

were first calculated in the last Century; only recently has this been recognized as an issue demanding - and getting - concerted international attention.

Uncertainty. Despite great advances in understanding environmental processes, in measuring present conditions and trends, and quantifying likely consequences, an unavoidably-large area of scientific uncertainty inhibits timely, collective action to reduce risk. Increasing awareness of the risks of desertification, deforestation, loss of biological diversity, stratospheric ozone depletion, global warming and other issues has been achieved thanks in large part to cooperative programs launched since Stockholm. Recent assessment results have focussed new attention on the need to improve understanding about natural processes in which human interventions are now a significant modifying force. New tools of observation and data processing allow holistic analysis of Earth's systems and strengthen the ability of science to observe environmental changes on a global scale. ICSU is currently sponsoring the largest ever international scientific research program: the International Geosphere-Biosphere Program - "Global Change", in order "to develop a scientific understanding needed to anticipate future change in the Earth's system" and, "to provide a foundation for decision makers."¹⁹

Caution. Since uncertainty is a serious obstacle to collective action, many governments favor a precautionary approach as most recently expressed in the declaration adopted at the ministerial conference convened by the UN Economic Commission for Europe (ECE) in Bergen, Norway, in May 1990:

In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.²⁰

Growing lead-times. Better understanding of global processes helps one recognize the long lead-times between action (or inaction) and effect, and the consequent value of identifying early, cost-effective measures that can reduce future risk. For as much as ten years after their release, CFCs drift up through the troposphere before beginning a century-long catalytic process of stripping ozone in the stratosphere.

Irreversibility. There is growing awareness that some of the international environmental issues that seemed correctable at Stockholm in 1972 may, in practice if not in theory, be irreversible; unless preventive