

## Causes and effects of global warming

M. Venkataramanan and Smitha

*Department of Economics, D.G. Vaishnav College, Chennai, India*  
smitha\_05@rediffmail.com

### Abstract

Global warming is defined as the increase of the average temperature on Earth. As the Earth is getting hotter, disasters like hurricanes, droughts and floods are getting more frequent. Over the last 100 years, the average air temperature near the Earth's surface has risen by a little less than 1 degree Celsius or 1.3 degrees Fahrenheit. Deforestation increases the severity of global warming. The ocean is a huge carbon sink, holding about 50 times as much carbon as the atmosphere. The oceans are no longer able to store carbon as they have in the past. Burning fossil fuels such as natural gas, coal, oil and gasoline raises the level of carbon dioxide in the atmosphere, and carbon dioxide is a major contributor to the greenhouse effect and global warming. The climate change would increase the number of people suffering from death, disease and injury from heatwaves, floods, storms and droughts. Floods are low-probability, high-impact events that can overwhelm physical infrastructure and human communities. Major storm and flood disasters have occurred in the last two decades. One can help to reduce the demand for fossil fuels, which in turn reduces global warming, by using energy more wisely.

**Keywords:** Global warming, fossil fuels, methane.

### Introduction

Global Warming is defined as the increase of the average temperature on Earth. As the Earth is getting hotter, disasters like hurricanes, droughts and floods are getting more frequent. Over the last 100 years, the average air temperature near the Earth's surface has risen by a little less than 1 degree Celsius or 1.3 degrees Fahrenheit. Global warming is the cause, climate change is the effect. Scientists often prefer to speak about climate change instead of global warming, because higher global temperatures don't necessarily mean that it will be warmer at any given time at every location on Earth. Warming is strongest at the Earth's Poles, the Arctic and the Antarctic, and will continue to be so. In recent years, fall air temperatures have been at a record 9 degrees Fahrenheit (5 degrees Celsius) above normal in the Arctic, according to the U.S. National Oceanic and Atmospheric Administration. But changing wind patterns could mean that a warming Arctic, for example, leads to colder winters in continental Europe. Regional climates will change as well, but in very different ways. Some regions like parts of Northern Europe or West Africa will probably get wetter, while other regions like the Mediterranean or Central Africa will most likely receive less rainfall. Melting ice is the most visible impact of a warming climate. The UN Panel on Climate Change finds that average Arctic temperatures have increased at almost twice the global average rate in the past 100 years.

*Green House Effect:* When sunlight reaches Earth's surface some is absorbed and warms the earth and most of the rest is radiated back to the atmosphere at a longer wavelength than the sun light. Some of these longer wavelengths are absorbed by greenhouse gases in the atmosphere before they are lost to space. The

absorption of this long wave radiant energy warms the atmosphere. These greenhouse gases act like a mirror and reflect back to the Earth some of the heat energy which would otherwise be lost to space. The reflecting back of heat energy by the atmosphere is called the "greenhouse effect". The major natural greenhouse gases are water vapor, which causes about 36-70% of the greenhouse effect on Earth (not including clouds); carbon dioxide CO<sub>2</sub>, which causes 9-26%; methane, which causes 4-9%, and ozone, which causes 3-7%. It is not possible to state that a certain gas causes a certain percentage of the greenhouse effect, because the influences of the various gases are not additive. Other greenhouse gases include, but are not limited to, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons and chlorofluorocarbons. Almost 100% of the observed temperature increase over the last 50 years has been due to the increase in the atmosphere of greenhouse gas concentrations like water vapour, carbon dioxide (CO<sub>2</sub>), methane and ozone. Greenhouse gases are those gases that contribute to the greenhouse effect (Fig. 1). The largest contributing source of greenhouse gas is the burning of fossil fuels leading to the emission of carbon dioxide.

