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OA/ID Number:	13714
Folder ID Number:	13714-004

Folder Title:
Global Change-Background [n.d.] [OA 8311]

Stack:	Row:	Section:	Shelf:	Position:
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Action? read

Posted: Tue, Apr 10, 1990 9:07 AM EDT Msg: MGJA-4223-7617
From: E.SHEA
To: R.CORELL

ON BEHALF OF THE AMERICAN PEOPLE, I WOULD LIKE TO WELCOME YOU TO THE UNITED STATES AND THIS MINISTERIAL CONFERENCE ON SCIENCE AND ECONOMICS RESEARCH RELATED TO GLOBAL CHANGE. OUR PARTICIPATION IN THIS CONFERENCE REFLECTS OUR SHARED COMMITMENT TO EFFECTIVE STEWARDSHIP OF THIS PLANET AND ITS VALUABLE RESOURCES.

TODAY, MORE THAN EVER, WE HAVE THE FREEDOM TO RECOGNIZE THAT SECURING PROSPERITY FOR THIS AND FUTURE GENERATIONS IS AS MUCH A FUNCTION OF MANAGING THE EARTH'S RESOURCES WISELY AS IT IS ENSURING PEACE AMONG NATIONS. MAINTAINING THE QUALITY OF THE PHYSICAL ENVIRONMENT IN WHICH WE LIVE IS AS VITAL TO OUR SURVIVAL AS IS SAFETY FROM MILITARY THREATS.

TODAY, MORE THAN EVER, WE RECOGNIZE THAT MEETING THE NEEDS OF THE PRESENT GENERATIONS MUST NOT MEAN MORTGAGING THE FUTURE; WE MUST MAXIMIZE OUR POTENTIAL FOR GROWTH NOW WHILE EXPANDING THE OPPORTUNITIES FOR FUTURE GENERATIONS. BECAUSE THOSE FUTURE GENERATIONS WILL, BY THEIR VERY EXISTENCE, PLACE ADDITIONAL STRESS ON THE PLANET WE CALL HOME, GLOBAL ENVIRONMENTAL STEWARDSHIP WILL BECOME THE DOMINANT SCIENTIFIC, ECONOMIC AND ENVIRONMENTAL ISSUE OF THE 21ST CENTURY.

TODAY, MORE THAN EVER, WE UNDERSTAND THAT HUMAN PROGRESS AND ECONOMIC PROSPERITY DEPEND ON SUCCESSFULLY ACCOUNTING FOR OUR ENVIRONMENTAL RESOURCES AND USING THEM WISELY.

TODAY, MORE THAN EVER, WE RECOGNIZE THAT OUR ACTIONS MAY BE BECOMING A DOMINANT FORCE IN THE EVOLUTION OF THE ENVIRONMENT WHICH SUSTAINS OUR LIVES.

TODAY, MORE THAN EVER, WE ARE IN SEARCH OF A MORE EFFECTIVE PARTNERSHIP WITH NATURE--A PARTNERSHIP WHICH RECOGNIZES THAT WE CAN NO LONGER VIEW OURSELVES AS ISOLATED INHABITANTS OF A STATIC ENVIRONMENT BUT RATHER AS FULL PARTICIPANTS IN A DYNAMIC EARTH SYSTEM WHICH CAN BOTH LIMIT AND SUSTAIN OUR PROGRESS.

TO ESTABLISH AND SUSTAIN SUCH A PARTNERSHIP, WE MUST SIGNIFICANTLY ADVANCE OUR UNDERSTANDING OF THE NATURAL AND HUMAN PROCESSES WHICH CHARACTERIZE THIS EARTH SYSTEM. WE MUST, BASED ON THAT KNOWLEDGE, CREATE SOLUTIONS THAT JOIN ECONOMIC GROWTH WITH SOUND MANAGEMENT OF OUR ENVIRONMENT. THE CHALLENGE OF INTEGRATING SCIENCE, ECONOMICS, AND ENVIRONMENTAL CONCERNS IS GREAT BUT THE REWARDS OF GLOBAL STEWARDSHIP ARE MORE PROFOUND THAN WE CAN EVER KNOW--FOR THEY REPRESENT OUR ONLY OPPORTUNITY FOR SUSTAINING AND IMPROVING THE QUALITY OF LIFE FOR A GROWING WORLD POPULATION.

AND SO WE MEET HERE FOR THE NEXT FEW DAYS. COMMITTED AS INTERNATIONAL POLITICAL LEADERS TO ESTABLISHING SUCH A PARTNERSHIP -- WITH ONE ANOTHER AND WITH THE SINGLE EARTH SYSTEM WHICH WE ALL CALL HOME. WE COME TOGETHER TO SHARE OUR EXPERIENCES AND OUR HOPES; OUR CONCERNS AND OUR MUTUAL PROMISE TO ENTER THE 21ST CENTURY AS COMMON STEWARDS OF OUR GLOBAL RESOURCES.

FOR THE NEXT TWO DAYS, I ASK THAT WE PUT ASIDE THE POLITICAL CONSIDERATIONS THAT TRADITIONALLY RULE OUR LIVES. I ASK THAT

WE JOIN TOGETHER IN DISCUSSIONS THAT WILL HIGHLIGHT OUR SIMILARITIES AND LEAD TO A FIRM COMMITMENT TO ADDRESS THE SCIENTIFIC AND ECONOMIC UNCERTAINTIES WHICH CURRENTLY CHARACTERIZE THE CURRENT DEBATE OVER GLOBAL ENVIRONMENTAL ISSUES.

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DAN!
LIFE IMITATES
ART!
Mark

"PLANET EARTH...
... I'LL PROBABLY STAY."
DEVO, 1976

Action? read

Posted: Tue, Apr 10, 1990 9:07 AM EDT Msg: MGJA-4223-7617
From: E.SHEA
To: R.CORELL

Science Advisor

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optimistic, sense of leadership...

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Ch. 3 BUDGET.

'91 BUDGET: R+D ↑ incr. in future.

Basic Research - 12% ↑

6% incr. for DoD.

impt. that young scis & engineers get support they need to begin work.... — (under them even to set funding)

87% of all scis. who ever lived in US are alive today...!

$1 B. → Comm. on Earth Sciences - coordinates 7 Agencies work on Global Change....

~~Human~~ Life

BIOTECHNOLOGY.

COMPUTING.

Material Science & Engineering.

