

# Ecological Effect of Pollution

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**Abstract**—Global pollution is a major problem that is yet to be solved. There are several causes of increasing pollution such as burning fossils, deforestation, increase in number of industries and vehicles etc. Humans are almost responsible for all types of pollution. The impact on global environment is becoming more serious. These impacts are discussed in this paper along with probable controlling methods of pollution.

**Index Terms**—Air, water & land pollution, pollutants, effects, causes of pollution, atmosphere, India

## I. INTRODUCTION

What is relatively new and even more worrying is global pollution - that is pollution emitted locally that has global effects. Drawing on the latest research on the impacts of recent climate change, and studies on projected future climate change, the reports show that a doubling of atmospheric levels of carbon dioxide and other greenhouse gases are increasing rapidly. There is growing and alarming evidence that this is already beginning and is driven by a level of greenhouse gases in the Earth's atmosphere that is currently higher than has been seen in over 150,000 years. The projected decline could contribute to the rapid release of hundreds of billions of tonnes of additional carbon dioxide into the atmosphere, accelerating the rate of climate change.

This paper will explain how this pollution occurs, how it leads to climate change, what the damaging impacts might be and what action can be taken to reduce them.

## II. CAUSES OF POLLUTION

### A. Burning Fossil Fuels

The burning of fossil fuels such as coal, oil and natural gas - themselves largely the remains of ancient forests - has expanded rapidly since the late 19th century. Carbon emissions from fossil fuels have increased around 4.3 percent each year since then, only declining when industrial production slowed during the Great Depression and the two World Wars.

The burning of fossil fuels produces around 21.3 billion tonnes (21.3 gigatonnes) of carbon dioxide per year, but it is estimated that natural processes can only absorb about half of that amount, so there is a net increase of 10.65 billion tonnes of atmospheric carbon dioxide per year (one tonnes of

atmospheric carbon is equivalent to 44/12 or 3.7 tonnes of carbon dioxide). Carbon dioxide is one of the greenhouse gases that enhances radioactive forcing and contributes to global warming; causing the average surface temperature of the Earth to rise in response, which climate scientists agree will cause major adverse effects.

### B. Deforestation

Deforestation is damaging to individuals living in the world today, and may be devastating to generations of the future. Currently, deforestation in many parts of the world is responsible for climate changes, reduced rainfall, and the endangerment of wild life and plant species. While some experts disagree on the exact extent of the damage deforestation causes, all agree that future generations are likely to suffer the most from current environment alternating practices. According to current estimates, half of the world's forest cover has been destroyed. This number includes over 60 percent of temperate broadleaf and mixed forests, 45 percent of tropical moist forests, and 70 percent of tropical dry forests. Today, 11 countries are facing total deforestation and another 28 countries have forestland that is threatened.

Carbon dioxide is released into the atmosphere when forests are cleared using fire in tropical countries such as Brazil and Indonesia, and as exposed forest soil decomposes. The agricultural crops which usually replace tropical forests have a far lower capacity to store carbon.

## III. VEHICULAR POLLUTION

The large majority of today's cars and trucks travel by using internal combustion engines that burn gasoline or other fossil fuels. The process of burning gasoline to power cars and trucks contributes to air pollution by releasing a variety of emissions into the atmosphere. Emissions that are released directly into the atmosphere from the tailpipes of cars and trucks are the primary source of vehicular pollution. But motor vehicles also pollute the air during the processes of manufacturing, refueling, and from the emissions associated with oil refining and distribution of the fuel they burn.

Primary pollution from motor vehicles is pollution that is emitted directly into the atmosphere, whereas secondary pollution results from chemical reactions between pollutants after...

Research shows that motor vehicles are responsible for about 70 per cent of south east Queensland's air pollution. Unless we all start reducing car use and motor vehicle pollution, this level is set to increase dramatically.

## IV. INDUSTRIAL POLLUTION

Industrial pollution is the air, water, and chemical pollution caused by industries. There has always been

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pollution. Industrial pollution began when our country went through the Industrial Revolution. Most all parts of the world are affected in some way by industrial pollution. Big cities with steel mills, power plants, heating plants, or railroad stations feel the direct effects of industrial pollution. The smog, smell, and contamination of food or water are some direct effects. Remote areas of the world are affected indirectly by industrial pollution. Even though the people in these communities may not live near any factories, plants, etc. they still are affected. The air pollution caused by the industries can carry for many miles (World Book 338). In the 1700's and early 1800's coal powered most industries. The burning of coal fills the air with smoke and soot. Coal was a very efficient way of powering industries. It was also a big problem. The Industrial Revolution created lots of jobs for people. In fact, this period was characterized by the overcrowding of cities with factory workers. It also increases the products being made in the U.S. Steel, clothes, coal, and power

## V. IMPACT OF A CHANGING CLIMATE

### A. The Greenhouse Effect

Increases in the amount of gases such as carbon dioxide in the atmosphere are occurring because of emissions from human activities such as the burning of fossil fuels (coal, oil and gas) or through deforestation. These increases are sufficient to lead on average to substantially increased warming.

