CLIMATE CHANGE

STATEMENT OF THE PROBLEM

The average temperature of the earth's surface has risen by 0.74 degrees C since the late 1800s. It is expected to increase by another 1.8° C to 4° C by the year 2100 - a rapid and profound change - should the necessary action not be taken. Even if the minimum predicted increase takes place, it will be larger than any century-long trend in the last 10,000 years.

The principal reason for the mounting thermometer is a century and a half of industrialization: the burning of ever-greater quantities of oil, gasoline, and coal, the cutting of forests, and the practice of certain farming methods.

These activities have increased the amount of "greenhouse gases" in the atmosphere, especially carbon dioxide, methane, and nitrous oxide. Such gases occur naturally - they are critical for life on earth, they keep some of the sun's warmth from reflecting back into space, and without them the world would be a cold and barren place. But in augmented and increasing quantities, they are pushing the global temperature to artificially high levels and altering the climate. Eleven of the last 12 years are the warmest on record, and 1998 was the warmest year.

The current warming trend is expected to cause extinctions. Numerous plant and animal species, already weakened by pollution and loss of habitat, are not expected to survive the next 100 years. Human beings, while not threatened in this way, are likely to face mounting difficulties. Recent severe storms, floods and droughts, for example, appear to show that computer models predicting more frequent "extreme weather events" are on target.

The average sea level rose by 10 to 20 cm during the 20th century, and an additional increase of 18 to 59 cm is expected by the year 2100. (Higher temperatures cause ocean volume to expand, and melting glaciers and ice caps add more water.) If the higher end of that scale is reached, the sea could overflow the heavily populated coastlines of such countries as Bangladesh,

cause the disappearance of some nations entirely (such as the island state of the Maldives), foul freshwater supplies for billions of people, and spur mass migrations.

Agricultural yields are expected to drop in most tropical and sub-tropical regions - and in temperate regions too - if the temperature increase is more than a few degrees C. Drying of continental interiors, such as central Asia, the African Sahel, and the Great Plains of the United States, is also forecast. These changes could cause, at a minimum, disruptions in land use and food supply. And the range of diseases such as malaria may expand.

Global warming is a "modern" problem - complicated, involving the entire world, tangled up with difficult issues such as poverty, economic development and population growth. Dealing with it will not be easy. Ignoring it will be worse.

Over a decade ago, most countries joined an international treaty - the **United Nations Framework Convention on Climate Change** - to begin to consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable. More recently, a number of nations approved an addition to the treaty, called the **Kyoto Protocol**, which has more powerful (and legally binding) measures. The Protocol's first commitment period began in 2008 and ends in 2012. A strong multilateral framework needs to be in place by 2009 to ensure that there is no gap between the end of the Kyoto Protocol's first commitment period in 2012 and the entry into force of a future regime.

ANALYSIS OF THE PROBLEM

Human activity -- particularly the burning of fossil fuels -- has made the blanket of greenhouse gases around the earth "thicker." The resulting increase in global temperatures is alterating the

complex web of systems that allow life to thrive on earth, such as cloud cover, rainfall, wind patterns, ocean currents, and the distribution of plant and animal species.

The greenhouse effect and the carbon cycle. More of the sun's energy is being trapped in the atmosphere, and much more of the world's carbon (in the form of carbon dioxide) is resting in the air rather than in trees, soil, and subterranean deposits.

Current evidence of climate change. Some consequences of global warming are already apparent.

Future effects. The complexity of the climate system means predictions vary widely, but even the minimum changes forecast could mean frequently flooded coastlines, disruptions to food and water supplies, and the extinction of many species.

The Intergovermental Panel on Climate Change. An international group of experts formed in 1988 reviews scientific research and offers assessments of climate change and its effects.

The Greenhouse Effect and the Carbon Cycle

Greenhouse gases make up only about 1 per cent of the atmosphere, but they act like a blanket around the earth, or like the glass roof of a greenhouse -- they trap heat and keep the planet some 30 degrees C warmer than it would be otherwise.

