industry. In the software industry, standards tend to be proprietary. This difference has led to a profound difference in industry structure.

THE SCOPE OF THE GLOBAL CLIMATE CHANGE PROBLEM

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Addressing global climate change is a paramount challenge of the 21st Century. Since the beginning of the industrial revolution, atmospheric concentrations of carbon dioxide (CO2), the chief heat-trapping greenhouse gas, have risen 35 percent—from about 275 parts per million by volume (ppmv) then to 370 ppmv today. This increase is due to human activities, primarily from the burning of fossil fuels and from deforestation. Carbon that has been sequestered in the Earth's crust (in the form of oil, coal, and other fossil fuels) over millions of years has been extracted, burned, and released into the atmosphere in large quantities within the past 200 years. Atmospheric concentrations of methane, the second leading greenhouse gas, have more than doubled over the past two centuries. These changes in the composition of the Earth's atmosphere have increased the average global surface temperature by about 0.6° C (1° F) over the past 100 years. Regional climate changes due to temperature increases have already affected many physical and biological systems, and emerging evidence suggests impacts on human settlements from recent increases in floods and droughts.

If the trends in greenhouse gas emissions growth are not altered, global temperatures are expected to rise between 1.4 and 5.8° C (2.5 to 10.4° F) by 2100, according to the latest assessment of the Intergovernmental Panel on Climate Change. The effects of such temperature changes on agricultural production, water supply, forests, and overall human development are unknown but will likely be detrimental to a large portion of the world's population. To prevent atmospheric CO2 concentrations from exceeding a level of 450 ppmv, global emissions would need to decrease dramatically during this century. Over the same period, however, the global population is expected to increase by 40 to 100 percent (from today's population of six billion) and economic growth is projected to climb 10- to 20-fold.

According to the Intergovernmental Panel on Climate Change (IPCC 2001c), climate change is a vastly different problem than other environmental and public policy issues. Below are six characteristics of the problem that help explain why this is so and militate against easy solutions.

The problem is global. Climate change is related to the concentration of greenhouse gases (GHGs) in the Earth's atmosphere. Emissions from all sources from all countries determine the concentration of these gases. Some countries are very large emitters, and others are very small emitters. Acting alone, individuals and countries that reduce emissions will have a small overall effect.

The problem is long-term. Emissions of carbon dioxide (CO2), on average, remain in the atmosphere for about 100 years (some other gases persist for thousands of years). Thus, GHG concentrations are related to the net accumulation of gases over long periods of time, not to a single year's emissions. This raises complicated ethical questions because the future generations that will be most affected by climate change are not present to participate in today's decisions.

Associated human activities are pervasive. GHG emissions are linked to a broad array of human activities, including those related to energy use, industrial activities, and land use decisions. In addition, the wide range of policies affecting technological innovation, economic growth, and population size further shape emissions.

Uncertainty is pervasive. Many uncertainties exist regarding the magnitude of future climate change and its consequences, as well as the costs, benefits, and barriers to implementation of possible solutions.

The consequences are potentially irreversible and are distributed unevenly.

Sea level rise and other potential consequences of a global temperature increase can take more than one thousand years to play out. Likewise, societies differ in their vulnerability to climate change impacts, with poorer societies less able to adapt to the consequences of climate change.

The global institutions needed to address the issue are only partially formed. The 1992 Climate Convention has nearly universal membership (including the United States). This agreement establishes an

objective of stabilizing atmospheric GHG concentrations at a level that would avoid "dangerous" human interference with the climate system. The definition of "dangerous," however, is left open to broad interpretation by Parties. The 1997 Kyoto Protocol has expanded the decision-making process for climate change policy, but currently includes only short-term targets for some industrialized countries.

SUSTAINABLE DEVELOPMENT INDICATORS FOUNDING SYSTEM

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The longstanding and widening debate on the environment, based on expanding scientific knowledge, has established that the earth is a bounded system, with a limited capacity to regenerate resources and absorb waste. Sound development of both social and ecological systems is only possible within the constraints imposed by the natural environment, and the challenge facing our societies today is how to preserve the delicate balance of the biosphere. The international community has" recognized that increasing; environmental degradation is related to the present development of human society. This is characterized by production and consumption models based on high utilization of natural resources and energy, the latter being mostly derived from fossil sources.

The concept of sustainable development, first conceived at international level in the nineteen eighties, emphasizes the need for solutions that can harmonize the expectations of economic systems with the conservation of ecosystems. The sustainability approach introduces the principle of environmental responsibility for the future survival of our planet and the principle of intra- and inter-generation equity. Implicit here is the need to improve the quality of life of the poorest populations on earth and that of future generations. The principles of responsibility and equity, underlying the sustainable development concept, show the importance of finding shared political solutions to international disputes, without having recourse to war, which always has disastrous consequences for the lives of millions of people and destroys the