According to the royal society of science the concentration of CO<sub>2</sub> has gone up by 90 parts per million (PPM) since the 1800's. Scientists have also tested air bubbles trapped

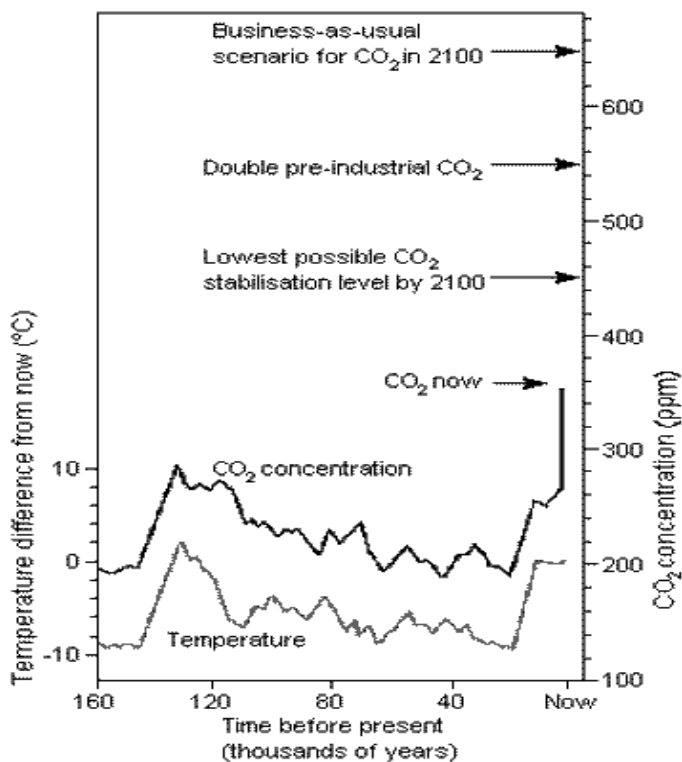


Fig.1 Most rapid change in last 10,000 years

The climate record over many thousands of years can be built up by analyzing the composition of the ice, and the air trapped in the ice, obtained from different depths from cores drilled from the Antarctic or Greenland ice-caps. Fig 1 is a record of the change in temperature at which ice was laid down (the change in global average temperature is about half the change at the poles) and of the atmospheric carbon dioxide content over the last 160,000 years.

**Fig.1** Record from an Antarctic ice core of temperature and carbon dioxide concentration.

In terms of global average temperature The 1990s have been particularly warm. Not only is 1998 the warmest year on record, the first eight months of 1998 were themselves the warmest of those months on record; a striking statistic. If carbon dioxide concentration increases during the 21st century to more than twice its pre-industrial value (Fig 1) then calculations show that global average temperature will

SCIENTIFIC EVIDENCE shows that the climate is changing: average global temperatures have risen about 0.5 degrees over the last century, and the seven hottest years since records began 140 years ago all occurred after 1980. These temperature increases have been most dramatic at high latitudes. Summer temperatures on Ellesmere Island, in Canada's High Arctic, are higher than they have been for more than 1,000 years.

Extreme climate events cause huge economic and social impacts. **Infrastructure** (buildings, Transport, energy and water supply) is affected, posing a specific threat to densely populated areas. The situation could be exacerbated by the rise in sea level.

### B. Health

Changing weather conditions will also have profound effects on **human health** and on **animal and plant health**. As extreme events become more frequent, weather-related deaths and diseases could rise. Climate change could also increase the spread of serious infectious vector-borne transmissible diseases including zoonoses. Climate change will threaten animal wellbeing and could also impact plant health, favoring new or migrant harmful organisms, which could adversely affect trade in animals, plants and their products. Climate change will cause significant changes in the quality and availability of **water resources**, affecting many sectors including food production, where water plays a crucial role. More than 80% of agricultural land is rain-fed. Food production also depends on available water resources for irrigation. Limited water availability already poses a problem in many parts of Europe and the situation is likely to deteriorate further due to climate change, Europe's high water stress areas expected to increase from 19% today to 35% by the 2070s. This could also increase migration pressures.