Human activities are making the blanket "thicker" -- the natural levels of these gases are being supplemented by emissions of carbon dioxide from the burning of coal, oil, and natural gas; by additional methane and nitrous oxide produced by farming activities and changes in land use; and by several long-lived industrial gases that do not occur naturally.

These changes are happening at unprecedented speed. If emissions continue to grow at current rates, it is almost certain that atmospheric levels of carbon dioxide will double from pre-industrial levels during the 21st.

The result, known as the "enhanced greenhouse effect," is a warming of the earth's surface and lower atmosphere. The IPCC assesses with very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming. The 'best case' computer climate models estimate that the average global temperature will rise by 1.8° C to 4.0° C by the year 2100. A temperature increase of 0.74° C occurred last century and for the next two decades, a warming of about 0.2° C per decade is projected should greenhouse gas emissions continue to rise at their current pace and are allowed to double from their pre-industrial level.

A rise in temperature will be accompanied by changes in climate -- in such things as cloud cover, precipitation, wind patterns, and the duration of seasons. In its Fourth Assessment Report, the IPCC projects that heat waves and heavy precipitation events are very likely to increase in frequency in the 21st century. In a world that is crowded and under stress, millions of people depend on weather patterns, such as monsoon rains, to continue as they have in the past. Changes, at a minimum, will be difficult and disruptive.

Current Evidence of Climate Change

1 **Extra-strength weather**

Thefrequence of heavy precipitation events has increased over most land areas. Significantly increased precipitation has been observed in eastern parts of North and South America, northern Europe and northern and central Asia. There is also observational evidence for an increase of intense tropical cyclone activity in the North Atlantic since about 1970.

Drying has also been observed over large regions, i.e. the Sahel, the Mediterranean, southern Africa and parts of southern Asia.

In Africa's large catchment basins of Niger, Lake Chad, and Senegal, total available water has decreased by 40 to 60 per cent, and desertification has been worsened by lower average annual rainfall, runoff, and soil moisture, especially in southern, northern, and western Africa.

The Rhine floods of 1996 and 1997, the Chinese floods of 1998, the East European floods of 1998 and 2002, the Mozambique and European floods of 2000, and the monsoon-based flooding of 2004 in Bangladesh (which left 60 per cent of the country under water), are examples of more powerful storms.

2 **The decline of winter**

Average Arctic temperatures increased at almost twice the global rate in the past 100 years. Temperatures at the top of the permafrost layer have generally increased since the 1980s by up to 3°C. In the Russian Arctic, buildings are collapsing because permafrost under their foundations has melted.

Snow cover has declined by some 10 per cent in the mid- and high latitudes of the Northern Hemisphere since the late 1960s. Mountain glaciers and snow cover have declined in both hemispheres and widespread decreases in glaciers and ice caps have contributed to sea level rise. New data evaluated by the IPCC shows that losses from the ice sheets of Greenland and Antarctica have very likely contributed to sea level rise from 1993 to 2003. The average global sea level rose at an average rate of 1.8 mm per year between 1961 and 2003, but between 1993 and 2003 it rose by 3.1 mm per year.

Almost all mountain glaciers in non-polar regions retreated during the 20th century. The overall volume of glaciers in Switzerland decreased by two-thirds.

Future Effects

Even the minimum predicted shifts in climate for the 21st century are likely to be significant and disruptive. Scientific understanding and computer models have improved recently and many projections can now be made with greater certainty.

The matter is serious. Predictions of future climate impacts show that the consequences could vary from disruptive to catastrophic.

The minimum warming forecast for the next 100 years is more than twice the 0.6° C increase that has occurred since 1900s and that earlier increase is already having marked consequences.