*Causes of global warming:* The buildup of carbon dioxide in the atmosphere, mainly from your fossil fuel emissions, is the most significant human cause of global warming. Carbon dioxide is released every you burn something, be it a car, airplane or coal plant. This means you must burn less fossil fuel if you want the Earth's climate to remain stable! And unfortunately, we are currently destroying some of the best known mechanisms for storing that carbon—plants. Deforestation increases the severity of global warming as well. Carbon dioxide is released from the human

conversion of forests and grasslands into farmland and cities. All living plants store carbon. When those plants die and decay, carbon dioxide is released back into the atmosphere. As forests and grasslands are cleared for your use, enormous amounts of stored carbon enter the atmosphere. An unstoppable feedback loop may happen if you let this continue. If the activities mentioned above warm the Earth just enough, it could cause natural carbon sinks to fail. A "carbon sink" is a natural system that stores carbon over thousands of years. Such sinks include peat bogs and the arctic tundra. But if these sinks destabilize, that carbon will be released, possibly causing an unstoppable and catastrophic warming of the Earth. The oceans are no longer able to store carbon as they have in the past. The ocean is a huge carbon sink, holding about 50 times as much carbon as the atmosphere. But now scientists are realizing that the increased thermal stratification of the oceans has caused substantial reductions in levels of phytoplankton, which store CO<sub>2</sub>. Increased atmospheric carbon is also causing an acidification of the ocean, since carbon dioxide forms carbonic acid when it reacts with water. The tiny plants of the ocean, the very bottom of that vast watery food chain, are suffering from the effects of global warming, which means they are becoming less able to store carbon, further contributing to climate change. As carbon sinks fail, the amount of carbon in the atmosphere climbs!

**Methane's huge impact:** Methane is created when bacteria break down organic matter under oxygen-starved conditions. This occurs when organic matter is trapped underwater, as in rice paddies. It also takes place in the intestines of herbivorous animals, such as cows, sheep, and goats. Because human agriculture has grown over time to engulf most of the arable land on the planet, it is now adding a lot of methane to the atmosphere. Landfills and leakage from natural gas fields (methane is a component of natural gas) are also significant sources of methane. Clathrates are a hidden source of Methane. Clathrates are frozen chunks of ice and methane that rest at the bottom of the world's oceans. As the water warms, the ice melts, and the methane is released. If the current global warming, which is caused by humans, were to cause changes in the Earth's ocean currents, then a rapid melting of clathrates would be possible. This too would create a positive feedback loop that would cause further global warming. It is believed that some of the warming cycles in the Earth's history have been caused by the sudden thawing of clathrates.

### A growing problem

The "green revolution" of the twentieth century has allowed the farmers of the world to use chemical fertilizers and machines to produce far more food than they ever did before. One of the primary components of the green revolution has been the development of

nitrogen fertilizers that dramatically accelerate the growth and productivity of plants in the field. Plants "fix," or capture, nitrogen on their own as well, but green revolution technologies have become so popular that humans are now adding more nitrogen to the earth than all of the plants in the world combined.

### *Effects of global warming:*

Increasing global temperatures are causing a broad range of changes. Sea levels are rising due to thermal expansion of the ocean, in addition to melting of land ice. Amounts and patterns of precipitation are changing. The total annual power of hurricanes has already increased markedly since 1975 because their average intensity and average duration have increased (in addition, there has been a high correlation of hurricane power with tropical sea-surface temperature). Changes in temperature and precipitation patterns increase the frequency, duration, and intensity of other extreme weather events, such as floods, droughts, heat waves, and tornadoes. Other effects of global warming include higher or lower agricultural yields, further glacial retreat, reduced summer stream flows, species extinctions. As a further effect of global warming, diseases like malaria are returning into areas where they have been extinguished earlier. Although global warming is affecting the number and magnitude of these events, it is difficult to connect specific events to global warming. Although most studies focus on the period up to 2100, warming is expected to continue past then because carbon dioxide (chemical symbol CO<sub>2</sub>) has an estimated atmospheric lifetime of 50 to 200 years.

### *Effects on weather:*

Increasing temperature is likely to lead to increasing precipitation but the effects on storms are less clear. Extratropical storms partly depend on the temperature gradient, which is predicted to weaken in the northern hemisphere as the polar region warms more than the rest of the hemisphere. Regional effects of global warming vary in nature. Some are the result of a generalised global change, such as rising temperature, resulting in local effects, such as melting ice. In other cases, a change may be related to a change in a particular ocean current or weather system. In such cases, the regional effect may be disproportionate and will not necessarily follow the global trend. There are three major ways in which global warming will make changes to regional climate: melting or forming ice, changing the hydrological cycle (of evaporation) and changing currents in the oceans and air flows in the atmosphere. The coast can also be considered a region, and will suffer severe impacts from sea level rise.