Life Scis. ①
Phys. Scis ②
INT. NEEDS? ③
INDUST TECHNOL ④

WHCUS.2
4/2/90 12:00(NOON)

THEME 1: UNCERTAIN CHANGE: THE SCIENTIFIC AND ECONOMICS RESEARCH CHALLENGE

- WHAT SCIENTIFIC RESEARCH RELATED TO GLOBAL CHANGE IS BEING CONDUCTED OR IS NOW PLANNED IN YOUR COUNTRY? PLEASE PROVIDE A BREAKDOWN OF THIS WORK INTO THE FOLLOWING CATEGORIES:

  - GLOBAL/REGIONAL FORECASTS OF HUMAN ACTIVITIES LEADING TO POSSIBLE GLOBAL CHANGE;
  - GLOBAL/REGIONAL MODELS OF GEOPHYSICAL GLOBAL CHANGE PROCESSES;
  - SOCIAL AND ECONOMIC IMPACT OF POSSIBLE GLOBAL CHANGE WITH OR WITHOUT ADAPTIVE STRATEGIES; AND
  - SOCIAL AND ECONOMIC CONSEQUENCES OF SPECIFIC ACTIONS THAT MIGHT BE TAKEN TO ARREST POSSIBLE GLOBAL CHANGE.

RESPONSE:

The U.S. Global Change Research Program was initiated to improve our understanding of the global Earth system, reduce major scientific and socio-economic uncertainies and ensure a long-term National commitment to continually re-evaluate the effectiveness of policy in the light of new scientific insights. A brief summary of the history, goal and scientific nature of the U.S. Global Change Research Program is included as Attachment A to this Questionnaire.

With an ultimate focus on the provision of policy-relevant information about the current and anticipated state of the global environment, the USGCRP supports three scientific priorities:

- ESTABLISH AN INTEGRATED, COMPREHENSIVE PROGRAM OF DOCUMENTING THE EARTH SYSTEM ON A GLOBAL SCALE THROUGH OBSERVATIONAL PROGRAMS AND DATA MANAGEMENT SYSTEMS;

- CONDUCT A PROGRAM OF FOCUSED STUDIES TO IMPROVE OUR UNDERSTANDING OF THE PHYSICAL, GEOLOGICAL, CHEMICAL, BIOLOGICAL, AND SOCIAL PROCESSES THAT INFLUENCE EARTH SYSTEM PROCESSES AND TRENDS ON GLOBAL AND REGIONAL SCALES; AND

- DEVELOP INTEGRATED CONCEPTUAL AND PREDICTIVE EARTH SYSTEM MODELS.

Of particular relevance to the questions raised here, are the current and proposed activities under the Human Interactions science element. Current and planned activities under this science element recognize that adequate models of the physical

and biological processes of change must incorporate an understanding of the relationship between those processes and the human activities that stimulate and mediate changes in the global environment. USGCRP/Human Interactions studies address high-priority observational, research and modelling requirements associated with the following questions:

- What data are needed to verify models of interaction between human and natural systems and to assess the likelihood of changes in those processes?

- How do population dynamics contribute to global environmental change?

- How do institutions influence environmental processes and respond to changes in global environmental conditions?

- How do technological and economic development contribute to global environmental change, and how will changing environmental conditions affect future technological and economic development? and

- How do changing patterns in the use of land, water, energy resources and other natural resources affect global environmental change?

In all cases, these research activities are driven by the need to establish a sound empirical basis upon which to ultimately assess the feasibility and likely results of various policies options. **[NOTE: most of this text drawn from existing USGCRP documents]**

In addition to the fundamental science program embodied in the USGCRP, major studies of mitigation and adaptation policies are underway throughout the Federal Government (e.g., in DOE, EPA, DOI, OTA) and in the private and non-profit sectors (e.g., Electric Power Research Institute-EPRI, Harvard, MIT and Stanford). Some of the issues addressed by these studies include:

- determining the economic obligations and responsibilities to future generations and how to allocate costs for reduction in the rate of global environmental change;

- global analysis of the impact of rising energy costs from global carbon dioxide emissions reductions; and

- assessing options for mitigating or reducing tropical deforestation (including methods for sustainable agriculture).

In many cases, these and similar studies contribute directly to the deliberations of the Response Strategies Working Group

of the Intergovernmental Panel on Climate Change (IPCC). The Committee on Earth Sciences recently established a Mitigation and Adaptation Research Strategies Working Group charged with, among other things, the identification of an explicit research agenda for this important area.

The Adaptive Strategies Program of the Environmental Protection Agency is worth specific mention in this regard. The Adaptive Strategies Program is designed to identify resource impacts on both domestic and international level and to examine policy options to mitigate domestic impacts. The Program builds on the recent EPA Report to Congress entitled POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGE IN THE UNITED STATES. The Adaptive Strategies Program sponsors international studies to examine the social and economic impacts of climate change on agriculture, water resources, coastal resources, forests, biodiversity, fisheries, infrastructure, and human health. Through this program, the implications of global warming will be assessed as well as the effectiveness of policy alternatives, such as taking no action, planning, or taking immediate action. EPA hopes that these studies will more clearly define national vulnerabilities and provide for the exploration of adaptive strategies with natural resource managers, states and local governments.

WHAT POTENTIAL CONFLICTS, IF ANY, BETWEEN YOUR INTEREST IN CONTINUED ECONOMIC PROGRESS AND YOUR INTEREST IN ARRESTING POSSIBLE UNDESIRABLE GLOBAL CHANGE HAVE BEEN IDENTIFIED BY YOUR EXISTING RESEARCH? WHAT SCIENTIFIC AND ECONOMICS RESEARCH IS MOST CRITICAL TO IMPROVING OUR UNDERSTANDING OF RELEVANT TRADEOFFS AND POSSIBLY IMPROVING THE TRADEOFFS THEMSELVES?

RESPONSE:

Sound policy must be justified on the basis of a strong scientific understanding not only of physical and biological processes but also the social, economic and environmental consequences of action or inaction.

The uncertainties associated with the timing and magnitude of possible global change mean that policies will vary in their appeal as uncertainties are reduced. Thus an appropriate strategy to address possible global change in today's economic environment may be wholly inappropriate within a decade. Economics research should focus on evaluating the benefits and costs of policies under a broad range of outcomes that reflect the scientific (and related economic) uncertainties of possible global change. **[NOTE: MUCH OF ABOVE TEXT DRAWN FROM CEA TASK GROUP REPORT]**

The U. S. believes that an effective response to potential environmental changes requires the consideration of market mechanisms, including: (i) the development of thorough cost-benefit analyses of possible response options and (ii) the important role of the private sector in the development of new practices and technologies to reduce sources, enhance sinks and adapt to possible global environmental changes. **[NOTE: drawn from Delegation Guidelines to Hague Ministerial meeting]**

Two particular areas of study within the U.S. Global Change Research Program address the scientific and economic aspects of relevant tradeoffs:

- How do institutions influence environmental processes and respond to changes in global environmental conditions?

