

6

CLIMATE CHANGE

“I call upon the Millennium Summit to promote the adoption and implementation of the Kyoto Protocol. Specifically, I urge those States whose ratifications are needed to bring it into effect to take the necessary action in time for entry into force by 2002, as a fitting celebration of our progress since Stockholm in 1972 and Rio in 1992.”

Secretary-General Kofi Annan in the *Millennium Report*.

Vital statistics

- Global mean surface temperatures have increased 0.6-1.2°F since the late 19th century.
- The 20th century's 10 warmest years all occurred within the last 15 years. Of these, 1998 was the warmest year on record.
- Global mean sea level has already risen by around 10 to 15 centimeters during the past century, and global warming is expected to cause a further rise of 15 to 95 cm by the year 2100 (with a "best estimate" of 50 cm).
- Precipitation has increased by about 1 percent over the world's continents in the last century.
- Carbon emissions have quadrupled during the past half-century.
- The cost of natural disasters in 1998 alone exceeded the cost of all such disasters in the 1980s.
- Eighty-four Governments have signed the Kyoto Protocol, but only 22 countries have ratified the treaty; none of them from the industrialized world.

What are we doing to our planet?

The last several decades have been a time of international soul-searching about the environment. More and more, we are realizing that the Industrial Revolution has changed forever the relationship between humanity and nature. There is real concern that by the middle or the end of the 21st century human activities will have changed the basic conditions that have allowed life to thrive on earth.

The 1992 United Nations Framework Convention on Climate Change and its 1997 Kyoto Protocol are part of a series of recent agreements through which countries around the world are banding together to meet this challenge. Other treaties adopted under UN auspices deal with such matters as pollution of the oceans, dryland degradation, damage to the ozone layer, and the rapid extinction of plant and animal species. The Climate Change Convention focuses on something particularly disturbing: we are changing the way energy from the sun interacts with and escapes from our planet's atmosphere. By doing that, we risk altering the global climate. Among the expected consequences are an increase in the average temperature of the earth's surface and shifts in worldwide weather patterns. Other -- unforeseen -- effects cannot be ruled out.

What exactly is “climate change”?

Shifts in climate have shaped human destiny since the beginning of time, and people have largely responded by adapting, migrating and growing smarter. Previously the global climate changed human beings. Now human beings seem to be changing the global climate. The results are uncertain, but if current predictions prove correct, the climatic changes over the coming century will be larger than any since the dawn of human civilization.

The principal change to date is in the earth's atmosphere. We have changed, and are continuing to change, the balance of gases that form the atmosphere. This is especially true of such key "greenhouse gases" as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Humans are changing this balance when we burn coal, oil and natural gas, spewing huge amounts of carbon dioxide into the air. When we destroy forests the carbon stored in the trees escapes to the atmosphere. Other basic activities, such as raising cattle and planting rice, emit methane, nitrous oxide and other greenhouse gases. 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 century. If no steps are taken to slow greenhouse gas emissions, it is quite possible that levels will triple by the year 2100.

The most direct result, says the scientific consensus of the UN's Intergovernmental Panel on Climate Change (IPCC), is likely to be a "global warming" of 1 to 3.5°C over the next 100 years. That is in addition to an apparent temperature increase of around half a degree Centigrade since the pre-industrial period before 1850, at least some of which may be due to past greenhouse gas emissions.

Just how this would affect us is hard to predict because the global climate is a very complicated system. For example, wind and rainfall patterns that have prevailed for hundreds or thousands of years, and on which millions of people depend, may change. Sea levels may rise and threaten islands and low-lying coastal areas. In a world that is increasingly crowded and under stress -- a world that has enough problems already -- these extra pressures could lead directly to more famines and other catastrophes.

What has been the international response?

“In many cases, we already know what needs to be done,” said Secretary-General Kofi Annan this year in June in an address to the 2000 graduating class of Stanford University. “The Kyoto Protocol on climate change can begin to control carbon emissions -- if it is ratified and implemented, not least by the United States, the world's largest producer of greenhouse gases. This would be an enormous gift to the entire planet,” he told the students.

Long before the Kyoto Protocol was signed, climate change was recognized as a serious problem. The First World Climate Conference held in 1979 explored how climate change might affect human activity. Subsequent international scientific and

intergovernmental conferences on the subject were held under UN auspices throughout the next decade.

