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REPORT TO CONGRESS

UNITED STATES GOVERNMENT ACTIVITIES
TO THE CONGRESS OF THE UNITED STATES:
RELATED TO THE GREENHOUSE EFFECT

In accordance with Section 9 of Public Law 99-383 (100 Stat. 816), I transmit herewith a report on current government activities in the area of research on the so-called "Greenhouse Effect."

While you will note that extensive investigations of the phenomenon are in progress, we do not plan to establish an International Year of the Greenhouse Effect as suggested in the language of Public Law 99-383.

These recognitions have prompted the Government to pursue aggressively the planning, initiation and coordination of long-term national and international research, monitoring, assessment, and educational activities and programs designed to understand how the Earth functions as a system of interrelated biological, chemical, and physical processes operating within the atmosphere, biosphere, oceans, and solid earth. These integrated and coordinated national and international programs are expected to lead to new knowledge about the climate system and those factors, including the greenhouse species, that influence and control it.

With these activities the Government is preparing to embark on a sustained program of exploration and assessment required to address societally important questions regarding our environment.
January 26, 1988.

Ronald Reagan

THE WHITE HOUSE,

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REPORT TO CONGRESS

UNITED STATES GOVERNMENT ACTIVITIES

RELATED TO THE GREENHOUSE EFFECT

SUMMARY

This report responds to the mandate of Sec. 9 of P.L. 99-383 that requires the President to inform Congress of actions taken or proposed to be taken by the Federal Government with respect to the establishment of 1991 as an International Year of the Greenhouse Effect, including descriptions of possible international programs and related research and educational activities. As of July 31, 1987, no specific Federal actions have been taken or are being proposed to be taken for the establishment of calendar year 1991 as an International Year of the Greenhouse Effect.

The Federal Government recognizes the "greenhouse effect" as an important national and international scientific and societal issue that must be addressed in a scientifically rigorous and comprehensive manner. The Government further recognizes that an understanding of the greenhouse warming phenomenon, which is one example of possible changes that could occur in the global environment, requires a thorough investigation of the Earth's entire geosphere/biosphere system and the coupling and feedback among the individual elements of this system.

These recognitions have prompted the Government to pursue aggressively the planning, initiation and coordination of long-term national and international research, monitoring, assessment, and educational activities and programs designed to understand how the Earth functions as a system of interrelated biological, chemical, and physical processes operating within the atmosphere, biosphere, oceans, and solid earth. These integrated and coordinated national and international programs are expected to lead to new knowledge about the climate system and those factors, including the greenhouse species, that influence and control it.

With these activities the Government is preparing to embark, in the 1990's, on a sustained program of exploration and assessment required to address societally important questions regarding man's environment.

Engineering and Technology (FCCST) for the coordination of research, monitoring and assessment activities of programs dealing with global environmental issues;

The major Federal activities bearing on the greenhouse effect issue that have been initiated and planned in the past year include:

- (1) Continued development of a five-year plan for the National Climate Program for the period of 1987 through 1991;
- (2) Initiation of the NSF thrust in Global Geosciences which includes studies designed to provide a fuller understanding of how natural and anthropogenic processes may affect the Earth's life support system;
- (3) Completion by the DOE of six State-of-the-Art Reports (atmospheric CO₂, climate modeling, climate detection, vegetative effects, glaciers, ice and sea level change, and resources) and initiation of research plans to determine potential climate, ecosystem and resource effects of CO₂ and energy technologies.
- (4) Further planning of NASA programs related to the recent Earth System Science report of research and observational needs required for defining the environment's dynamics, evolution, and susceptibility to change;
- (5) Further planning for NOAA's climate and global change activities with the goal of improving the ability to assess and predict potential global and regional changes in the climate system;
- (6) Initiation of studies by EPA to respond to Congress for two reports on global climate change, and planning activities at EPA, USGS, and other agencies to define their roles in the national efforts of studying and assessing the issues related to global changes in the environment;
- (7) Formation of an NAS/NRC national scientific planning and advisory committee for the International Geosphere-Biosphere Program (IGBP); and
- (8) Establishment by the Director of the Office of Science and Technology Policy (OSTP), Executive Office of the President, of a Committee on Earth Sciences (CES) under the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) for the coordination of research, monitoring and assessment activities of programs dealing with global environmental issues;

In addition to the above, research programs have been continued in energy technologies that could lead to reductions in carbon dioxide production, including conservation, solar energy, geothermal energy, and nuclear fission and fusion energy production.

These activities will be incorporated into the normal agency planning process. It is important that the agency planning the interagency coordination processes promote optimal and realistic research investments, especially in the current constrained fiscal environment. This can be accomplished through the elimination of redundant programs, the coordination of research efforts, explicit problem and agency role definition, and the incorporation of acceptable international cooperation.

All of the above activities involve international coordination and/or collaboration. The following sections of this report outline various national and international programs, plans, and activities relevant to greenhouse effect issues.