- How do technological and economic development contribute to global environmental change, and how will changing environmental conditions affect future technological and economic development?

Perhaps the most important characteristic of an effective global change research effort is the commitment to continually re-evaluate policy decisions in the light of new scientific insights. **[NOTE: Drawn largely from the current draft of the CES FY 1991 Research Plan]**

WHAT IS YOUR GOVERNMENT'S CURRENT AND PROJECTED BUDGET FOR SCIENTIFIC AND ECONOMICS RESEARCH RELEVANT TO GLOBAL CHANGE ISSUES? HOW ARE YOUR RESEARCH EFFORTS COORDINATED ACROSS AGENCIES AND DEPARTMENTS WITHIN YOUR GOVERNMENT?

RESPONSE:

The President's FY 1991 budget proposes to spend $1.034 billion for global change research by Federal agencies. This represents a 57% increase over the current funding level of $659.3 million for the U.S. Global Change Research Program.

The U.S. Global Change Research Program is coordinated at the highest levels of government through the interagency Committee on Earth Sciences (CES) which reports directly to the President's Science Advisor. The Committee on Earth Sciences was formed in April 1987 to:

> INCREASE THE OVERALL EFFECTIVENESS AND PRODUCTIVITY OF FEDERAL R&D EFFORTS DIRECTED TOWARD UNDERSTANDING OF THE EARTH AS A GLOBAL SYSTEM.

Additional details on the history, membership and activities of the Committee on Earth Sciences with respect to the U.S. Global Change Research Program are provided in Attachment A to this Questionnaire. The coordination of global change research activities by CES is primarily focused in: (i) the Working Group on Global Change which addresses the fundamental science embodied in the U.S. Global Change Research Progrm and (ii) the newly created Working Group on Mitigation and Adaptation Strategies. The Committee on Earth Sciences provides the integrating focus in the United States for scientific input to national and international global change deliberations. **[NOTE: Drawn from existing USGCRP documents]**

WHAT IS THE INSTITUTIONAL STRUCTURE FOR CONDUCTING SCIENTIFIC ECONOMICS RESEARCH RELEVANT TO GLOBAL CHANGE IN YOUR COUNTRY?

RESPONSE:

U.S. global change research activities are primarily supported through the work of seven Federal Government agencies in close collaboration with the academic scientific community and the private sector. Federal agencies and laboratories, universities and private sector research institutions operate in a partnership which allows each to bring their unique talents and capabilities to bear on the scientific challenge associated with documenting, understanding and predicting changes in the global environment and their regional impacts.

The principal Federal funding agencies for global change research are: the Department of Commerce (primarily through its National Oceanic and Atmospheric Administration), the Department of Energy, the Department of the Interior, the Environmental Protection Agency, the National Aeronautics and Space Administration, the National Science Foundation, and the U.S. Department of Agriculture. Investigators at academic institutions across the country collaborate with their Government counterparts routinely and the private sector is encouraged to bring their expertise to bear on such problems as the development of new practices and technologies to mitigate and/or adapt to potential environmental change.

WHAT STUDIES HAVE BEEN CONDUCTED IN YOUR COUNTRY ON METHODS (AND POSSIBLE SOCIAL AND ECONOMIC CONSEQUENCES) OF LIMITING GREENHOUSE GAS EMISSIONS?

RESPONSE:

Several studies have been completed on methods and

consequences of limiting greenhouse gas emissions, both within the Federal Government and in the private and non-profit sectors. The primary focus of these investigations has been on three methods: (i) the use of a carbon tax as a means to limit emissions; (ii) the shift from fossil fuels to energy that is more environmentally benign; and
(iii) reforestation.

WHAT STUDIES HAVE BEEN CONUCTED IN YOUR COUNTRY REGARDING THE SOCIAL AND ENVIRONMENTAL COUNSEQUENCES OF GLOBAL WARMING THAT MAY OCCUR? HOW SENSITIVE ARE THESE ESTIMATES TO THE ASSUMED RATE OF WARMING AND THE APPLICATION OF ADAPTATION MEASURES?

RESPONSE:

Several studies have examined the social and economic consequences of potential global warming. This work has been supported within the Federal Government, at universities, and in the private and non-profit sectors. Completed research has centered on several areas: agriculture, the implications of a rise in sea level, and human health. Far less research has been completed that examines the social and economic consequences arising from potential effects of global warming on forestry, fisheries, water resources and biodiversity.



Most studies of global warming assume a doubling of carbon dioxide by the middle of the next century. Sensitivity of results is very dependent on the rate of warming assumed as well as feedback mechanisms which are difficult to incorporate in models, and which could affect the timing, magnitude and regional nature of any given increase in the concentration of greenhouse gases on observed surface temperature.

While several of the studies outline or explore adaptation strategies, the results of the analyses are generally presented as if no adaptation occurs. For example, estimates of changes in agriculture do not include factors such as farm management response with existing technology, development of new crop varieties better suited to the new climate and ambient carbon dioxide conditions, irrigation costs and options, and changes in the distribution of agricultural pests and diseases.

WHAT ARE THE PRESENT SOURCES, BY PERCENTAGE, OF ELECTRICAL ENERGY IN YOUR COUNTRY? WHAT ARE THE PROJECTED SOURCES, AND OVERALL USAGE LEVELS, IN 2000, 2010 AND 2020? WHAT TECHNOLOGIES ARE CURRENTLY UNDER CONSIDERATION OR BEING PLANNED TO INCREASE ENERGY EFFICIENCY IN GENERATION AND UTILIZATION IN YOUR COUNTRY?

