Earth Summit

In June 1992 representatives from 172 nations convened in Rio de Janeiro, Brazil, for the United Nations Conference on Environment and Development (UNCED), commonly called the Earth Summit. The Earth Summit was an unprecedented meeting of representatives, including 108 heads of state, 2,400 representatives from various non-governmental organizations (NGOs), and nearly 10,000 journalists. An additional 17,000 NGO representatives attended a parallel NGO forum that provided recommendations to the Earth Summit.

The massive interest and participation of nations and NGOs in the Earth Summit indicated a shift in global attitudes toward the environment. Scientific evidence gathered in the second half of the twentieth century indicated that human activity was taking a toll on the environment. The scientific evidence also indicated that pollution and depletion of natural resources that occurred in one country could have a profound effect on the environment of other nations or the entire planet. At the Earth Summit, world leaders devised plans and policies to protect the environment by involving national and local governments and NGOs.

Historical Background and Scientific Foundations

The Earth Summit was not the first international conference to address environmental issues. In 1972 the United Nations convened the United Nations Conference on the Human Environment in Stockholm, Sweden. This conference, often called the Stockholm Conference, was the first international conference to address environmental problems directly.

Representatives from 113 nations and over 400 NGOs attended the Stockholm Conference. The conference produced the Declaration of the Conference on the Human Environment, which stated that every person deserved a clean, healthy environment. The conference also produced an Action Plan, which contained 109 specific recommendations for improving the environment, including limiting the use of ozone-depleting chlorofluorocarbons (CFCs).

In 1983 the United Nations convened the World Commission on Environment and Development (WCED), also known as the Brundtland Commission. The commission

addressed the ongoing deterioration of the environment and depletion of natural resources and the effect that these conditions had on human social and economic activities. The most notable result of the Brundtland Commission was the publication of its report, *Our Common Future,* in 1987.

Our Common Future stressed the need for sustainable development that would promote economic growth while protecting the environment for future generations. The report laid the international political groundwork for the Earth Summit by establishing the environment and sustainable development among the most pressing international issues.

Impacts and Issues

Earth Summit 1992 produced several long-range reports and implementation plans that continue to serve as blueprints for international action on environmental issues, including the World Summit on Sustainable Development (Earth Summit 2002) and the Kyoto Protocol. Earth Summit 1992 produced the Rio Declaration on Environment and Development, the Statement of Forest Principles, and Agenda 21. The Earth Summit also led to the establishment of the Convention on Biological Diversity, and the United Nations Framework Convention on Climate Change (UNFCCC).

Kyoto Protocol, in full **Kyoto Protocol to the United Nations Framework Convention on Climate Change**, international treaty, named for the Japanese city in which it was adopted in December 1997, that aimed to reduce the emission of gases that contribute to global warming. In force since 2005, the protocol called for reducing the emission of six greenhouse gases in 41 countries plus the European Union to 5.2 percent below 1990 levels during the “commitment period” 2008–12. It was widely hailed as the most significant environmental treaty ever negotiated, though some critics questioned its effectiveness.

Background And Provisions

The Kyoto Protocol was adopted as the first addition to the United Nations Framework Convention on Climate Change (UNFCCC), an international treaty that committed its signatories to develop national programs to reduce their emissions of greenhouse gases. Greenhouse gases, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6), affect the energy balance of the global atmosphere in ways expected to lead to an overall increase in global average temperature, known as global warming (*see also* greenhouse effect). According to the Intergovernmental Panel on Climate Change, established by the United Nations Environment Programme and the World Meteorological Organization in 1988, the long-

term effects of global warming would include a general rise in sea level around the world, resulting in the inundation of low-lying coastal areas and the possible disappearance of some island states; the melting of glaciers, sea ice, and Arctic permafrost; an increase in the number of extreme climate-related events, such as floods and droughts, and changes in their distribution; and an increased risk of extinction for 20 to 30 percent of all plant and animal species. The Kyoto Protocol committed most of the Annex I signatories to the UNFCCC (consisting of members of the Organisation for Economic Co-operation and Development and several countries with "economies in transition") to mandatory emission-reduction targets, which varied depending on the unique circumstances of each country. Other signatories to the UNFCCC and the protocol, consisting mostly of developing countries, were not required to restrict their emissions. The protocol entered into force in February 2005, 90 days after being ratified by at least 55 Annex I signatories that together accounted for at least 55 percent of total carbon dioxide emissions in 1990.