- In 1990 the IPCC released its First Assessment Report. Established in 1988 by the UN Environment Programme (UNEP) and the World Meteorological Organization (WMO), the Panel was given a mandate to assess the state of existing knowledge about the climate system and climate change; the environmental, economic and social impacts of climate change; and the possible response strategies. Approved after a painstaking peer review process, the Report confirmed the scientific evidence for climate change. This had a powerful effect on both policy-makers and the general public and provided the basis for negotiations on the Climate Change Convention, which began in early 1991.
- Facing a strict deadline - the June 1992 "Earth Summit" - negotiators from 150 countries finalized the Convention in just 15 months. It was adopted in New York on 9 May 1992 and signed by 154 states (plus the European Community) at Rio de Janeiro. The Convention entered into force on 21 March 1994, and, as of May 2000, has 184 Parties.

The Climate Change Convention is a manifestation of the political will of the nations of the world to agree that there is a problem and that a common course of action is needed. It is especially significant because it tackles a problem whose consequences are uncertain and which will be more important for our grandchildren than for the present generation.

The Convention sets an "ultimate objective" of stabilizing "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system." It directs that "such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." This leaves room for interpretation in the light of scientific findings and the trade-offs and risks that the global community is willing to accept.

- In December 1995, the IPCC released its Second Assessment Report. Written and reviewed by some 2,000 scientists and experts worldwide, it was soon widely known for concluding that "the balance of evidence suggests that there is a discernible human influence on global climate." However, the Report did much more, for example, confirming the availability of so-called no-regrets options and other cost-effective strategies for combatting climate change.
- In December 1997 in Japan, at the Third Conference of the Parties to the Convention, some 10,000 delegates, observers and journalists witnessed the historic adoption of the Kyoto Protocol. Under the treaty, industrialized countries have a legally binding commitment to reduce their collective greenhouse gas emissions by at least 5 per cent compared to 1990 levels by the period 2008-2012. The Protocol will enter into force 90 days after it has been ratified by at least 55

Parties to the Convention, including developed countries representing at least 55 per cent of this group's total 1990 CO2 emissions.

Effects of climate change

No one is certain about climate change's future effects or their severity. Responding to the threat is expected to be complicated and difficult. However, in most scientific circles the issue is no longer whether or not climate change is a potentially serious problem. Rather, it is how the problem will develop, what its effects will be, and how these effects can best be detected. Computer models of something as complicated as the planet's climate system are not far enough advanced yet to give clear and unambiguous answers. Nevertheless, the big picture painted by these models cries out for attention. For example:

- *Regional rain patterns may change:* Scientists are uncertain about which areas of the world risk becoming wetter and which drier. But with global water resources already under severe strain from rapid population growth and expanding economic activity, the danger is clear.
- *Climate and agricultural zones may shift towards the poles:* Increased summer dryness may reduce mid-latitude crop yields, and the poleward edges of the mid-latitude agricultural zones might benefit from higher temperatures. However, in some areas rugged terrain and poor soil would prevent these countries from compensating for reduced yields in today's more productive areas.
- *Melting glaciers and the thermal expansion of seawater may raise sea levels, threatening low-lying coastal areas and small islands:* The most vulnerable land would be the unprotected, densely populated coastal regions of some of the world's poorest countries.

In response, the Convention establishes a framework and a process for agreeing to specific actions -- later. The diplomats recognized that it would not be possible in the year 1992 for the world's Governments to agree on a detailed blueprint for tackling climate change. But by establishing a framework of general principles and institutions, and by setting up a process through which Governments meet regularly, they got things started.

The Convention is designed to allow countries to weaken or strengthen the treaty in response to new scientific developments. For example, they can agree to take more specific actions (such as reducing emissions of greenhouse gases by a certain amount) by adopting "amendments" or "protocols" to the Convention. This is what happened in 1997 with the adoption of the Kyoto Protocol. The Convention takes preliminary steps that clearly make sense for the time being. Countries ratifying the Convention agree to develop national programmes to slow climate change. It also encourages them to share technology and to cooperate in other ways such as through scientific research and data gathering.

Sharing the burden and responsibility

Countries with high standards of living are mostly (if unwittingly) responsible for the rise in greenhouse gases. Developing countries now fear being told that they should curtail their own fledgling industrial activities. Because energy-related emissions are the leading cause of climate change, there will be growing pressure on all countries to reduce the amounts of coal and oil they use. There also will be pressure (and incentives) to adopt advanced technologies so that less damage is inflicted in the future. If countries in the early stages of industrialization agree to cut back on burning the fossil fuels that are the cheapest, most convenient, and most useful for industry, how could they make any progress? Who pays?