Extreme weather events are striking more often and sea levels have already risen by 10 to 20 cm over pre-industrial averages. Sea level rise will continue for centuries due to the time scales associated with climate processes and feedbacks. In its Fourth Assessment Report, the IPCC states that the contraction of the Greenland ice sheet is projected to continue to contribute to sea level rise after 2100. If this contraction is sustained for centuries, that would lead to the virtually complete elimination of the Greenland ice sheet and a resulting contribution to sea level rise of about 7m.

A future of more severe storms and floods along the world's increasingly crowded coastlines is likely, and will be a bad combination even under the minimum scenarios forecast. Furthermore, extra-tropical storm tracks are projected to move poleward, with consequent changes in wind, precipitation, and temperature patterns, continuing the pattern observed over the last half century.

Salt-water intrusion from rising sea levels will reduce the quality and quantity of freshwater supplies. This is a major concern, since billions of people already lack access to freshwater. Higher ocean levels already are contaminating underground water sources in Israel and Thailand, in various small island states in the Pacific and Indian Oceans and the Caribbean Sea,

and in some of the world's most productive deltas, such as China's Yangtze Delta and Vietnam's Mekong Delta.

Most of the world's endangered species -- some 25 percent of mammals and 12 per cent of birds -- may become extinct over the next few decades as warmer conditions alter the forests, wetlands, and rangelands they depend on, and human development blocks them from migrating elsewhere.

Higher temperatures are expected to **expand the range of some dangerous "vector-borne" diseases**, such as malaria, which already kills 1 million people annually, most of them children.

WHAT CAN BE DONE

Measures -- heavily dependent on teamwork and political will -- can slow the rate of global warming and help the world cope with the climate shifts that occur.

Reducing Greenhouse Gas Emissions

1 Making efficiency pay off

Getting more electricity, transport, and industrial output for less coal, oil, or gasoline is a no-lose situation: more profit, less pollution, less global warming. . . although initial outlays for better equipment and technology can be expensive.

Natural gas releases less carbon dioxide per unit of energy than coal or oil. Hence, switching to natural gas is a quick way to cut emissions.

Industry, which accounts for over 40 per cent of global carbon-dioxide emissions, can benefit from combined heat and power co-generation, other uses of waste heat, improved energy management, and more efficient manufacturing processes.

Installing more efficient lighting and appliances in buildings can significantly cut electricity use. Improving building insulation can greatly reduce the amount of fuel needed for heating or air conditioning.

2 Taking advantage of existing renewable energy technologies

Solar energy and wind-generated electricity -- at current levels of efficiency and cost -- can replace some fossil-fuel use, and are increasingly being used. Greater employment of such technologics can increase their efficiences of scale and lower their costs. The current contribution of such energy-producing methods to world supplies is less than 2 per cent.

Expansion of hydro-electric power, where appropriate, could make a major contribution to lowering greenhouse-gas emissions. . . but the use of hydropower is necessarily limited by its impacts on human settlements and river systems.

New technologies have become available for "capturing" the carbon dioxide emitted by fossil-fuel power plants before it reaches the atmosphere. The carbon dioxide is then stored underground in empty oil or gas reservoirs, unused coal beds, or in the deep ocean. While not exactly "renewable," this approach, which is already in limited use, is being scrutinized for possible risks and environmental impacts.

Expanding Forests

1 The role of "sinks"

Trees and other green plants, using only sunlight for energy, take carbon dioxide out of the atmosphere, releasing oxygen and storing carbon in a safe and useful way. (Any skeptic of the potential of solar power needs only to look at the near-miracle of photosynthesis.) Forests, which provide all kinds of undervalued benefits for mankind, can be major allies in the battle against climate change and global warming. . . if only humans start planting them and stop cutting them down.