The protocol provided several means for countries to reach their targets. One approach was to make use of natural processes, called "sinks," that remove greenhouse gases from the atmosphere. The planting of trees, which take up carbon dioxide from the air, would be an example. Another approach was the international program called the Clean Development Mechanism (CDM), which encouraged developed countries to invest in technology and infrastructure in less-developed countries, where there were often significant opportunities to reduce emissions. Under the CDM, the investing country could claim the effective reduction in emissions as a credit toward meeting its obligations under the protocol. An example would be an investment in a clean-burning natural gas power plant to replace a proposed coal-fired plant. A third approach was emissions trading, which allowed participating countries to buy and sell emissions rights and thereby placed an economic value on greenhouse gas emissions. European countries initiated an emissions-trading market as a mechanism to work toward meeting their commitments under the Kyoto Protocol. Countries that failed to meet their emissions targets would be required to make up the difference between their targeted and actual emissions, plus a penalty amount of 30 percent, in the subsequent commitment period, beginning in 2012; they would also be prevented from engaging in emissions trading until they were judged to be in compliance with the protocol. The emission targets for commitment periods after 2012 were to be established in future protocols.

Challenges

Although the Kyoto Protocol represented a landmark diplomatic accomplishment, its success was far from assured. Indeed, reports issued in the first two years after the treaty took effect indicated that

most participants would fail to meet their emission targets. Even if the targets were met, however, the ultimate benefit to the environment would not be significant, according to some critics, since China, the world's leading emitter of greenhouse gases, and the United States, the world's second largest emitter, were not bound by the protocol (China because of its status as a developing country and the United States because it had not ratified the protocol). Other critics claimed that the emission reductions called for in the protocol were too modest to make a detectable difference in global temperatures in the subsequent several decades, even if fully achieved with U.S. participation. Meanwhile, some developing countries argued that improving adaptation to climate variability and change was just as important as reducing greenhouse gas emissions.

Montreal Protocol, formally **Montreal Protocol on Substances That Deplete the Ozone Layer**, international treaty, adopted in Montreal on Sept. 16, 1987, that aimed to regulate the production and use of chemicals that contribute to the depletion of Earth's ozone layer. Initially signed by 46 countries, the treaty now has nearly 200 signatories.

In the early 1970s, American chemists F. Sherwood Rowland and Mario Molina theorized that chlorofluorocarbon (CFC) compounds combine with solar radiation and decompose in the stratosphere, releasing atoms of chlorine and chlorine monoxide that are individually able to destroy large numbers of ozone molecules. (Along with Dutch chemist Paul Crutzen, Rowland and Molina were awarded the 1995 Nobel Prize for Chemistry for this work.) Their research, first published in the journal *Nature* in 1974, initiated a federal investigation of the problem in the United States, and the National Academy of Sciences concurred with their findings in 1976. In 1978 CFC-based aerosols were banned in the United States, Norway, Sweden, and Canada.

Further validation of their work came in 1985 with the discovery of a "hole" in the ozone shield over Antarctica by the British Antarctic Survey and the publication of its findings in *Nature*. Shortly before these findings were to appear, representatives from 28 countries met to discuss the issue at the Vienna Convention for the Protection of the Ozone Layer. The meeting called for international cooperation in research involving ozone-depleting chemicals (ODCs) and empowered the United Nations Environment Programme (UNEP) to lay the groundwork for the Montreal Protocol.

The initial agreement was designed to reduce the production and consumption of several types of CFCs and halons to 80 percent of 1986 levels by 1994 and 50 percent of 1986 levels by 1999. The protocol went into effect on Jan. 1, 1989. Since then the agreement has been amended to

further reduce and completely phase out CFCs and halons, as well as the manufacture and use of carbon tetrachloride, trichloroethane, hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), hydrobromofluorocarbons (HBFCs), methyl bromide, and other ODCs. Several subsequent meetings of the signing countries were convened to track overall progress toward this goal and to authorize new changes to the process of phasing out ODCs.

It is important to note that ODC phase-out schedules differ between developed and developing countries. The period for developing countries to come into compliance is slightly longer, owing to the fact that they have fewer technical and financial resources to introduce substitutes. In developed countries the production and consumption of halons formally ended by 1994, several other chemicals (such as CFCs, HBFCs, carbon tetrachloride, and methyl chloroform) were phased out by 1996, methyl bromide was eliminated in 2005, and HCFCs are scheduled to be completely phased out by 2030. In contrast, developing countries phased out CFCs, carbon tetrachloride, methyl chloroform, and halons by 2010; they are scheduled to phase out methyl bromide by 2015 and eliminate HCFCs by 2040.

The Antarctic ozone hole grew in size throughout the 1990s and the first decade of the 21st century. The ozone layer over the Arctic also thinned, although not as pronouncedly as over the Antarctic. Despite these findings, most scientists contend that the ozone layer will eventually recover. They note that the success of the treaty is exclusively responsible for the substantial decrease of ODCs available for release into the atmosphere. Signs of recovery might not become apparent until about 2020, however, because of natural variability. According to the World Meteorological Organization and the UNEP, the full recovery of the ozone layer is not expected until at least 2049 over middle latitudes and 2065 over Antarctica