### *Glacier retreat and disappearance:*

Mountain glaciers and snow cover had decreased in both the northern and southern hemispheres. This widespread decrease in glaciers and ice caps has

contributed to observed sea level rise. Predictions relating to future changes in glaciers.

- Mountainous areas in Europe will face glacier retreat
- In Latin America, changes in precipitation patterns and the disappearance of glaciers will significantly affect water availability for human consumption, agriculture, and energy production
- In Polar regions, there will be reductions in glacier extent and the thickness of glaciers.

**Oceans:**

The role of the oceans in global warming is a complex one. The oceans serve as a sink for carbon dioxide, taking up much that would otherwise remain in the atmosphere, but increased levels of CO<sub>2</sub> have led to ocean acidification. Furthermore, as the temperature of the oceans increases, they become less able to absorb excess CO<sub>2</sub>. Global warming is projected to have a number of effects on the oceans. Ongoing effects include rising sea levels due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. Other possible effects include large-scale changes in ocean circulation.

**Health:**

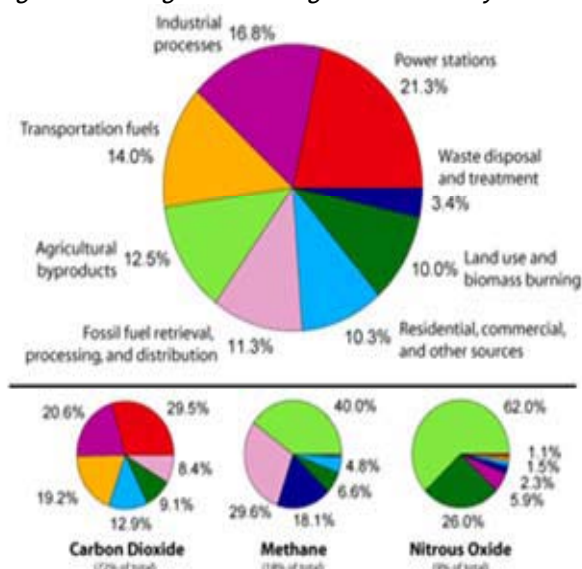
Human beings are exposed to climate change through changing weather patterns (temperature, precipitation, sea-level rise and more frequent extreme events) and indirectly through changes in water, air and food quality and changes in ecosystems, agriculture, industry and settlements and the economy. The effects of climate change to date have been small, but are projected to progressively increase in all countries and regions. It is concluded that climate change had altered the seasonal distribution of some allergenic pollen species. With medium confidence, they concluded that climate change had altered the distribution of some infectious disease vectors and increased heat wave-related deaths.

**Measures to reduce global warming**

Burning fossil fuels such as natural gas, coal, oil and gasoline raises the level of carbon dioxide in the atmosphere, and carbon dioxide is a major contributor to the greenhouse effect and global warming. You can help to reduce the demand for fossil fuels, which in turn reduces global warming, by using energy more wisely. Here are 10 simple actions you can take to help reduce global warming.

1. **Reduce, Reuse, Recycle:** Do your part to reduce waste by choosing reusable products instead of disposables. Buying products with minimal packaging (including the economy size when that makes sense for you) will help to reduce waste. And whenever you can, recycle paper, plastic, newspaper, glass and aluminum cans. If there isn't a recycling program at your

Fig. 1. Annual greenhouse gas emission by sector.



workplace, school, or in your community, ask about starting one. By recycling half of your household waste, you can save 2,400 pounds of carbon dioxide annually.

2. **Use Less Heat and Air Conditioning:** Adding insulation to your walls and attic, and installing weather stripping or caulking around doors and windows can lower your heating costs more than 25 percent, by reducing the amount of energy you need to heat and cool your home. Turn down the heat while you're sleeping at night or away during the day, and keep temperatures moderate at all times. Setting your thermostat just 2 degrees lower in winter and higher in summer could save about 2,000 pounds of carbon dioxide each year.