The world at large currently doesn't "pay" much for the positive effects of

forests. The value of trees as lumber and as firewood, and the value of the land they occupy for housing or farming, tend to be short-term and specific. In fact, these benefits may be a matter of survival in some regions. The value of forests for preventing global warming and preserving the earth's biodiversity, by contrast, are long-term and their rewards apply to everyone generally. A way has to be found to make the expansion and nurturing of forests appealing and cost-effective to the local populations that usually decide their fate.

Under the **Kyoto Protocol**, once it takes effect, industrialized countries which lack space or cost-effective options for expanding forests on their own territories may partially compensate for their greenhouse-gas emissions by paying for the establishment and maintenance of forests in other countries.

2 Changing agricultural methods

Carbon stored in agricultural soils often can be preserved or enhanced by switching to "no-tillage" or "low-tillage" techniques, which slow the rate at which organic soil matter decomposes.

In rice fields, emissions of methane, a powerful greenhouse gas, can be suppressed to some extent through tillage practices, water management, and crop rotation.

Using nitrogen fertilizers more efficiently can reduce emissions of nitrous oxide, another potent greenhouse gas.

Changing Lifestyles and Rules

1 The role of culture and habit

People don't necessarily make decisions based on efficiency or the health of the environment. They are apt to do what they've done in the past, what is expected, what their friends and neighbors do, what is fashionable. Driving a car with a large engine when a small engine -- which burns less fuel -- will do the job is a matter of choice. In choosing cars and electrical appliances and methods for heating and cooling their homes, human beings

don't necessarily think about climate change. And when thousands and even millions of people make choices that add unnecessarily to the global warming problem, the effects can be considerable.

Traditions and habits also may limit the lifestyle choices that are available. Businesses and governments tend not to supply products, services, and policies people don't want. Mass transit is much less wasteful of fossil fuels than automobile use, but if the public hasn't demanded mass transit and the necessary train lines and subway systems and bus routes haven't been built, then they aren't quickly available when and if people change their minds. Momentum has to be built up for such changes . . . and yet, paradoxically, if the options aren't available, it's hard to establish momentum for them. "Hybrid" cars use roughly half the gasoline of standard automobiles, but because few customers have asked for such vehicles, the price per car is high and few auto makers produce them.

2 Governments as prods and guides

Laws and regulations can have a major impact on greenhouse-gas emissions because they affect business behavior and public habits. Some governments encourage the use of mass transit; some -- through tax arrangements, road-building programmes, and even subsidies -- encourage the burning of fossil fuels. One way (admittedly not always popular) of changing behavior is to make it illegal. Another is to make it more expensive through taxes or penalties.

Some governments, spurred by membership in the United Nations Framework Convention on Climate Change, have already attempted to cut greenhouse gas emissions with a mixture of carrots and sticks -- with inducements, subsidies, voluntary programmes, regulations, and fines. Several have attacked the problem directly by imposing "taxes" on carbon use. Others have established "carbon markets" where units of energy use may be bought and sold. These arrangements anticipate provisions that will apply to governments that have ratified the Kyoto Protocol, once the Protocol enters

into force.

THE INTERNATIONAL ORGANIZATIONS AND TREATIES ABOUT CLIMATE CHANGE

THE INTERGOVERMENTAL PANEL ON CLIMATE CHANGE

In 1988, an **Intergovernmental Panel on Climate Change** was created by the World Meteorological Organization and the United Nations Environment Programme (UNEP). This group issued a first assessment report in 1990 which reflected the views of 400 scientists. The report stated that global warming was real and urged that something be done about it.

The Panel's findings spurred governments to create the **United Nations Framework Convention on Climate Change**. By standards for international agreements, negotiation of the Convention was rapid. It was ready for signature at the 1992 United Nations Conference on Environment and Development -- more popularly known as the "Earth Summit" -- in Rio de Janeiro.

The Intergovernmental Panel, or IPCC, now has a well-established role. It does not conduct its own scientific inquiries, but **reviews worldwide research, issues regular assessment reports (there have now been four), and compiles special reports and technical papers**.