NATIONAL CLIMATE PROGRAM

Interagency coordination and planning of national efforts aimed at understanding and assessing greenhouse effect questions rests with the National Climate Program (NCP). The Program is implemented through the National Climate Program Office (NCPO) and is overseen and reviewed by the Climate Program Policy Board. The National Climate Program is concerned with all aspects of climate change. The first National Climate Program Five-Year Plan was published in 1980, in accordance with the National Climate Program Act (P.L. 95-367). The plan must be updated periodically to reflect revisions and extensions to the NCP. An interim plan for FY 1984-86 clarifies the overall structure of the climate program and includes changes made since the original plan was written. A new five-year plan is expected to be completed in 1987. NCP activities directly related to greenhouse effect issues are described in the following paragraphs.

The NCP has recognized since its inception that the composition of the atmosphere is a fundamental determinant of the earth's climate. A number of gases and aerosols are found in small concentrations in the atmosphere. Many of these are relatively transparent to solar radiation but absorb earth radiation and reradiate a portion back toward the surface. Changes in the concentration of these so-called "greenhouse gases" may alter the earth's climate. Carbon dioxide is the most important man-influenced trace gas because of its long lifetime and effect on the radiation balance in the atmosphere. The Department of Energy (DOE) serves as the lead agency for coordinating the Government's research efforts in atmospheric carbon dioxide. Research

priorities have been established through several national and international workshops, conferences, and technical reports, and are described in a series of recent DOE publications.

Proper assessment of man's influence on climate requires consideration not only of carbon dioxide, but also of other species that, in combination, have the potential of significantly increasing the greenhouse effect. The Interim National Climate Program Plan has placed an increasing emphasis on addressing the climatic issues of radiatively active species other than carbon dioxide. The most important of these species are methane; nitrous oxide; the chlorofluorocarbons; tropospheric ozone; and stratospheric water vapor. In addition to these gases, atmospheric aerosols may have significant climatic impact over large regions. NOAA has assumed the lead in monitoring and evaluating the impact of these trace gases and aerosols through a new program, Radiatively Important Trace Species (RITS), begun in 1985. This program is coordinated with DOE, NSF, NASA, and EPA, all of whom have related interests in trace gas studies. The NCPO oversees the coordination of this program and its relationship to the existing carbon dioxide program.

The goals of the National Climate Program cannot be achieved by observational and research efforts constrained by national boundaries. The program depends significantly on the free international flow of meteorological and oceanographic data. A national commitment to the major international climate-related programs is, therefore, a key part of the National Climate Program plan.

INTERNATIONAL CLIMATE PROGRAMS

Internationally, three organizations, the World Meteorological Organization (WMO), the International Council of Scientific Unions (ICSU), and the United Nations Environmental Program (UNEP), are responsible jointly for activities related to the greenhouse problem. An international Advisory Group on Greenhouse Gases (AGGG) was established in 1985 to promote and advise governments and organizations about international research on greenhouse gases. WMO and UNEP agreed in 1987 to establish an intergovernmental mechanism for carrying out internationally coordinated assessments of the magnitude, timing, and potential impact of climate change and to replace the AGGG since it is not an intergovernmental body.

Two major international programs, the World Climate Program (WCP) and the International Geosphere-Biosphere Program (IGBP), are concerned, in part, with the greenhouse effect questions.

The WCP consists of four components - Data, Applications, Impacts and Research. The WMO is responsible for the overall coordination of the WCP and for the data and applications components of the

Program. The United Nations Environmental Program (UNEP) has accepted the responsibility to implement the impacts component. The research element of WCP is being managed jointly by ICSU and WMO. While all elements of the WCP are moving aggressively, special emphasis will be placed on the assessment of the potential impact of climate change by the World Climate Impact Program.

U.S. experts participate actively in formulating and guiding the World Climate Program. Therefore, there is a strong correspondence between goals and activities of this international program and the National Climate Program.

The International Geosphere-Biosphere Program: A Study of Global Change

In 1986 the General Assembly of the International Council of Scientific Unions (ICSU) endorsed the establishment of a research program named the International Geosphere-Biosphere Program: A Study of Global Change. IGBP would be directed at providing the scientific information needed to understand and assess the future of the Earth's environment over the next century.

The objective of the Program is to "describe and understand the interactive physical, chemical, and biological processes that regulate the total Earth system, the unique environment that it provides for life, the changes that are occurring in this system, and the manner in which they are influenced by human actions."

Detailed plans for the IGBP are evolving. The IGBP recognizes that a one-year research effort is inappropriate for this type of research. Operations are planned to begin in the early 1990's and last at least a decade. Continuous global monitoring, both in situ and from spaceborne stations, can be expected during the latter part of the decade and to continue into the next century.

IGBP will emphasize the study of interactive Earth processes that are not addressed by other existing programs. Candidate topics suggested for early emphasis in the IGBP include: (1) Studies of biogeochemical cycles; (2) Studies of the ocean euphotic zone; (3) Studies of soil dynamics and soil chemistry; and (4) Studies of variable solar inputs to the Earth. Emphasis is also to be given to the development of an information system and global data sets required by the overall program.

NASA Earth System Science

AGENCY PROGRAMS

The U.S., as a first step, has responded to the call for the IGBP by forming, through the National Academy of Sciences/National Research Council (NAS/NRC), a national committee for the IGBP. This U. S. committee is being funded by NSF, NASA, NOAA, DOE,

USGS, and the Navy, and will provide advice to the Government and scientific community about national activities related to Global Change.

