Key Findings of the IPCC Second Assessment Report

During 1995, the Intergovernmental Panel on Climate Change prepared its Second Assessment Report. U.S. scientists and research findings played a pivotal role in the development of this assessment. The following conclusions about climate change, its consequences, and the potential for adaptation and mitigation are extracted from the report. The IPCC findings provide important guidance for decision makers and identify critical research questions that need to be pursued.

Effects of Human Activities on Regional and Global Climate, and on Sea Level

- Human activities are increasing the atmospheric concentrations of CO_2 and other greenhouse gases that tend to warm the atmosphere and, in some regions, of aerosols that tend to cool the atmosphere.

- The Earth's climate is changing. The surface temperature this century is as warm or warmer than any other century since at least 1400 AD; the global average surface temperature has increased by 0.3° to 0.6° C (about 0.5° to 1° F) over the last century; the last few decades have been the warmest this century; sea level has risen 10 to 25 cm (about 4 to 10 inches); and mountain glaciers have generally retreated this century.

- Models that account for the observed increases in the atmospheric concentrations of greenhouse gases and sulfate aerosols are simulating the recent history of observed changes in surface temperature and its vertical distribution with increasing realism.

- The balance of evidence suggests that there is a discernible human influence on global climate.

- Without specific policies that reduce the growth of greenhouse gas emissions, the Earth's average surface temperature is projected to increase by about 1° to 3.5° C (about 2° to 6.5° F) by 2100-a rate of warming that would probably be greater than any seen in the last 10,000 years.

- The reliability of regional-scale predictions is still low, and the degree to which climate variability may change is uncertain.

- Sea level is projected to rise by 15 to 95 cm (6 to 38 inches) by 2100.

- The long atmospheric lifetime of many greenhouse gases, coupled with the thermal inertia of the oceans, means that the warming effect of anthropogenic emissions will be long-lived.

- Even after a hypothetical stabilization of greenhouse gas concentrations, temperatures would continue to increase for several decades, and sea level would continue to rise for centuries.

Potential Health and Environmental Consequences of Climate Change

- Human-induced regional and global changes in temperature, precipitation, soil moisture, and sea level add important new stresses on ecological and socioeconomic systems that are already affected by pollution, increasing resource extraction, and non-sustainable management practices.

- Most systems are sensitive to both the magnitude and rate of climate change.

- Many regions are likely to experience adverse effects as a result of climate change, some of which are potentially irreversible; however, effects of climate change in some regions may be beneficial.

- The projected changes in climate include potentially disruptive effects that will affect the economy and the quality of life for this and future generations:

    - *Human Health*. will be adversely affected through an increase in the rate of heat-related mortality and in the potential for the spread of vector-borne diseases such as malaria, dengue, yellow fever, and encephalitis and non-vector-borne diseases such as cholera and salmonellosis.

    - *Food Security*. will be threatened in some regions of the world, especially in the tropics and subtropics where many of the world's poorest people live. On the whole, the effects of climate change over the next century on total global food production may be small to moderate in comparison to the effects of population change and demands for improved nutrition.

    - *Water Resources*. will be increasingly stressed, leading to substantial economic, social, and environmental costs, especially in regions that are already water-limited and where there is strong competition among users.

    - *Human Habitat Loss*. will occur in regions where small islands and coastal plain and river areas are particularly vulnerable to sea level rise.

    - *Natural Ecosystems*. will be degraded because the composition, geographic distribution, and productivity of many ecosystems will shift as individual species respond to changes in climate. This may lead to reductions in biological diversity and in the goods and services ecosystems can provide for society.

- Developing countries are more vulnerable than developed countries to climate change because of their socioeconomic conditions.

- Impacts will be hard to quantify with certainty because of uncertainties in regional climate projections, the complicating effects of multiple stresses, and a lack of understanding of some key

processes.

Approaches to Mitigate or Adapt to Climate Change

- Adaptation-which involves adjustments in practices, processes, or structures of systems-can be helpful in reducing adverse impacts or in preparing to take advantage of potential beneficial changes in climate.

- Successful adaptation will depend upon education, technological advances, institutional arrangements, availability of financing, technology transfer, information exchange, and incorporation of climate change concerns into resource-use and development decisions. Potential adaptation options for many developing countries are extremely limited due to the limited availability of technological, economic, and societal capabilities.

- Options such as migration corridors to assist adaptation of natural ecosystems to new climate conditions are, however, currently limited and their effectiveness is generally unproven.

- Stabilization of the atmospheric concentrations of CO_2 at three times the pre-industrial concentration or less will eventually require human-induced emissions of greenhouse gases to be cut below today's levels.

- Gains in energy efficiency of 10-30% above present levels are feasible at little or no cost in many parts of the world through technical conservation measures and improved management practices over the next 2 to 3 decades.

- Significant reductions in net greenhouse gas emissions can be achieved utilizing an extensive array of technologies, and policy measures that accelerate technology development, diffusion, and transfer in all sectors.

- Flexible, cost-effective policies relying on economic incentives and instruments, as well as internationally coordinated instruments, can considerably reduce mitigation and adaptation costs.