The IPCC's findings, because they reflect global scientific consensus and are apolitical in character, form a useful counterbalance to the often highly charged political debate over what to do about climate change. IPCC reports are frequently used as the basis for decisions made under the Convention, and they played a major role in the negotiations leading to the **Kyoto Protocol**, a second, more far-reaching international treaty on climate change that entered into force on 16 February 2005.

THE KYOTO PROTOCOL

The adoption of the Framework Convention on Climate Change (UNFCCC) in 1992 was a major step forward in tackling the problem of global warming. Yet as greenhouse gas (GHG) emission levels continued to rise around the world, it became increasingly evident that only a firm and binding commitment by developed countries to reduce emissions could send a signal strong enough to convince businesses, communities and individuals to act on climate change. Member countries of the UNFCCC therefore began negotiations on a Protocol - an international agreement linked to the existing Treaty, but standing on its own.

After two and a half years of intense negotiations, the Kyoto Protocol was adopted at the third Conference of the Parties to the UNFCCC (COP 3) in Kyoto, Japan, on 11 December 1997. The Protocol shares the objective and institutions of the Convention. The major distinction between the two, however, is that while the Convention encouraged developed countries to stabilize GHG emissions, the Protocol commits them to do so. The detailed rules for its implementation were adopted at COP 7 in Marrakesh in 2001, and are called the "Marrakesh Accords."

Because it will affect virtually all major sectors of the economy, the Kyoto Protocol is considered to be the most far-reaching agreement on environment and sustainable development ever adopted. However, any treaty not only has to be effective in tackling a complicated worldwide problem, it must also be politically acceptable. Most of the world's countries eventually agreed to the Protocol, but some nations, including the United States, chose not to ratify it. The Kyoto Protocol entered into force on 16 February 2005.

The Protocol requires developed countries to reduce their GHG emissions below levels specified for each of them in the Treaty. These targets must be met within a five-year time frame between 2008 and 2012, and add up to a total cut in GHG emissions of at least 5 percent against the baseline of 1990. Review and enforcement of these commitments are carried out by United Nations-based bodies.

The Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." This has two main reasons. Firstly, those countries can more easily pay the cost of cutting emissions. Secondly, developed countries have historically contributed more to the problem by emitting larger amounts of GHGs per person than in developing countries.

In order to give Parties a certain degree of flexibility in meeting their emission reduction targets, the Protocol developed three innovative mechanisms - known as Emissions Trading, Joint Implementation and the Clean Development Mechanism (CDM). These so-called "market-based mechanisms" allow developed Parties to earn and trade emissions credits through projects implemented either in other developed countries or in developing countries, which they can use towards meeting their commitments. These mechanisms help identify lowest-cost opportunities for reducing emissions and attract private sector participation in emission reduction efforts. Developing nations benefit in terms of technology transfer and investment brought about through collaboration with industrialized nations under the CDM.

Some scientists have doubted the scientific basis of the Kyoto Protocol, claiming that there is not a clear connection between increases in GHG emissions and climate change. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change(IPCC), launched in the course of 2007, put an end to that discussion. Prepared by scientists from all over the world, it placed the reality of human-induced climate change beyond any doubt. It is politically significant that governments endorsed the IPCC's Fourth Assessment Report by consensus, making it a solid foundation for sound political decision-making.

The Kyoto Protocol is generally seen as an important first step towards a truly global emission reduction regime that will stabilize GHG concentrations at a level which will avoid dangerous climate change. As a result of the Protocol, governments have already put, and are continuing to put legislation

and policies in place to meet their commitments; a carbon market has been created; and more and more businesses are making the investment decisions needed for a climate-friendly future. The Protocol provides the essential architecture for any new international agreement or set of agreements on climate change. The first commitment period of the Kyoto Protocol expires in 2012.

Attachment:

KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

http://unfccc.int/resource/docs/convkp/kpeng.pdf