Global Warming: A Changing Atmosphere

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February 7, 1995

Abstract

There are a variety of global concerns in the world today dealing with maintaining the planet and environment we live in. One such issue is global warming. The Earth has seen many changes in temperature within its life time but none so dramatic as what has been observed in today's day in age. There is much scientific evidence to confirm these results. It is predicted that the Earth will go through major economical, social, and environmental changes if the problem of global warming, due to the greenhouse effect, is not addressed soon. There has been some recent movement how to solve these problems but progress is slow. Meanwhile individuals will have to learn how to take care of the environment they live in by educating themselves about alternatives to fossil fuels and impacts global warming can have on our planet.

1 Introduction

In recent years there has been concern over the world's changing climate. Some predict that the planet will exhibit an overall increase in temperature due to gases' humans release into the atmosphere. These types of predictions may not be that far off the mark. Some believe that changes in temperature on a global scale could have severe effects on how we live. Who is to blame for these atmospheric changes? It is certainly not a natural phenomenon that has occurred in nature, or is it? Humans are more than likely accountable for this and should take responsibility for their actions. There are those who believe that global warming will have advantageous effects on the way we live and there are those who will argue that its effects will devastate our society. This paper will look at both sides of this topic. By exploring how global weather patterns have changed over the years, we can get a feel for how the climate is changing and what to expect in the future. The paper will also address the social, environmental and economic aspects of this, "Changing Atmosphere" on a global scale.

2 The Climate is Changing!

For millions of years the Earth's atmosphere has acted as an insulating blanket, holding in a portion of the sun's energy and warming the surface of the planet. This retaining of energy has created a comfortable and stable environment for living beings. However, scientists are beginning to accumulate evidence that the Earth's climate may no longer be stable. Scientists have good reason to believe that our climate is changing. Statistics show that the Earth has been getting warmer over the past 150 years. In fact, 1990 was the warmest year in recorded history [4].

On a historical note, our Earth's climate has changed significantly over its lifetime. The most significant changes have occurred with the coming and going of the ice ages. The Earth has seen a total of seven ice ages in its history with the most recent occurring about 15,000 years ago [7]. So apparently variation in global temperatures is a natural phenomenon. More recently though, the Earth has been subject to changes never before experienced. Such as pollutant's (*i.e.*, CO_2, CFCs) being released into the atmosphere causing planetary warming.

This warming trend can be seen when the temperature of the Earth is

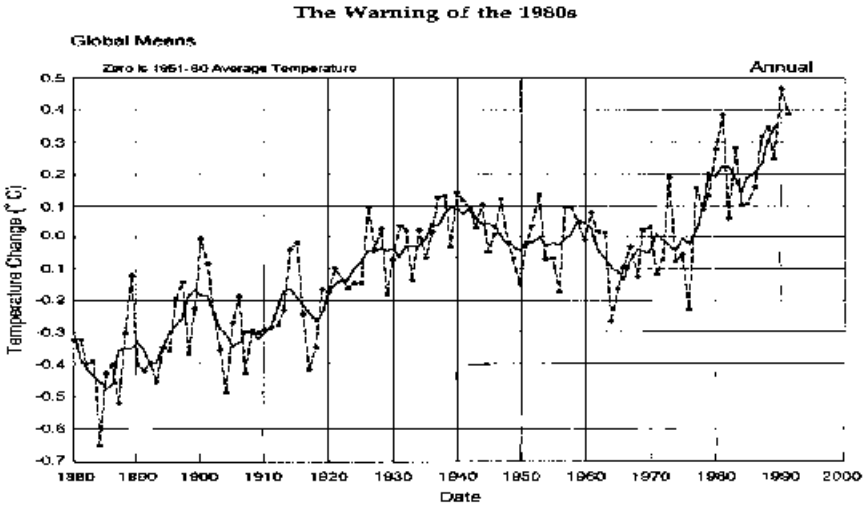

Figure 1: Global temperature trend since 1880. Reproduced, with permission, from James Hansen and Helene Wilson, NASA Gaddard Institute for Space Studies, "GISS Analysis of 1991 Global Surface Air Temperature," Jan. 6, 1992.

looked at over a span of at least one hundred of years (see Figure 1). It is here that a warming trend can be seen. Between 1880 and 1990, the Earth's average temperature seems to have increased by about 0.5 deg C (0.9 deg F), or about 2 percent [7], making the current temperature of the world, on average, around 15 deg C (59 deg F). More recently, the 1980's claimed 7 of the 10 warmest years in history [2].

3 The Greenhouse Effect

Over its history the Earth has been warming and cooling naturally. This is not surprising or uncommon. However, recently the Earth has exhibited an accelerated warming trend. This trend is different from the Earth's *natural* way of warming in that it is caused by human activity, rather than by geological processes that were going on in the past. It is also apparent that this warming trend is happening at a much faster rate than previously observed.

The greenhouse effect is a phrase sometimes used to describe the recent warming trend of the Earth due to increased levels of carbon dioxide and

other atmospheric gases that let heat in but prevent some of it from going back out. It is imperative to understand this phenomenon for it is a major cause of global warming. It has been known that the atmosphere acts like a *greenhouse glass* in that it allows the short-wave radiation to pass through it but traps the long-wave, reflected heat radiation. This is what is known as "the greenhouse effect." One might think of an automobile with all the windows rolled up on a sunny day. The glass windshield passes direct solar energy but traps the radiant energy reflected from the seats and dashboard. As a result the car gets very hot. The Earth's atmosphere works in the same way. Carbon dioxide, nitrous oxide, methane and other gases tend to trap radiant heat at the Earth's surface. The denser the greenhouse gases, the more heat trapped.