RESPONSE:

The United States draws its energy supplies from an array of

sources. Based on 1988 statistics, petroleum provides the largest single share, accounting for 43 percent of the total supply. Coal and natural gas make virtually identical contributions to energy supply, each accounting for an additional 23 percent of the Nation's total. Nuclear power and hydroelectric power account for another 7 percent and 3 percent respectively, with other forms of enrgy making up a balance of less than 1 percent. **[NOTE: Taken from final draft of the Interim Report on the Development of a National Energy Strategy]**

[NEED INPUT--DOE?--ON PROJECTIONS OF FUTURE USE]

The United States is committed to a strong program of strategic research to improve energy efficiency. Advances in energy-conservation technology accounted for two-thirds of the recent improvements in energy productivity by U.S. industry, and for three-fourths of those in transportation from 1973 to 1987. As a result of these improvements, the United States used virtually no more energy (and less oil) in 1987 than it did in 1973--although our population continued to expand, and products and services steadily increased. Additional improvements are expected from continued support for strategic research in the areas of: combustion, heat transfer, materials, tribology (the study of friction, wear, and lubrication), superconductivity and electrochemistry.

The primary goal of U.S. strategic research for energy supply is to provide additional fundamental knowledge that can be used in: fossil energy, renewable energy, nuclear fission, and nuclear fusion technologies. In the area of fossil energy (petroleum, natural gas, and coal), the principal challenges relate to enhancing supplies, exploring the basic processes of converting fossil fuel into liquid and gaseous fuels, improving combustion efficiency, converting one energy form to another, and reducing hazardous emissions.

In the area of renewable energy, strategic research efforts are expected to focus primarily on: (i) capturing and converting the Sun's incident radiation into usable solar energy at competitive costs; and (ii) identifying and tapping usable heat below the Earth's surface in regions of the country beyond those where geothermal energy is already an economic reality.

Strategic research in nuclear engineering is expected to contribute to the development of a new generation of advanced nuclear fission reactors. Research in plasma physics, materials science and engineering, and chemical-process technology are expected to contribute to efforts to determine the scientific feasibility of controlled nuclear fusion as a potentially inexhaustible source of heat for electricity generation.
***[NOTE: ABOVE MATERIAL TAKEN FROM THE FINAL DRAFT OF THE

INTERIM REPORT ON THE DEVELOPMENT OF A NATIONAL ENERGY STRATEGY]***

THEME II: INTEGRATING SCIENTIFIC AND ECONOMICS RESEARCH IN THE POLICY PROCESS

WHAT MECHANISMS EXIST IN YOUR COUNTRY FOR PROVIDING ECONOMIC AND SCIENTIFIC INFORMATION CONCERNING GLOBAL CHANGE ISSUES TO DECISION MAKERS?

HOW IS THE SCIENTIFIC AND ECONOMICS INFORMATION CONCERNING GLOBAL CHANGE USED BY DECISION MAKERS IN YOUR COUNTRY TO ADDRESS THE ENVIRONMENTAL RAMIFICATIONS OF ECONOMIC POLICIES AND THE ECONOMIC CONSEQUENCES OF ENVIRONMENTAL POLICIES?

RESPONSE:

In the Executive Branch of the Federal Government, the Office of Science and Technology Policy (OSTP) serves as a source of scientific, engineering and technological analysis and judgement for the President with respect to major policies, plans and programs of the Federal Government. OSTP advises the President of scientific and technological considerations in several areas, including the environment; evaluates the quality and effectiveness of the Federal effort in science and technology; and assists the President in providing leadership and coordination for the research and development programs of the Federal Government.

Under OSTP's Federal Coordinating Council on Science, Engineering and Technology (FCCSET), the interagency Committee on Earth Sciences (CES) is responsible for coordinating the U.S. Global Change Research Program. The CES was created under the auspices of the White House Office of Science and Technology Policy in 1987 as a means to ensure the improved Government-wide coordination required if the United States were to position itself to effectively address the environmental, economic, and social issues raised by changes in the global environment. Additional details on the CES and the U.S. Global Change Research Program are included in Attachment A. This Attachment also includes an abbreviated U.S. Government organizational chart which identifies those Executive Branch agencies and offices with a primary interest in global change science and economics. Through the development and coordination of the U.S. Global Change Research Program, the Committee on Earth Sciences provides an integrating focus for scientific input to national and international policy deliberations.

In order to ensure the effective coordination of global change

policy development at the highest levels in the United States, the President has established a Working Group on Global Change within the Cabinet. This Working Group is chaired by the Director of the White House Office of Science and Technology Policy, Dr. D. Allan Bromley who is also responsible for oversight of the Committee on Earth Sciences. This joint responsibility on the part of the Chairman, as well as the participation of the senior leadership of CES agencies, along with Cabinet-level officials responsible for global change policy (e.g., energy and environmental policy), on the Working Group helps to ensure that new scientific insights are readily available to decision makers and that policy will be continually re-evaluated in light of those new scientific insights.

In the fall of 1989, this Cabinet Working Group established three Task Forces designed to address the some of the most significant obstacles to an effective U.S. response to the social, environmental and economic challenges posed by changes in the global environment. Of particular significance to this Conference is the Task Force on Economics, chaired by the Council on Economic Advisors, which has provided the Office of the President with a draft report in early 1990 which provides a thorough review and inventory of all work being conducted at universities, think-tanks, U.S. Government agencies, and other nations on the social and economic impacts of possible global change.

WHAT SCIENTIFIC AND ECONOMIC MODELS ARE USED BY YOUR GOVERNMENT IN ESTIMATING ENVIRONMENTAL AND ECONOMIC CONSEQUENCES OF GOVERNMENT ACTIONS RELATED TO GLOBAL CHANGE?

RESPONSE:

Global climate models used today have their roots in weather prediction models used since the 1960's to make operational global forecasts a few days in advance. They are based on the fundamental laws of physics. Of the different possible methods of estimating potential greenhouse-gas induced future climates and climate effects (laboratory simulation, warm-world analogues from paleo-reconstructions, and theoretical

climate/climate effects models), the theoretically-based mathematical climate and climate effects models offer the best practical approach. The primary climate models, called general circulation models (GCM's), predict a variety of climatic variables such as temperature, precipitation, winds, snow mass, and soil moisture. The GCM's are the only models that provide geographic distributions of these variables and hence, regional predictions.

To be used for global change predictions, an atmospheric GCM must be integrted with models of the ocean and land surface and the biotic changes inherent to them. Various combinations of coupled ocean-atmosphere models have been applied to greenhouse gas-induced warming predictions. Most have been atmospheric GCM's coupled to simpler, mixed-layer ocean models. Although it is possible to couple atmospheric and oceanic GCM's, until now it has been impractical because of the long time required to achieve an equilibrium (steady state) model climate.

Integrating with the terrestrial sector and the biosphere in general is yet more primitive. A few coupled atmosphere-biosphere GCM's are in the early stages of development and none has been applied to carbon dioxide-doubling predictions. Land boundary and general biota interactions are represented only in a rudimentary fashion. New models of biotic systems are required to describe fundamental processes related to changing climate and other variables.