Several Federal agencies also have responded to this international initiative and are formulating research and observational programs within the general concept of Global Change. NSF has established a Global Geosciences thrust that is expected to contribute to the U.S. participation in the IGBP; NASA and NOAA are continuing to examine programs for inclusion into their future planning process that should be compatible with the existing National Climate Program and the emerging IGBP activities.

To increase the overall effectiveness and productivity of Federal R&D efforts directed toward an understanding of the Earth as a global system, the Director of the Office of Science and Technology Policy (OSTP) has established a Committee on Earth Sciences (CES) under the Federal Coordinating Council for Science, Engineering and Technology (FCCSET). CES is charged with reviewing and coordinating Federal programs and plans dealing with both national and international activities in earth sciences, earth sciences being broadly defined to include the physical, chemical, and biological processes associated with the atmosphere, oceans, and the land.

NSF: Global Geosciences

In 1987 the National Science Foundation initiated a Global Geosciences program for support of studies of the Earth as a system of interrelated physical, chemical, and biological processes that regulate environmental conditions on this planet. The goal of Global Geosciences is to understand the earth system and how it functions, and to describe and predict major cause and effect relationships among earth processes.

Component elements of Global Geosciences, with particular emphasis on environmental chemistry and biogeochemistry, include research on global tropospheric chemistry, global ocean fluxes, world ocean circulation and global ecosystem dynamics. In these programs sources, sinks and transport of natural and anthropogenic substances in the environment are to be studied to understand better the processes controlling the Earth's life-sustaining capabilities.

NASA: Earth System Science

NASA is currently examining a geosciences research program for incorporation into their future planning process based on the recent Earth System Science report. This Earth System Science program emphasizes the development and use of space-based techniques for a holistic approach to the study of environmental

elements in order to explain the Earth's dynamics, evolution and environmental changes that can occur on global scales.

The goal of this program is to obtain an understanding of the Earth by describing how its component parts and their interactions have evolved, how they function, and how they may be expected to continue to evolve or change. Two primary research elements have been suggested for the program. The first involves a study of fundamental solid Earth characteristics for an understanding of planetary evolution on longer time scales. The second element would include studies of the fluid and biological media of the Earth in order to gain an improved understanding of environmental changes on decadal to century time scales.

NOAA: Climate and Global Change

Since 1987, NOAA has been engaged in further planning of its climate and global change activities with the broad goal of increasing the reliability of assessments and quantitative predictions of changing global and regional climate. This includes activities related to climate diagnostics and prediction, monitoring and data management, and research on global climate systems.

These activities will put NOAA in a position to fulfill its responsibility as the nation's primary source of global environmental information and help provide improved climate predictions and assessments to other Federal agencies, the public and private sectors, and the international community. Priority is being given to the objective of providing reliable predictions of global climate change, and associated regional implications on time scales ranging from seasons to centuries.

DOE: Energy, Carbon Dioxide, and Climate

Research on effects of carbon dioxide from energy usage was initiated by the Department of Energy in 1978. The goal is to identify energy options that require governmental action in response to changes in atmospheric CO₂, as well as the direct effect of CO₂ on climate, vegetation and other earth systems. These energy options include conservation, solar, geothermal, nuclear fission and fusion in addition to coal, gas, oil and hydropower. There are four areas of study: energy systems and carbon cycle research, climate systems, ecological and agricultural systems, and resource analysis. Energy systems and carbon cycle research provide future estimates of atmospheric CO₂. Research on climate systems is directed towards reducing uncertainties about CO₂-induced regional and seasonal patterns of climate change and understanding interactions between the atmosphere, oceans, and cryosphere. Research on agricultural and ecological systems is designed to determine the response of crops and natural systems such as forests to increased concentrations of

atmospheric CO₂ and corresponding changes in climate. Resource analysis is aimed at understanding how the direct effects of CO₂ (e.g., changes in climate and vegetation) may affect natural resources and human welfare.

EPA: Climate Assessment Program

EPA is building a capability to understand the implications of climate change by studying the role of greenhouse gases in the atmosphere, emissions of these gases, potential ecological and human health effects, and policy implications.

In the short term, EPA is responding to a Congressional request to write two reports on global warming. The first will examine the relative contribution of anthropogenic and natural sources to global warming and assess trends of growth in emissions. The second will look at some of the potential effects of climate change across the United States and identify linkages among potential effects within certain regions of the country. These reports will be ready by the fall of 1988.

In the longer term EPA will advance its capability to analyze the greenhouse effect and advise on policies and strategies to respond to climate change. The Agency will develop basic information through research and monitoring of emission sources, selected studies of linkages between climate and the chemistry of the atmosphere, and research into potential environmental effects of climate change.

Building this capability will enable EPA to be an active participant in international efforts on global warming. EPA intends to contribute to such activities as the UNEP and WMO assessments of climate change impacts, the International Geosphere-Biosphere Program, and bilateral programs with the USSR, PRC, Canada, and other countries.