The Convention puts the lion's share of the responsibility for battling climate change -- and the lion's share of the bill -- on the rich countries. The Convention tries to make sure that any sacrifices made in protecting our shared atmosphere will be shared fairly among countries -- in accordance with their "common but differentiated responsibilities and respective capabilities and their social and economic conditions". It notes that the largest share of historical and current emissions originates in developed countries. So specific commitments in the treaty relating to financial and technological transfers apply only to the very richest countries.

The Kyoto Protocol

After the Convention's adoption, emissions levels continued to rise in nearly all countries around the world. More and more people came to accept that only a firm and binding commitment by developed countries to reduce greenhouse gases could send a signal strong enough to convince businesses, communities and individuals to change their ways.

In 1997, Governments responded to growing public pressure by adopting the **Kyoto Protocol**. A protocol is an international agreement that stands on its own but is linked to an existing treaty. It builds on the concerns and principles of the Convention, but adds new commitments -- which are stronger and far more complex and detailed than those in the original Convention.

This complexity is a reflection of the enormous challenges posed by the control of greenhouse gas emissions. It is also a result of the diverse political and economic interests that had to be balanced in order to reach an agreement. Billion-dollar industries will be reshaped; some will profit from the transition to a climate-friendly economy, others will not. Because the Kyoto Protocol will affect virtually all major sectors of the economy, it is considered to be the most far-reaching agreement on environment and sustainable development ever adopted. Among other things, the Kyoto Protocol:

- Sets legally binding targets and timetables for cutting developed country emissions, reducing their collective emissions by at least 5 per cent – 8 per cent in the European

Union (EU), Switzerland, and most Central and East European states; 7 per cent in the US; and 6 per cent in Canada, Hungary, Japan and Poland. New Zealand, Russia and Ukraine are to stabilize their emissions, while Norway may increase emissions by up to 1 per cent, Australia by up to 8 per cent, and Iceland 10 per cent.

- Addresses the six main greenhouse gases – carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. These are to be combined in a "basket", so that reductions in each gas are credited towards a single target number of carbon dioxide equivalents.
- Measures cuts in the three major gases - carbon dioxide, methane and nitrous oxide -- against a base year of 1990; cuts in the other three long-lived industrial gases can be measured against either a 1990 or 1995 baseline.
- Recognizes that emissions cuts must be credible and verifiable. Each country will need an effective national system for estimating emissions and confirming reductions. Standardized guidelines must be crafted to make national figures comparable. The process must be open and transparent.

The issue of emissions targets for developing countries, and the broader question of how commitments should evolve in the future given continuing growth in global emissions, has generated a great deal of intense debate. Many developing countries resist formal commitments, even if voluntary, that would put an upper limit on their emissions, noting that their per capita emissions are still low compared to those of developed countries.

The Kyoto Protocol is not an end result, and can be strengthened and built on in the future. What's more, although developing countries are not currently subject to any specific timetables and targets, they are expected to take measures to limit the growth rate of their emissions and to report on actions they are taking to address climate change. There is a good deal of evidence that many developing countries are indeed taking steps that should help their emissions grow at a slower rate than their economic output. This is particularly true in the field of energy.

The costs of implementation

The costs of climate change policies can be minimized through "no regrets" strategies. Such strategies make economic and environmental sense whether or not the world is moving towards rapid climate change. For example, boosting energy efficiency not only reduces greenhouse gas emissions but also lowers the cost of energy, thus making industries and countries more competitive in international markets; it also eases the health and environmental costs of urban air pollution. At the same time, the precautionary principle and the expected net damage from climate change justify adopting policies that do entail some costs.

Among the Protocol's innovations are three "mechanisms". Parties can use to obtain credit for reducing emissions in other countries. The idea is that countries that find it particularly expensive to reduce emissions at home can pay for cheaper emissions cuts elsewhere. The global economic efficiency of reducing emissions is increased while the overall 5 per cent reduction target is still met. The Protocol stipulates, however, that

credit for making reductions elsewhere must be supplementary to domestic emissions cuts.

