back into space, but much of it remains trapped in the atmosphere by the greenhouse gases. This is the completely natural process and without these gases all the heat would escape back into space and Earth's average temperature would be about 30 degrees Celsius (54 degrees Fahrenheit) colder. The greenhouse effect is very important process, because 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 extra warming may cause problems for humans, plants, and animals.

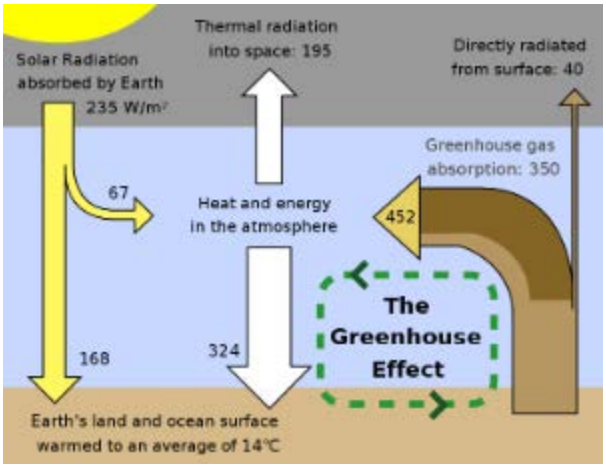
The Enhanced Greenhouse Effect

Some human activities also produce greenhouse gases and these gases keep increasing in the atmosphere. The change in the balance of the greenhouse gases has significant effects on the entire planet. Burning fossil fuels - coal, oil and natural gas - releases carbon dioxide into the atmosphere.

Cutting down and burning trees also produces a lot of carbon dioxide. A group of greenhouse gases called the chlorofluorocarbons have been used in aerosols, such as hairspray cans, fridges and in making foam plastics.

Since there are more and more greenhouse gases in the atmosphere, more heat is trapped, which makes the Earth warmer. This is known as global warming. A lot of scientists agree that man's activities are making the natural greenhouse effect stronger. If we carry on polluting the atmosphere with greenhouse gases, it will have very dangerous effects on the Earth. Today, the increase in the Earth's temperature is increasing with unprecedented speed.

To understand just how quickly global warming is accelerating, consider that during the entire 20th century, the average global temperature increased by about 0.6 degrees Celsius (slightly more than 1 degree Fahrenheit). Using computer climate models, scientists estimate that by the year 2100 the average global temperature will increase by 1.4 degrees to 5.8 degrees Celsius (approximately 2.5 degrees to 10.5 degrees Fahrenheit).



Greenhouse Gases

Many greenhouse gases occur naturally in the environment, such as water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Others such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) are created and emitted solely through human activities. Human activities also add significantly to the level of naturally occurring greenhouse gases. The principal greenhouse gases that enter the atmosphere because of human activities are:

- **Carbon Dioxide (CO2)**: Carbon dioxide enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

- **Nitrous Oxide (N2O)**: Nitrous oxide is emitted during various agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.
- **Methane (CH4)**: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane is also emitted when organic waste decomposes, whether in landfills or in connection with livestock farming.
- **Fluorinated Gases**: Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (i.e., CFCs, HCFCs, and halons). These gases are typically emitted in smaller quantities, but because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases ("High GWP gases").

Greenhouse gases vary in their ability to absorb and hold heat in the atmosphere. HFCs and PFCs are the most heat-absorbent, but there are also wide differences between naturally occurring gases. For example, nitrous oxide absorbs 270 times more heat per molecule than carbon dioxide, and methane absorbs 21 times more heat per molecule than carbon dioxide. However, carbon dioxide contributes the most, since its level in the athmosphere is the highest.

Estimates of future emissions and removals depend in part on assumptions about changes in underlying human activities. For example, the demand for fossil fuels such as gasoline and coal is expected to increase greatly with the predicted growth of the U.S. and global economies. The Fifth U.S. Climate Action Report

Many, but not all, human sources of greenhouse gas emissions are expected to rise in the future. This growth may be reduced by ongoing efforts to increase the use of newer, cleaner technologies and other measures. Additionally, our everyday choices about such things as commuting, housing, electricity use, and recycling can influence the amount of greenhouse gases being emitted.