Most model predictions used to date have been studies in which a control simulation, with present-day atmospheric carbon dioxide concentrations, is compared to an experimental simulation with double the carbon dioxide concentrations. Both are run until the model's climate equilibrates; the time required to attain the new equilibrium climate not being a factor. Recently, non-equilibrium or transient, predictions have been made with significant new results but the computer time required for these 100-year simulations has limited the number of model runs to date. ****[ABOVE TEXT TAKEN DIRECTLY FROM THE CURRENT DRAFT OF THE USGCRP FY 1991 RESEARCH PLAN--"SPRING DOCUMENT"]****

Several models are used by the Federal Government to estimate the environmental and economic consequences of policy actions related to global change. EPA maintains and applies the Atmospheric Stabilization Framework (Edmonds and Reilly), for evaluating the global consequences of policy options that might be implemented by individual countries or groups of countries. This modelling system has been used extensively to support the IPCC efforts currently underway. A recently completed draft of a study by CBO used the Dynamic General Equilibrium Model developed by Jorgenson to explore the implications of a carbon charge on reducing emissions and economic effects. CBO also used the ASF/Edmonds-Reilly model

as well as Global 2100 (developed by Manne and Richels) to explore the long-term implications of policies restricting carbon dioxide emissions.

WHAT SCIENTIFIC AND ECONOMICS RESEARCH QUESTIONS ARE THE MOST IMPORTANT TO ANSWER IN ORDER TO SUPPORT THE DEVELOPMENT OF DOMESTIC AND INTERNATIONAL POLICIES TOWARD GLOBAL CHANGE?

RESPONSE:

To support the development of policies toward global change, critical economic research questions must address the broad spectrum of knowns and unknowns associated with the timing and magnitude of possible global change. In responding to the Domestic Policy Council, the Task Force on Economic Costs recommended that an interagency, coordinated economic research program be undertaken that would evaluate the economic effects of possible global change and the benefits of slowing such change, the costs and effectiveness of various adaptive and emissions reduction measures, and the effects of such measures on U.S. and world trade and capitol flows. In addition, such a research agenda should incorporate opportunities for the private sector in the development of new adaptation and mitigation practices and technologies. Specifically, sound and rational economic research on the benefits and costs of proposed policy actions must be evaluated under a broad range of outcomes that reflect the uncertainties that pervade the global change issue, so that decision makers are afforded the highest degree of flexibility in policy options. ***[TEXT DRAWN LARGELY FROM CEA TASK GROUP REPORT]***

In the context of the seven science elements which characterize the U.S. Global Change Research Program, and recognizing the Program's ultimate goal of providing scientific information most relevant to policy formulation, the U.S. has identified the following high-priority questions which, when addressed, will reduce major scientific uncertainties and significantly enhance our ability to predict both natural and human-induced changes in the global Earth system. These questions are:

CLIMATE AND HYDROLOGIC SYSTEMS

- What is the role of clouds in the Earth's radiation and heat budgets?
- How do the oceans interact with the atmosphere in the storage, transport and uptake of heat?
- How will changes in climate affect temperature, precipitation, soil moisture patterns, and the general distribution of water and ice on the land surface?

- How can the reliability of global- and regional-scale climate predictions be improved?

- What is the role of polar regions in global climate change?

BIOGEOCHEMICAL DYNAMICS

- How are the oceans and terrestrial biosphere responding to increases in the introduction of fossil fuel carbon to the atmosphere and how will these responses change with time?

- Why is methane currently increasing in the atmosphere at a rate which may make this the most important greenhouse gas of concern in the future?

- Is the ability of the atmosphere to cleanse itself changing as a result of changing chemical composition?

- Can changes in the natural or anthropogenic sulfur emissions to the atmosphere ameliorate or enhance global warming?

- What are the global consequences of stratospheric ozone depletion in polar regions resulting from increased concentrations of chlorine and bromine in the stratosphere?

ECOLOGICAL SYSTEMS AND DYNAMICS

- What natural and managed systems are most sensitive to global change?

- What are the direct effects of carbon dioxide fertilization on natural and managed ecological systems?

- What are the likely changes and rates of change in natural and managed ecosystems due to global changes other than the direct effects of carbon dioxide fertilization?

- Can current natural and managed ecological systems adapt to rapid rates of change?

- How do ecological systems themselves contribute to processes of global change?
- How can ecological responses to global change be distinguished from natural variability, and other anthropogenic sources of change?

EARTH SYSTEM HISTORY

- What are the natural ranges and rates of change in the climate and environmental systems?

- How rapidly have ecosystems adapted to past abrupt transitions in climate?

- Do past warm intervals in Earth history provide appropriate scenarios to test model predictions of future global warming?

- What unidentified mechanisms of sea-level fluctuation may impede our ability to predict future sea-level change?

- Are there more than one stable mode of atmosphere-ocean circulation?

HUMAN INTERACTIONS

- What data are needed to verify models of interaction between human and natural systems and to assess the likelihood of changes in those processes?

- How do population dynamics contribute to global environmental change?

- How do institutions influence environmental processes and respond to changes in global environmental conditions?

- How do technological and economic development contribute to global environmental change, and how will changing environmental conditions affect future technological and economic development?

- How do changing patterns in the use of land, water, energy resources, and other natural resources affect global environmental change?

SOLID EARTH PROCESSES

- How do different coastal regions respond geologically and ecologically to higher sea level and how can the contributions from changes in climate (e.g., glacier melting and ocean warming) be differentiated from those due to tectonic processes?

- What are the magnitude, geographic location, and frequency of occurrence of volcanic eruptions and their effect on regional and global climate?
- How do permafrost regions of the northern hemisphere respond to climate warming?

- How and at what rate do climatically sensitive transition

regions respond to climate change and human activities?

- What are the causes and consequences of crustal deformation?

SOLAR INFLUENCES

- What aspects of solar variability are influencing the stratospheric ozone layer?
- What impact do other solar inputs, e.g., particles, have on the upper atmosphere and how are they coupled to other atmospheric regions?
- How does the sun's output vary and what is the impact on terrestrial climate?
- What do current upper atmosphere models predict for the impact of greenhouse gases?