Governments must still decide just how the three mechanisms for doing this will function. The rules they adopt will strongly influence the costs of meeting emissions targets. They will also determine the environmental credibility of the mechanisms – that is, their ability to contribute to the Protocol's aims rather than opening up "loopholes" in emissions commitments. This issue will dominate the agenda of the November 2000 meeting of the Convention's Parties in the Netherlands city of The Hague.

An *emissions trading* regime will allow industrialized countries to buy and sell emissions credits amongst themselves. Countries that limit or reduce emissions more than is required by their agreed target will be able to sell the excess emissions credits to countries that find it more difficult or more expensive to meet their own targets. The rules, however, have not yet been decided on. Governments are debating the best way to ensure that emissions trading do not undermine incentives for countries to cut their own domestic emissions.

Joint implementation (JI) projects will offer "emissions reduction units" for financing projects in other developed countries. A joint implementation project could work like this: Country A faces high costs for reducing domestic emissions, so it invests in low-emissions technologies for a new power plant in Country B (very likely an economy in transition). Country A gets credit for reducing emissions (at a lower cost than it could domestically), Country B receives foreign investment and advanced technologies, and global greenhouse gas emissions are reduced: a "win-win-win" scenario.

Not only governments, but businesses and other private organizations will be able to participate directly in these projects. Some aspects of this approach have already been tested under the Convention through a voluntary programme for "Activities Implemented Jointly". Reporting rules, a monitoring system, institutions, and project guidelines must still be adopted.

A *Clean Development Mechanism* will provide credit for financing emissions-reducing or emissions-avoiding projects in developing countries. This promises to be an important new avenue through which Governments and private corporations will transfer clean technologies and promote sustainable development. Credit will be earned in the form of "certified emissions reductions".

Whereas joint implementation and emissions trading merely shift around the pieces of the industrial countries' overall 5 per cent target, the CDM involves emissions in developing countries (which do not have targets). This in effect increases the overall emissions cap. Verification is therefore particularly important for this mechanism.

How can behavior and economies be made more climate-friendly?

Minimizing greenhouse gas emissions will require policymakers to take some tough decisions. They need to design policies that fully engage the energies of civil society, particularly industry. Given the right incentives and pressures, the business sector will roll out low-emissions technologies and services faster than many now believe possible. One needs only look at developments in the automobile industry.

Schools, community groups, the media, families, and consumers also have a crucial role to play. Individuals can make a real difference by changing their habits and making thoughtful purchases. If consumers are convinced that the rules of the game are changing, they will start taking the myriad small decisions that, when added together, can have a dramatic impact on emissions.

If large segments of society are willing to make these changes, we can expect an early transition to more energy-efficient, technologically innovative, and environmentally sustainable societies. The trick is getting started.

The Protocol responds by highlighting effective domestic policies and measures for reducing emissions, such as:

- the phase out of counter-productive subsidies on carbon-intensive activities;
- The introduction of energy-efficiency and other regulatory standards that promote the best current and future technologies;

Local and urban governments -- which often have direct responsibility for transport, housing, and other greenhouse gas-emitting sectors of the economy -- can also play a role by:

- designing and building better public transport systems;
- creating incentives for people to use them rather than private automobiles; and
- tightening construction codes so that new houses and office buildings will be heated or cooled with less fuel.

Meanwhile, industrial companies need to start shifting to new technologies that use fossil fuels and raw materials more efficiently. Wherever possible they should switch to renewable energy sources such as wind and solar power. They should also redesign products such as refrigerators, automobiles, cement mixes, and fertilizers so that they produce lower greenhouse gas emissions. Farmers should look to technologies and methods that reduce the methane emitted by livestock and rice fields. Individual citizens, too, must cut their use of fossil fuels -- take public transport more often, switch off the lights in empty rooms -- and be less wasteful of all natural resources.

Box: What can you do?

- Use alternative transportation – whenever possible walk, cycle or use mass transit.
- Always drive within the speed limit, optimizing your fuel economy.
- Plant trees to provide shelter.
- Protect forest resources as carbon sinks.
- Reduce waste and recycle where possible.
- Conserve energy at home and work; promote the use of renewable and alternative sources.
- Be a smart consumer – choose products and services that make use of “green” technologies and energy-efficient practices.
- Call on your national leaders to ratify the Kyoto Protocol, if they have not already done so.