How does this greenhouse effect work? To start with the sun gives off a significant amount of radiant energy at very short wavelengths. About half this solar energy reaches the Earth's surface. Particles and gases in the Earth's atmosphere absorb about 25 percent of this energy, and another 25 percent is reflected back to space by the atmosphere, mostly from clouds. In addition, 5 percent is reflected back by the land surfaces such as ice and snow. The rest is absorbed by the Earth's surface [2]. The greenhouse shield captures nearly 90 percent of the out going heat radiation and retains it long enough to keep the planet's temperature within comfortable means. Without the *shielding greenhouse*, provided by the envelope of atmosphere around the Earth, our planet would be 50 to 100 deg F (27 to 56 deg C) colder than it is [5]).

So it is the trapping of infrared radiation in our planet's surface layers that makes the greenhouse work. Any change in the chemical composition of the planet's atmosphere that alters the greenhouse properties will certainly lead to a change in the planet's climate. The problem that the Earth faces today is the increased rate at which these gases are being emitted into the atmosphere thus changing the chemical composition stated previously and ultimately causing a dramatic change in planet's climate.

4 Some Impacts of Global Warming

The literature published thus far on global warming shows a multitude of problems and effects due to this warming trend of the Earth. The increased rate of emitted gases into the atmosphere is one of the major problems we face

today. The main culprits for this increased warming are gases such as carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, carbon monoxide, and ozone. All of these gases have an effect in the atmosphere and are increasing in concentration. Carbon dioxide levels alone has increased 25 percent in the last century [4].

Of all the gases' chlorofluorocarbons are most interesting to look at because they are connected with the destruction of the ozone and are the second greatest contributor to global warming next to CO_2 [2]. These gases come from spray can propellants and are used as refrigerants. The ozone has the property in that it absorbs most of the sun's ultraviolet radiation. The radiation can damage the DNA molecules that are essential to life. If the ozone is destroyed, it can have a deviating effect on the way we live. With out the ozone, there will be an increase in global warming and skin cancer.

Humans and other forms of life have constructed their lives around predictable climates. This includes such things as planting crops according to rainfall, harvesting, and building villages on coastal shores in hopes that sea levels remain constant. In the years to come, however, this will more than likely change due to global warming. It is predicted that global warming will affect the poles, raise sea levels, increase the frequency of stormy weather, shorten water supply, disrupt agriculture, destroy various forms of habitats, and increase forest fires. It is estimated that the poles will heat up at an accelerated rate and sea levels could rise by as much as 3 feet within the next 100 years [5]. This would conceivably submerge Miami. In the United Stated, 20% to 45% of all wetlands would be lost to a 2-foot rise in sea level, and between 2,000 and 6,000 square miles of dry land would succumb to flooding [5]. Some predictions estimate that global warming will make summers drier in many places across the planet.

Others view global warming as beneficial. At some of the higher latitudes warmer temperatures will mean longer growing seasons and more rainfall. Some believe that this process will bring food and prosperity to vast areas of the globe that have been desolate for thousands of years. Increased rainfall and agricultural productivity should raise world food production by 50 percent in the year 2050 [5]. The grain belts and other locations of food production will simply move to northern regions. While this might be true, northern soils are much poorer than those in the South. Another point that some believe is that with increased carbon dioxide levels will come an increase in crop growth rates. But here again the growth rate of weeds increases as well making it more difficult and costly to farm.

5 The Future Outlook and What is Being Done

It is sad that global warming is not taken as seriously as it should. The public is lacking motivation and insensitive to educate itself on the consequences of pollution and global warming. From the literature read on the topic it seems that most scientists agree that the full effects of global warming will not be felt soon and to make matters worse, its effects are somewhat unpredictable. It is statements like these that sway the public to *not concern themselves* with the issues at hand. Many societies feel that "if it is not going to affect us now then why worry about it." This is definitely the wrong attitude to take. It is the same story with politicians. Trying to persuade a politician to take action on global warming could be, and usually is, very difficult. Which brings us to why the government has been slow in their response to take some precautions against global warming. If global warming is to be dealt with, policies will have to be very detailed and presented and accepted on an international scale. This could conceivably cost billions of dollars. But I guess that's the price you pay when you mismanage the environment for so long.

Some suggest that a way to decrease carbon dioxide emission would be to raise the price of fossil fuels by placing a tax on them. Here it is thought that, like in the 1970's, consumption will decrease. Simpler methods could be to pass laws directly limiting the carbon dioxide emissions from individuals as well as industry. In 1988 there was a conference that involved over 46 countries all of which were to discuss the issue of lowering carbon dioxide emission's world wide. The result of this conference was that the United States, Japan and the Soviet Union vetoed submitted proposals. Their claim was that they needed more scientific and economical studies done. How are we ever going to get ahead of the global warming game with reactions like this?

Though this paper sounds negative so far, there are those that are doing something about global warming. Such as looking for other sources of energy and discovering new ways to conserve energy. To date there are plenty of alternatives to fossils fuels like wind energy, solar energy, geothermal energy, hydropower and nuclear energy. Some of these seem more attractive than others and could take up pages more to talk about.

Global warming is a complicated problem with many variables assigned to

it. Because of its complexity and size many people feel helpless in combating it. That is too bad because we as individuals can make a difference. We just need to stop procrastinating and take some action now. There are many ways to preserve our environment and planet and we should take them more seriously. There is no doubt that it will take whole countries to come to terms and deal with the problem. But until then, we should realize that we only have one planet to live on and once it is gone, so is mankind.

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