****[NOTE: ABOVE QUESTIONS ARE DRAWN FROM THE CURRENT DRAFT OF THE CES SPRING DOCUMENT]

THEME III: BUILDING PARTNERSHIPS FOR SCIENTIFIC AND ECONOMICS RESEARCH

WHAT LESSONS CAN BE LEARNED FROM YOUR COUNTRY'S EXPERIENCE IN INTEGRATING SCIENTIFIC AND ECONOMIC ENERGY-RELATED RESEARCH OVER THE PAST TWO DECADES?

RESPONSE:

Addressing the environmental, social and economic issues associated with possible changes in the global environment demands a well-coordinated, national and international effort organized and supported at the highest levels of government. National leaders and their science, environment and energy ministers must commit to a long-term scientific program to improve our understanding of the global Earth system, reduce

major uncertainties in the decision process, and continually re-evaluate the effectiveness of policy in the light of new scientific insights.

The U.S. experience has demonstrated that no single agency, or for that matter, no single country, has the breadth of expertise or resources required to effectively address the issues associated with global environmental change. Effective stewardship of our global resources demands: coooperation among nations; effective government-wide integration within countries; and a deliberate effort to entrain the broadest possible participation of government, academia and the private sector. When a scientific program encourages each of these groups to bring their unique talents and expertise to bear on the problem, the collective result is far greater than the sum of the parts.

The effective integration of earth system science, economics research and, ultimately policy, requires the establishment of government-wide mechanisms or institutions which ensure: (i) a clear statement of the problem being addressed; (ii) development of programs which are, from their inception, designed to provide the scientific basis for decision-making related to that problem; (iii) a clearly-identified focus for scientific input to national and international policy deliberations; (iv) full and equal participation by all relevant government bodies with clearly stated individual roles and responsibilities; (v) close ties with similar efforts in other countries; and (vi) the effective involvement of the full suite of intellectual resources available in scientific projects which demand multi-disciplinary and multi-institutional collaboration.

FORECASTS OF TECHNOLOGY ADVANCES, THEIR COSTS, AND MARKET PENETRATION NECESSARILY INVOLVE BOTH SCIENTIFIC AND ECONOMIC CONSIDERATIONS. HOW CAN SCIENTIFIC AND ECONOMIC RESEARCH BE INTEGRATED TO PROVIDE THE MOST ACCURATE AND CLOSELY-BOUNDED TECHNOLOGY FORECASTS POSSIBLE? HOW CAN THIS RESEARCH CONTRIBUTE TO TECHNOLOGY DEVELOPMENT?

RESPONSE:

The Mitigation and Adaptation Research Strategies (MARS) Working Group of the Committee on Earth Sciences is charged with identifying an explicit research agenda which will address the issue of technology development to either adapt to or mitigate possible global changes. In defining this research agenda, the CES will pay close attention to the effective linking of earth systems science and economics research to identify appropriate and effective technological

options from an environmental standpoint as well as their costs and benefits from an economic standpoint. Central to the effective transfer of technology developed through such a research program is defining the appropriate involvement of the private sector from the earliest stages of development.

WHAT ARE YOUR GOVERNMENT'S CURRENT FORECASTS OF FUTURE TECHNOLOGIES RELEVANT TO MITIGATION OF OR ADAPTATION TO GLOBAL CHANGE?

RESPONSE:

A broad effort is currently underway in the United States to examine technology and practices relevant to mitigation and/or adaptation in a number of environmental areas, including:

- efforts to achieve a "no net loss" of our valuable wetlands;
- protection of biodiversity and the preservation of endangered species;
- evaluation of the concept of low-input sustainable agriculture (the subject of a recently-completed National Academy of Sciences report which examined the potential to maintain and improve agricultural productivity with changing input and management practices);
- resource conservation and management efforts in a number of Federal agencies;

[COULD USE A COUPLE MORE EXAMPLES HERE]

In the area of global change, the Mitigation and Adaptation Research Strategies (MARS) Working Group of the Committee on Earth Sciences has been charged with identifying an explicit research agenda which will, among other things address the issue of technology development to either adapt to or mitigate possible global changes. In the area of climate change, for example, this research agenda is likely to contribute to: (i) efforts to evaluate methods and consequences of limiting greenhouse gas emissions including the use of a carbon tax, shifting away from fossil fuels, and reforestation; (ii) improvements in energy efficiency and conservation technologies; (iii) technological advancements for increasing the use of renewable energy sources such as solar and geothermal; (iv) development of new generation nuclear fission reactors; and (v) determining the scientific and technological

feasibility of controlled nuclear fusion as a potentially inexhaustible source of heat for electricity generation; (vi) the development and evaluation of new crop varieties and agricultural practices; (vii) methods for adapting to or mitigating the effects of sea level rise on both natural ecosystems and human infrastructure; and (viii) the development of new technologies and practices required to mitigate possible human health effects.

WHAT INTERNATIONAL MECHANISMS WOULD BE MOST EFFECTIVE TO CARRY OUT ECONOMIC AND SCIENTIFIC RESARCH ON GLOBAL CHANGE?

DO YOU ANTICIPATE THAT NEW ENTITIES WILL BE REQUIRED TO CARRY OUT JOINT RESEARCH EFFORTS? IF EXISTING ORGANIZATIONS CAN FILL THE NEED, WHICH ONES SHOULD BE USED? WHAT CHANGES WILL BE NEEDED IN THESE ORGANIZATIONS TO PRODUCE INTEGRATED RESULTS?

RESPONSE:

The United States believes that the following precepts should characterize an effective international global change research effort:

- Countries must give futher impetus to scientific research on environmental issues, to developing necessary technologies and to evaluating the economic costs and benefits of specific response options.

- Countries must combine their efforts in order to improve observation and monitoring on a global scale. Prime examples of the need and opportunity for such collaboration include: the World Meteorological Organization's World Weather Watch; global ocean monitoring efforts such as those currently being coordinated by the IOC; the global monitoring of atmospheric constituents being coordinated through UNEP and WMO; the compilation of standard gridded geophysical data through the UNEP GEMS/GRID program; international cooperation in satellite-based monitoring programs; and data communication and archiving.

- International cooperation to improve the knowledge base regarding the science and prediction of global change (particularly climate change) will require a commitment to technology development and transfer which will strengthen indigenous capacity and infrastructure in LDC's and will heighten the awareness of decision-makers and the public to the issues.