### C. Land and Sea

Climate change increases land and sea temperatures and alters precipitation quantity and patterns, resulting in the increase of global average sea level, risks of coastal erosion and an expected increase in the severity of weather-related natural disasters. Changing water levels, temperatures and flow will in turn affect food supply, health, industry, and transport and ecosystem integrity. Climate change will lead

to significant economic and social impacts with some regions and sectors likely to bear greater adverse affects. Certain sections of society (the elderly, disabled, low-income households) are also expected to suffer more.

#### D. Agriculture

Climate change will impact a number of sectors. In agriculture projected climatic changes will affect crop yields, livestock management and the location of production. The increasing Likelihood and severity of extreme weather events will considerably increase the risk of crop failure. Climate change will also affect soil by depleting organic matter – a major contributor to soil fertility. The effects of climate change on forests are likely to include changes in forest health and productivity and changes to the geographic range of certain tree species. Climate change will be an added stress for the **fisheries and aquaculture sectors**. Effects will also be severe on coasts and marine ecosystems. Coastal erosion rates will increase and existing defenses may provide insufficient protection. In this context, islands and outermost regions deserve special consideration

#### E. Marine Ecosystem

Climate change will increasingly drive **ecosystem including marine ecosystems** and **Biodiversity** loss, affecting individual species and significantly impacting ecosystems and their related services, on which society depends. Ecosystems play a direct role in climate regulation with peat lands, wetlands and the deep sea providing significant storage for carbon.

In addition, salt marsh ecosystems and dunes provide protection against storms. Other ecosystem services will also be affected such as the provision of drinking water, food production and building materials and oceans can deteriorate through acidification. Some land use practices and planning decisions (e.g. construction on flood plains), as well as unsustainable use of the sea (e.g. over fishing) have rendered ecosystems and socioeconomic systems more vulnerable to climate change and thus less capable of adapting.

#### F. Temperature Stress

TEMPERATURE AFFECTS THE rate of respiration and photosynthesis. Healthy trees grow by accumulating carbon through photosynthesis at a rate faster than they lose carbon through respiration and other processes. In the absence of other factors, increasing the air temperature accelerates the rate of both. However, at high temperatures, the rate of respiration surpasses the rate of photosynthesis, causing a tree to lose carbon and eventually die.

Seeds germinate within a specific range of soil temperatures. For example, black spruce seeds germinate between 15 and 28 degrees Celsius. If the soil temperature falls below 15 degrees, the processes that cause germination come to a halt. If soil temperatures rise above 28 degrees, bacteria and fungi can attack and consume seeds. The probability of germination also declines rapidly for higher temperatures.

#### G. Moisture Stress

TREES EXTRACT WATER and nutrients through roots, and lose water through transpiration. A similar process, evaporation, can dry forest soils. Evaporation and transpiration are strongly dependent on temperature. If a tree loses more water than it can absorb through its roots, it will dehydrate and die. Night temperatures also play a crucial role in relieving moisture stress. If night temperatures are too high, trees can die.

Spruce, pine and fir respond to moisture stress by closing tiny pores on their leaves or needles called stomata. With most transpiration taking place through the stomata, this can significantly reduce moisture stress. However, the stomata are also the pores which absorb carbon dioxide during photosynthesis. If the stomata are closed, photosynthesis stops and the tree may starve.

#### H. Forest

Climate affects the forest in many ways. In particular, warmer weather increases the frequency. In a changing climate, the natural balance of the boreal forest would be expected to undergo profound disruption, with parts eventually reverting to grassland, some areas becoming more vulnerable to large-scale wildfires and insect outbreak, while some species could decline in the face of increasing stress.

Weather patterns have changed at the closely monitored Experimental Lakes Area in the boreal forest of northwestern Ontario. Since the late 1960s, the average air temperature has risen by two degrees Celsius.

Over the past 200 years human activities have increased the amount of carbon dioxide in the atmosphere by over 30% - well beyond the range of its natural variation during the last million years or more. If the increase continues and if adequate action is not taken to stem it, the atmospheric carbon dioxide content will reach double its pre-industrial value during the 21st century.