The Effects of Global Warming

With more heat trapped on Earth, the planet will become warmer, which means the weather all over Earth will change. Since the conditions we are living in are perfect for life, a large rise in temperature could be disastrous for us and for any other living creatures on Earth. At the moment, it is difficult for scientists to say how big the changes will be and where the worst effects will occur. These are some of the assumptions.

The Weather

The effects will vary in different parts of the world: some places will become drier and others will become wetter. Although most areas will be warmer, some areas will become cooler. There may be many storms, floods and drought, but we do not know which areas of the world will be affected. All over the world, these

weather changes will affect the kinds of crop that can be grown. Plants, animals, and even people may find it difficult to survive in different conditions.

Sea Levels

Higher temperatures will make the water of the seas and oceans expand. Ice melting in the Antarctic and Greenland will flow into the sea. All over the world, sea levels may rise, perhaps by as much as 20 to 40 cm, by the beginning of the next century. Higher sea levels will threaten the low-lying coastal areas of the world, such as the Netherlands and Bangladesh. Throughout the world, millions of people and areas of land will be at danger from flooding. Many people will have to leave their homes and large areas of farmland will be ruined because of floods.

Farming

The changes in the weather will affect the types of crops grown in different parts of the world. Some crops, such as wheat and rice, grow better in higher temperatures, but other plants, such as maize and sugarcane, do not. Changes in the amount of rainfall will also affect how many plants grow. The effect of a change in the weather on plant growth may lead to some countries not having enough food. Brazil, parts of Africa, south-east Asia, and China will be affected the most and many people could suffer from hunger.

Plants & Animals

It has taken million of years for life to become used to the conditions on Earth. As weather and temperature changes, the homes of plants and animals will be affected all over the world. For example, polar bears and seals will have to find new land for hunting and living if the ice in the Arctic melts. Many animals and plants may not be able to cope with these changes and could die. This could cause the loss of some animal and plant species in certain or all areas of the world.

People

The changes in climate will affect everyone, but some populations will be at greater risk. For example, countries whose coastal regions have a large population, such as Egypt and China, may see whole populations move inland to avoid flood risk areas. The effect on people will depend on how well we can adapt to the changes and how much we can do to reduce climate change in the world.

Relationship Between Climate Changes and Global Public Health

Consensus exists among scientists all over the globe that the world's climate is changing and that these changes can affect human health. The more direct health effects of climate change can include injuries and illnesses from severe weather, floods, and heat exposure; increases in disease caused by allergies,

respiratory problems, and illnesses carried by insects or in water; and threats to the safety and availability of our food and water supplies. Less direct effects can include worry, depression, and the negative impacts of mass migration and regional conflicts.

To a large extent, public health depends on safe drinking water, sufficient food, secure shelter, and good social conditions. A changing climate is likely to affect all of these conditions. Warming climate as a result of the greenhouse effect is likely to bring some localized benefits, such as decreased winter deaths in temperate climates, and increases in food production in some regions.

However, the health effects of a rapidly changing climate are likely to be overwhelmingly negative, particularly in the poorest communities, which have contributed least to greenhouse gas emissions. Some of the health effects include increase in frequencies of heatwaves, shortages in supplies of freshwater, rise in temperatures followed by variable precipitation, which are likely to decrease the production of staple foods in many of the poorest regions, rising sea levels, and prolongation of seasons for transmission of important vector-borne disease, as well as the alteration of their geographical range. All these events may lead to increased risks of:

- water-borne disease,
- malnutrition,
- coastal flooding,
- huge population displacement, and
- new diseases moving into the regions which lack either population immunity or a strong public health infrastructure.

Measurement of health effects from climate change can only be very approximate. Nevertheless, a WHO quantitative assessment, taking into account only a subset of the possible health impacts, concluded that the effects of the climate change that has occurred since the mid-1970s may have caused over 150,000 deaths in 2000. It also concluded that these impacts are likely to increase in the future.

Conclusion

So far not many measures have been taken to address climate change. This is largely caused by the major uncertainties still surrounding the theory. But climate change is also a global problem that is hard to solve by single countries. Therefore in 1998, the Kyoto Protocol was negotiated in Kyoto, Japan. It requires participating countries to reduce their anthropogenic greenhouse gas emissions (CO2, CH4,

N2O, HFCs, PFCs, and SF6) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol was eventually signed in Bonn in 2001 by 186 countries. Several countries such as the United States and Australia have retreated.

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