- **Existing** mechanisms and institutions should be used

wherever possible to foster, coordinate and implement global change efforts. For example:

- individual nations should continue to support the activities of the World Climate Research Program jointly sponsored by the World Meteorological Organization and the International Council of Scientific Unions (ICSU) as well as enhance support for the evolving ICSU/International Geosphere-Biosphere Programme;

- the WMO/UNEP Intergovernmental Panel on Climate Change should continue to be viewed as the most appropriate forum for consideration of the issues related to global climate change;

- recognizing the role of satellites in global environmental monitoring, the Committee on Earth Observations Satellites, a coordinating mechanism for national and regional agency satellite programs, should be strengthened to more effectively coordinate data management of earth observations from space;

- individual nations should continue to support the activities of the International Development Association of the World Bank as well as the OECD;

[ARE THERE OTHER EXAMPLES WE SHOULD MENTION???]

Existing bodies such as the WMO, UNEP, and ICSU should be encouraged to pursue enhanced mechansisms to ensure greater communication and cooperation among the participants in the many existing and planned global change scientific programs.

[NOTE: MUCH OF THE ABOVE MATERIAL IS DRAWN FROM THE DELEGATION GUIDELINES FOR THE HAGUE MEETING]

WHAT ARE THE MAJOR BARRIERS TO CARRYING OUT INTEGRATED ECONOMIC AND SCIENTIFIC RESEARCH ON GLOBAL CHANGE?

RESPONSE:

The greatest barrier to carrying out global change research also offers the greatest opportunity for success -- no single agency and no single nation is equipped to address the problem of global environmental change alone. The effective collaboration of all interested parties, each bringing their own special expertise and programmatic contributions, will ensure scientific progress that no single group could hope to achieve on their own. The real challenge is to effectively

entrain these numerous participants in a manner that takes advantage of their individual strengths in collectively addressing the goals, objectives and scientific priorities of a well-defined program.

Global environmental problems, and research efforts in this area, are complicated by the fact that the individuals involved live in many nations. Because one nation cannot impose its wishes on another, international cooperation is required to solve problems. But differences across countries -- in income, natural resource endowments, population, sensitivity to particular environmental changes, and the political strength of environmental movements -- mean that countries inevitably have different views on these issues. Hence, countries' abilities and willingness to devote resources to research in the area of global change will also be dependent on these differences. **[FROM CEA]**

Another potential barrier to an effective resarch program is the need to ensure long-term stable support for what will undoubtedly be an expensive effort. The significant economic, social and environmental benefits that will accrue from a successful global change research effort, however, make such an investment not only sound but essential.

The earth system is too complex for us to perform direct experiments on it that would yield the information required to make reliable predictions of future environmental changes. Our only hope is to construct simplified models of this system upon which experiments can be performed through simulation to yield these predictions. To be useful, such models must accurately represent the primary physical, chemical and biological processes governing the behavior of the real system we wish to predict. The current lack of existing computers with sufficient capacity and speed to simulate the entire Earth system as a single system forces us to construct submodels to help predict future environments and responses to those environments on global and regional scales. The task then is to integrate the predictions from this hierarchy of models to provide decision-makers with the best possible scientific information to support environmental policy decisions.

Encouraging existing government and academic institutions to actively pursue research projects that cross disciplinary and institutional boundaries also presents a significant challenge not previously encounterd on such a massive scale in environmental science efforts. Scientists, institutions and nations must learn to be innovative not only in the way they look at earth system science but also in the way that they organize to conduct research.

Another critical element of a successful effort involves the free and open exchange of monitoring and other data related

to global change and other environmental issues. The United States is dedicated to pursuing whatever mechanisms are necessary to ensure such open data and information exchange.

The challenge of technology development and transfer also represents a potential barrier that must be overcome if global change scientific efforts are to be successful. A strong, truly international scientific and technological infrastructure is essential.

The availability of human resources could also prove to be a barrier to success unless deliberate efforts are made to actively increase the intellectual talent pool through education and technical training programs. Shortages in trained personnel, both as scientists and educators, appears to be particularly acute in the social sciences.

[WHAT ELSE SHOULD WE MENTION??]

WHAT DATA BASES RELEVANT TO GLOBAL CHANGE DO YOU HAVE IN YOUR COUNTRY WHICH MIGHT BE MADE AVAILABLE FOR SHARING WITH THE INTERNATIONAL COMMUNITY?

RESPONSE:

The United States believes that an essential ingredient of a successful global change science effort is the free and open exchange of relevant data and information among all participating parties. This includes observations from global monitoring networks (whether space-based on ground-based), the results of field experiments and similar research into Earth system processes, and predictive information products derived from numerical modelling efforts. The concept of free and open data exchange, along with discussions of data system improvements and enhanced communications to support global change science should be a key element of discussion at this Conference.

U.S. agencies, in collaboration with the academic community, have been conducting research related to global change for several decades. These efforts are producing derived data research products such as global analyses of critically important global change paramater, e.g., clouds, sea level, ocean color, vegetation indexes, trace gas sources and sinks, etc. These data and information products are available to the broader scientific community. The following examples provide a brief description of some of the existing ground- and space-based data currently being used by U.S. agencies in global change research:

NASA - Analysis of many different types of existing satellite data bases, including Nimbus, Landsat, Seasat, TIROS, ERBE, ISCCP, and AVHRR, are underway in NASA to assess the current state of the global environment and its variability.

Satellite data are used, for example, to better understand: (1) the chemistry and dynamics of the upper atmosphere; (2) the climate effects connected with clouds and radiation; (3) processes affecting global ocean circulation and the interactions between the atmosphere and ocean; (4) the dynamics of terrestrial vegetation in the context of global change; and (5) the role of the ocean in the global carbon cycle.

Department of Commerce/NOAA - The use of existing data sources for studies of climate and global change has a prominent position in NOAA. For example, NOAA has assembled a data base of surface marine observations extending back to 1854. These marine data have been crucial in the compilation of the global mean temperature record upon which many of the global climate change issues rest. Vast numbers of deep ocean observations from 1900 to the present have also been synthesized by NOAA into a climatology of the ocean basins, providing the basis for ocean model integrations and establishing a benchmark for observations in the global ocean. Satellite data are another valuable source of information. Using the satellite data archive, a program to develop historical measures of cloud parameters has been sponsored by NOAA and NASA since 1983. Some near-term improvements in representation of cloud processes in general circulation models can be expected as a result of this effort. NOAA-sponsored investigators are also active in the use of historical satellite microwave and IN SITU sea ice measurements to assess past fluctuations and trends in polar sea ice extent. Looking backward in time, NOAA is sponsoring an analytical program for the conversion of historical ocean nd atmospheric data, spanning several decades, into a homogeneous climate data set for studies of long-term climate change.