## VI. CONTROL OF POLLUTION

A planned and orderly global phase-out of fossil fuels and their replacement by the efficient use of renewable and clean energy sources, including the immediate reduction of greenhouse gas levels by at least 20 percent by 2005.

An end to global deforestation and the introduction of a programme of ecologically-based reforestation.

The immediate phase-out of CFCs, HCFCs and HFCs, and their replacement by chemicals which do not damage the ozone layer or contribute to the human-induced greenhouse effect.

Although there is a lot of uncertainty concerning the detail, the basic science underlying global warming and climate change is well understood and is not in question. Hundreds of scientists from over fifty nations, including the world's leading scientists in the field, have contributed as authors or reviewers to the Assessments of the Intergovernmental Panel on Climate Change (IPCC). Because of the uncertainties it is easy either to exaggerate the possible impacts to calamitous proportions or to suggest that too little is known to justify any action.

At the Earth Summit held in Rio de Janeiro in 1992, around 160 nations agreed the Framework Convention on

Climate Change (FCCC). Three widely accepted principles will govern the international agreements needed to meet the threat of climate change.

*Precautionary Principle;*

already clearly imbedded in the FCCC. This states that the existence of uncertainty should not preclude the taking of appropriate action. The objective for such action is simply stated as the stabilization of the concentrations of greenhouse gases (such as carbon dioxide) in the atmosphere in ways that allow also for necessary economic development.

*Polluter Pays Principle;*

which implies the imposition of measures such as carbon taxes or carbon trading.

*Principle of Equity;*

(both Intergenerational and Inter-national) which is the most difficult to apply. However, a proposal of the Global Commons Institute, that is being widely discussed, applies the second and third principles by allowing for the eventual allocation of carbon emissions to nations on an equal per capita basis while also allowing for emissions trading.

A start was made at Kyoto in 1997 with agreement to a Protocol (yet to be ratified) requiring developed nations to reduce their emissions of greenhouse gases by the year 2010 by 5% on average compared to 1990. This is a first step, hopefully demonstrating commitment by the developed world. Necessary post-Kyoto action, however, will be more demanding. Developing countries who wish to industrialize also need to join the action; in this they will need substantial encouragement (e.g. appropriate technology development and transfer) to enable them to develop industrially without vast increases in carbon dioxide emissions.

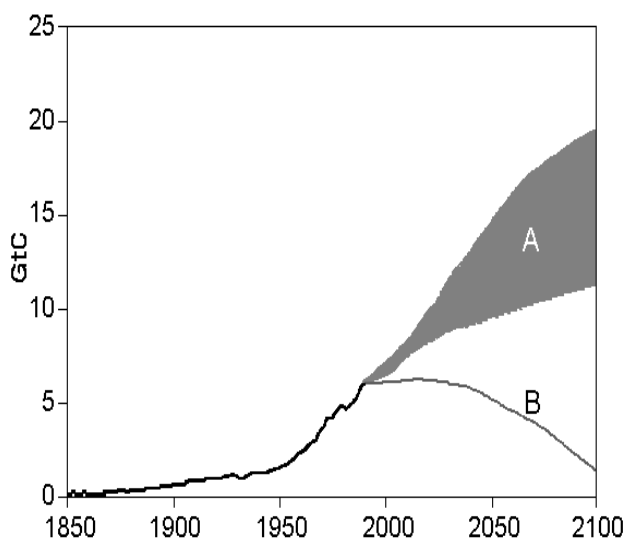


Fig.2: Global carbon emissions from fossil fuel use, from 1850-1990 and as projected to 2100 - in billions of tones of carbon (GtC). Region A shows the range of likely emissions under 'business-as-usual', and curve B an emission scenario that would lead to stabilization of the atmospheric carbon dioxide concentration as required by the FCCC.

## VII. CONCLUSION

- Ensure maximum energy efficiency in the home (over 25% of CO<sub>2</sub> emissions are from domestic energy use) through good heat insulation and through the use of high efficiency appliances (e.g. low energy light bulbs, Grade A or B appliances).
- Ensure maximum energy saving - do not overheat rooms and turn off lights when not required.
- Support, where possible, the provision of energy from renewable sources; e.g. purchase 'green' electricity now that this option is available.
- Use public transport, and walk and cycle where possible, and use a fuel-efficient car (over 25% of CO<sub>2</sub> emissions come from transport).
- Consider the environment when shopping; e.g. buy goods produced with low energy use and products that originate from renewable sources.
- Through the democratic process, encourage local and national government to deliver policies that properly take the environment into account.

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