3. **Change a light bulb:** Wherever practical, replace regular light bulbs with compact fluorescent light (CFL) bulbs. Replacing just one 60-watt incandescent light bulb with a CFL will save you \$30 over the life of the bulb. CFLs also last 10 times longer than incandescent bulbs, use two-thirds less energy, and give off 70 percent less heat. If every U.S. family replaced one regular light bulb with a CFL, it would eliminate 90 billion pounds of greenhouse gases, the same as taking 7.5 million cars off the road.

4. **Drive less and drive smart:** Less driving means fewer emissions. Besides saving gasoline, walking and biking are great forms of exercise. Explore your community mass transit system, and check out options for carpooling to work or school. When you do drive, make sure your car is running efficiently. For example, keeping your tires properly inflated can improve your gas mileage by more than 3 percent. Every gallon of gas you save not only helps your budget, it also keeps 20 pounds of carbon dioxide out of the atmosphere.

5. **Buy Energy-Efficient Products:** When it's time to buy a new car, choose one that offers good gas mileage. Home appliances now come in a range of energy-

efficient models, and compact florescent bulbs are designed to provide more natural-looking light while using far less energy than standard light bulbs. Avoid products that come with excess packaging, especially molded plastic and other packaging that can't be recycled. If you reduce your household garbage by 10 percent, you can save 1,200 pounds of carbon dioxide annually.

*6. Use Less Hot Water:* Set your water heater at 120 degrees to save energy, and wrap it in an insulating blanket if it is more than 5 years old. Buy low-flow showerheads to save hot water and about 350 pounds of carbon dioxide yearly. Wash your clothes in warm or cold water to reduce your use of hot water and the energy required to produce it. That change alone can save at least 500 pounds of carbon dioxide annually in most households. Use the energy-saving settings on your dishwasher and let the dishes air-dry.

*7. Use the "Off" Switch:* Save electricity and reduce global warming by turning off lights when you leave a room, and using only as much light as you need. And remember to turn off your television, video player, stereo and computer when you're not using them. It's also a good idea to turn off the water when you're not using it. While brushing your teeth, shampooing the dog or washing your car, turn off the water until you actually need it for rinsing. You'll reduce your water bill and help to conserve a vital resource.

*8. Plant a tree:* If you have the means to plant a tree, start digging. During photosynthesis, trees and other plants absorb carbon dioxide and give off oxygen. They are an integral part of the natural atmospheric exchange cycle here on Earth, but there are too few of them to fully counter the increases in carbon dioxide caused by automobile traffic, manufacturing and other human activities. A single tree will absorb approximately one ton of carbon dioxide during its lifetime.

*9. Get a report card from your utility company:* Many utility companies provide free home energy audits to help consumers identify areas in their homes that may not be energy efficient. In addition, many utility companies offer rebate programs to help pay for the cost of energy-efficient upgrades.

*10. Encourage Others to Conserve:* Share information about recycling and energy conservation with your friends, neighbors and co-workers, and take opportunities to encourage public officials to establish programs and policies that are good for the environment. These 10 steps will take you a long way toward reducing your energy use and your monthly budget. And less energy use means less dependence on the fossil fuels that create greenhouse gases and contribute to global warming.

## Conclusion

The climate change would increase the number of people suffering from death, disease and injury from heat waves, floods, storms and droughts. Floods are low-probability, high-impact events that can overwhelm physical infrastructure and human communities. Major storm and flood disasters have occurred in the last two decades. Vulnerability to weather disasters depends on the attributes of the person at risk, including where they live and their age, as well as other social and environmental factors. High-density populations in low-lying coastal regions experience a high health burden from weather disasters. Hot days, hot nights and heat waves have become more frequent. Heat waves are associated with marked short-term increases in mortality. In some regions, changes in temperature and precipitation are projected to increase the frequency and severity of fire events. Forest and bush fires cause burns, damage from smoke inhalation and other injuries. Background levels of ground-level ozone have risen since pre-industrial times because of increasing emissions of methane, carbon monoxide and nitrogen oxides. This trend is expected to continue into the mid-21<sup>st</sup> century.