I THE SCIENCE OF CLIMATE CHANGE

There was no disagreement that the composition of the atmosphere is changing or that the gases responsible for climate change, especially carbon dioxide (CO_2) , methane, nitrous oxide, and the chlorofluorocarbons (CFCs) are increasing at an exceedingly rapid rate. The overall "forcing functions" of climate change, underpinned by world population growth, were identified as increasing fossil-fuel use, agriculture and land-use changes, urbanization, and the introduction of chemicals for which there are no natural analogues.

The main categories of atmospheric pollutants are the greenhouse gases, the ozone layer depleters,¹ the acidic compounds such as sulfur dioxide (which contribute to acid rain), and the metals and organics that are toxic at higher concentrations as they accumulate in the food chain. The dominant source of the major contaminants in all categories is energy production and energy use. Jim Bruce, an advisor to the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), noted that nearly two-thirds of CO₂ emissions come from these sources. According to Michael McElroy of Harvard University, about 5 billion tons of carbon are produced annually in the form of CO_2 by burning coal, oil, and natural gas on a global scale: 1 ton per person on earth. In the industrialized world it is even higher; for the United States, it is almost three times higher than the global average. Although CO₂ is invisible and non-toxic, it is still the largest single human waste product. Mr. Bruce noted that about a million years' worth of naturally produced fossil-fuel deposition is extracted and consumed every year, producing more than 80 percent of the nitrous oxide emitted. A substantial portion of CFC emissions and most sulfur dioxide emissions are also related to energy use and production. It was also noted that the major portion of

¹ The man-made CFCs are implicated in stratospheric ozone depletion, but they too trap heat and are increasing at rates, in some cases, as high as 10 percent per year. Carbon dioxide emissions remain the principal cause of the greenhouse effect.

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