The 21st Century and beyond

In facing up to man-made climate change, human beings are going to have to think in terms of decades and centuries. The job is just beginning. Many of the effects of climate shifts will not be apparent for two or three generations. In the future, everyone may be hearing about -- and living with -- this problem.

The Framework Convention takes this into account. It establishes institutions to support efforts to carry out long-term commitments and to monitor long-term efforts to minimize -- and adjust to -- climate change. Governments can also strengthen the Convention, as it did in Kyoto in 1997. The Protocol's 5 per cent cut may seem a modest start, but given the rise in emissions that would otherwise be expected – and remember that emissions in a number of developed countries have risen steadily since the 1990 base year -- many countries are going to have to make a significant effort to meet their commitment.

The Kyoto Protocol makes an important promise: to reduce greenhouse gases in developed countries by the end of the first decade of the new century. It should be judged a success if it arrests and reverses the 200-year trend of rising emissions in the industrialized world and hastens the transition to a climate-friendly global economy.

Secretary-General Kofi Annan, in his *Millennium Report*, has called upon the Member States to promote the adoption and implementation of the Kyoto Protocol. Specifically, he has urged those States whose ratifications are needed to bring it into effect to take necessary action in time for entry into force by 2002.

Suggested activities for students

1. Make a copy of the following statements and ask students to rank each on a scale of 1 to 10 from strongest disagreement "1" to strongest agreement "10"
(A) Natural resources should not be left untapped if using them could improve living conditions for a group of people.

- (B) It is important for people to preserve wilderness areas even if a vast majority of people will never visit them.
- (C) The world's natural resources exist for people to use. Preserving these resources as wilderness is a luxury we often cannot afford.
- (D) Environmental degradation is the biggest problems facing humanity today.
- (E) People will eventually develop new technologies to cope with environmental problems.
- (F) People have a responsibility to protect all life forms on Earth.
- (G) Protecting a country's natural resources and natural heritage is primarily the government's responsibility.
- (H) The government is doing a good job of protecting your country's environment.
- (I) Recycling is the most important thing people can do to help improve the environment.
- (J) People should be able to use their own land (i.e. farming, housing, logging, wildlife habitat) in whatever way they see fit.
- (K) All people have a legal right to clean air and water.
- (L) When a dilemma arises between protecting wildlife and protecting jobs for people, we should consider the needs of people first.
- (M) The fate of the human race is tied to the fate of other living things; if people are to survive, we must protect all species and their habitats.
- (N) Human overpopulation is the single greatest factor contributing to Earth's environmental problems
- (O) The laws the federal government has passed to control pollution are sufficient to ensure safe air and water for future generations.

2. Find an open space and select one of the above statements. Ask students to group themselves along a line according to the number they chose. As this will reflect the range of opinions in the class, break the line at its midpoint and have half the students stay in place while the other half moves down so that each student has a partner. In partners allow one person a minute to explain his/her opinion to the partner. The partner should then paraphrase what was said in thirty seconds. Then that person has one minute to explain and the first person is to paraphrase when a minute is up. In discussing what happen, ask students their reasons for their choices, examples drawn from real-life situations, any changes; any need for additional information, where values come from. Repeat this activity for as many statements as you like.

Additional Resources

Understanding Climate Change: A Beginners Guide to the UN Framework Convention and Its Kyoto Protocol; September 1999, UNEP and UNFCCC; available on the Internet at www.unep.ch/iuc/submenu/begin/beginner-99.htm. Much of the above text is adapted from this publication.

Climate Change: Information Kit; July 1999, UNEP; available on the Internet at www.unep.ch/iuc/submenu/infokit/infokit-1999.htm

Common Questions about Climate Change; 1997, UNEP and WMO; available on the Internet at www.gcrio.org/ipcc/qa/cover.htm

Global Environment Outlook 2000; 1999, UNEP and Earthscan Publications; available on the Internet at www.unep.org/geo2000

Pachamama: Our Earth – Our Future; 1999, UNEP and Evans Brothers Limited; available on the Internet at www.unep.org/geo2000/pacha/index.htm

Taking Action: An Environmental Guide for You and Your Community; 1995, UNEP and NGLS; available on the Internet at www.nyo.unep.org/action

(This paper was contributed by UNEP)

Graphs/charts

Global carbon dioxide emissions

Source: <http://www.unep.org/geo2000/english/i25a.htm>

Global CFC production

Source: <http://www.unep.org/geo2000/english/i26a.htm>