



PRIOR ENVIRONMENTAL KNOWLEDGE FOR TEACHERS - FEEDU

GLOBAL WARMING AND CLIMATE CHANGE

Global warming is no longer a theory. The clear message from the scientific community is that this warming is due, at least in part, to the increasing concentrations of greenhouse gases in atmosphere. In the long term climate change may have large impacts on our economy and daily lives, but within the next decade or so, the first things to change may be subtle aspects of the behaviour of plants, animals and people where we already know them to be sensitive to climate from past records.

Thinning of the Ozone Layer

Manmade gas compounds including Chloroflouro carbons (CFC'S), Methyl Bromide and Halons all react with a delicate protective shield reducing the thickness of the Stratospheric Ozone Layer (an atmospheric layer up to 15km above the Earth), which allows more harmful ultra-violet radiation to reach the Earth. The Ozone Layer therefore acts like a shield and without it or with a thinned layer there is expected to be more incidences of skin cancer and cataracts caused by the increased levels of ultra-violet radiation.

Complete holes in the Ozone Layer already exist periodically over the Poles and the areas that have thinned significantly occasionally cover the UK. Worldwide legislation (agreed at the 1987 Montreal Protocol) is in force to reduce the levels of Ozone destroying gases produced, however, it will take 50 years for the Ozone Layer to begin to recover.



The Greenhouse Effect

Certain gases are more efficient at absorbing infra-red radiation energy as heat.

The Earth's atmosphere is made up of a mixture of gases most of which have no serious implication for global warming (including Nitrogen and Oxygen). The Earth sustains life because of a naturally occurring 'greenhouse effect' that keeps the Earth 30°C warmer than it would otherwise be. Manmade actions have in the past 150 years affected the mixture of the gases in the atmosphere. Increases in carbon dioxide (mainly from fossil fuel burning), Methane (from animals and decomposition), Nitrogen dioxide (from changing landuse), and CFC's (manmade chemicals) have made the atmosphere more heat absorbent therefore enabling the Earth to slowly warm above its usual temperature.

The increase in global temperature has occurred over the last 100 years and though only a matter of an increase of 2 degrees per 100 years is enough of a difference to interact with global weather patterns leading to more extreme weather conditions, including storms, Hurricanes, droughts and rainfall.

A warmer Earth leads to the melting of ice caps and glaciers and expands the volume of water in the seas and lakes, which is expected to lead to higher sea levels. In the UK it is anticipated that there will be frequent costal flooding, storm and water shortages.

Global warming may mean a warmer climate, it will also mean more costly insurance premiums, more expensive water and even UK incidences of diseases including Malaria!



The 1997 Kyoto Protocol was the first global agreement to limit greenhouse gas emissions. The Protocol in the part sets industrialised nations a target of reducing emissions of global warming gases 5% below 1990 levels by 2008-2012. However certain countries including the USA have been slow in agreeing to their obligations.

Local Air Pollution – Smogs

Air pollution at a local level is very important and can be potentially life threatening.

An example of how dangerous air pollution can be is documented following the London smogs of the 1950's, one episode of which claimed 4000 lives. These smogs killed people following a combination of adverse weather and pollution mostly from vehicles, households and factory chimneys. Smoke is made up of particles, including Carbon and Sulphur, gases including CO^2 , Nitrogen oxides and heat. Following the Clean Air Act of 1957 London no longer suffers with smogs on the scale of the 50's, However, this doesn't mean that air pollution has disappeared.

Much air pollution is now invisible. Carbon monoxide from vehicles and the carcinogen, benzene; chemical additive in petrol can easily be absorbed by the human body. High levels of nitrous oxide mixing with sunshine can create ground level ozone, which it is suggested can trigger asthma and other chest problems.



Oil pollution

On the 24th of March 1989, the Exxon Valdez oil tanker ran aground in the Prince William Sound off Alaska, Spilling 232,000 barrels of oil. The Effects of the incident are not really known, but it is known that the only 25% of the migratory Salmon population returned to the area the following season, thousands of otters were poisoned, and thousands of birds died.

The scale of the incident prompted the development of the Valdez Principles, which are slowly being adopted by industry. It also highlighted just how expensive a major oil spill can be - Exxon spent some 2 billion dollars cleaning up the spill, and a further \$1 billion dollars to settle civil and criminal charges related to the case. The world's over-dependence on oil and oil products means unless tanker shipping safety levels are improved that this kind of event is almost certain to happen again.

Water Scarcity

A number of areas experience significant water shortages due to low rainfall or high evaporation losses. Growing demands for water from increasing populations, agricultural and industrial demands for water has further reduced the amount of water available. The Middle East experiences all of these issues and it is expected that conflicts may arise over the control and usage of water by surrounding states.

The Aral sea, an inland lake in central Asia has suffered greatly from over abstraction for local cotton harvesting. The



shore is now 40 miles from the original ports and some 135 of the 173 species of animals dependent on the lake have died.

Acid Rain

Air pollution can easily cross national boundaries. When sulphur, Carbon and nitrogen oxides are absorbed by water droplets they can acidify cloud water which can fall to Earth in a concentrated form as rain or snow for example.

Such acidified precipitation has in the past made Scandinavian lakes and rivers so acidic that flora and fauna cannot survive. Such acid rain can also leak out chemicals from the soils which in effect poison the freshwater ecosystems. Acid rain has also 'damaged' large swathes of forestry in the region.

Action has been taken in the last 20 years to reduce the amount of air pollution being released especially by the UK power stations and heavy manufacturing industries, so now the issue of acid rain is no longer high on the international agenda.

Ground Water Contamination

Of more local concern is the increasing problem of ground water contamination. Our past industrial heritage has left a legacy that we are only now coming to terms with. Chemicals and other compounds that have leaked into the ground can also travel down to accumulate in aquifers making purification of the water very expensive or impossible. Groundwater contamination not only comes from past industrial practices, often underground storage containers (such as fuel tanks at petrol stations leak polluting the soils and water with potentially carcinogenic compounds).



Intensive farming practices have led to increased nitrogen levels in water supplies in East Anglia, which have been linked, with increased levels of child mortality through blue baby syndrome.

KEY FINDINGS

- By the 2050s, tropical grasslands and forests will be at risk of decline, whereas many temperate and boreal forests may continue to expand in response to climate change and increasing atmospheric CO₂.
- Climate change is likely to exacerbate the pressure put on water resources by an increasing global population, particularly in Africa, Central America, the Indian subcontinent and southern Europe. By the 2050s, there could be about a further 100 million people living in countries with extreme water stress due to climate change alone.
- Global food supply is expected to meet the overall needs of a growing world population but significant regional variations in crop yields due to climate change could lead to increased risk of hunger for an additional 50 million people by the 2080s, in tropics, particularly in Africa.
- Without measures adopted specifically to tackle rising sea levels, increased flooding is calculated to affect some 200 million people worldwide by the 2080s. Around 25% of the world's coastal wetlands could be lost by this time due to sea level rise alone.