Department of Interior - Space-based and ground-based data are being extensively used by the Department of Interior. For example, Landsat Thematic Mapper data are being used to develop a capabilitity for predicting the hydrologic and water resource responses to climate change. Some operational capabilities exist in DOI and others are being developed for classifying land cover and vegetation types on a regional basis using Landsat data. Changes in land cover and vegetation are also being monitored operationally over time using Advanced Very High Resolution Radiometer (AVHRR) data. Research on characteristics of irrigated lands, snow cover, glaciers, and sea ice as they pertain to climate change are being conducted using remote sensing techniques. In many cases, these ongoing activities have produced data sets that will be useful as baseline reference data against which to assess the impacts of global change.

Department of Energy - DOE is using meteorological data from various sources to evaluate General Circulation Models. Specifically, data from ERBE are used to determine the

agreement between the simulated and observed radiation balance at the top of the atmosphere. DOE is also participating in the International Satellite Cloud Climatology (ISCCP) program to establish cloud climatologies necessary to understand relative heat fluxes to and from the Earth. Pilot studies have used satellite data from AVHRR, Landsat, and the French SPOT sensors in studies of deforestation, land use changes, and the exchange of carbon dioxide between the atmosphere and oceans.

National Science Foundation - Various divisions of NSF also support the use of satellite data extensively for studying ocean circulation patterns, monitoring geodetic changes related to tectonic activity and sea level change, determining atmospheric structure, radiation budgets and cloud-radiation feedbacks, making ozone measurements to detect and study ozone depletion in polar regions, and studying agricultural drought.

Environmental Protection Agency - In support of the U.S. Global Change Research Program, EPA is using AVHRR, SPOT and Landsat Thematic Mapper data to study seasonal dynamics of vegetation in ecosystems across large regions. Data from these sources are analyzed to provide measurements of vegetation canopy spectral reflectance, temperature, and "greenness" as functions of leaf area and biomass distribution. These characteristics determine the rate of evapotranspiration and trace gas emissions. EPA is also working with the U.S. Geological Survey in studies of the hydrologic cycle and water resource responses to global change.

Department of Agriculture - The U.S. Department of Agriculture is using satellite data from Landsat and AVHRR to map snow cover in selected areas of the western United States. The resulting information on snow cover is used as input to hydrologic models to simulate and forecast streamflow. When data bases are developed on particular river basins, the existing or average conditions can be perturbed in the models to approximate the effects of potential global warming or other climate changes.

The above limited examples demonstrate the contributions which existing data and data collection systems are already making to global change research in the United States.

****[NOTE: ABOVE TEXT TAKEN FROM MARCH 19, 1990 LETTER FROM DALLAS PECK TO SENATOR ALBERT GORE ON THE USE OF EXISTING DATA IN SUPPORT OF GLOBAL CHANGE RESEARCH]****

****[NOTE: NEED SOME EXAMPLES OF THE KIND OF ECONOMIC DATA AVAILABLE TO INTERESTED PARTIES AS WELL]****

Attachment 4
4/2/90 12:00 NOON

ATTACHMENT
The U.S. Global Change Reseach Program

General Background

The U.S. Global Change Research Program (USGCRP) represents an integrated, Government-wide scientific effort designed to document, understand, and predict changes in the global environment as the foundation for national and international policymaking.

In March 1987, the White House Office of Science and Technology Policy (OSTP) established a new Committee on Earth Sciences (CES). To a great extent, CES was created in response to the recommendations of a Cabinet Working Group on Climate Change which concluded that improved mechanisms for Government-wide coordination were rquired for the U.S. to effectively address the significant economic, social, and environmental issues raised by changes in the global climate system. Thus, the CES was created to:

> Increase the overall effectiveness and productivity of Federal R&D efforts directed toward understanding the Earth as a global system.

Membership of CES includes the principal earth sciences funding agencies (NASA, NSF, Commerce, Energy, EPA, Interior, and USDA) as well as other Departments, Agencies, and Executive Branch offices with interest in the policy implications of such research (State, Transportation, CEQ, OSTP, and OMB). Figure 1 shows the organizational structure of U.S. Government agencies with interest and participation in global change science and economics research. Although the CES has a number of specific areas of responsibility, including coordination of Federal activities in groundwater research, natural hazards reduction, atmospheric research, and the academic oceanographic fleet, the primary focus of CES efforts to date has been the development of the U.S. Global Change Research Program and providing a focus for scientific input to national and international change policy deliberations.

The U.S. Global Change Research Program

The USGCRP was formally announced in the January 1989 CES Report: Our Changing Planet: A U.S. Strategy for Global Change Research. That report defined the goal, objectives and scientific framework for the USGCRP. It is important to note that the individual agency research efforts identified in that Report had been developed prior to the explicit definition of goals and objectives for the overall National effort. In some cases, agencies had initiated "earth system science" programs even before CES was created. Thus, while 1990 represents the official start of the USGCRP as a Presidential initiative, 1991 will mark the first time that CES agencies can develop and present a truly integrated national program.

Proposed activities within the USGCRP must first demonstrate their

responsiveness to the overarching goal of the USGCRP:

> To gain a predictive understanding of the interactive physical, geological, chemical, biological, and social processes that regulate the total earth system, and hence, establish the scientific basis for national and international policy formulation and decisions relating to natural and human-induced changes in the global environment and their regional impacts.

Thus, a proposed project must clearly be a part of a broad national and international scientific endeavor aimed at developing a capability to not only understand but predict both natural and human-induced changes in the global environment in an effort to profice decision-makers at all levels with a strong scientific foundation for policy formulation. In some cases, projects will be designed to provide near-term results by focusing an aggressive, limited-duration attack on some key aspect of the earth system--stratospheric ozone depletion for the role of ocean-atmospheric internations in the tropical Pacific in determining year-to-yera climate variability over North America. In other cases, projects will be designed as part of a long-term national commitment to the documentation of changes in the earth system on a global scale. NASA's Earth Observing System and NOAA's ocean observations and global sea level proposals are examples of such initiatives.

Once having passed this first filter, a proposed project must then demonstrate the nature of its contribution to one of the three scientific objectives or integrating priorities of the USGCRP:

- Establish an integrated, compreshensive program of documenting the earth system on a global schale through observational programs and data management systems;

- Conduct a program of focused studies to improve our understanding of the physical, geological, chemical, biological, and social processes that influence earth system processes and trends on global and trends on global and regional scales;

- Develop integrated conceptual and predictive earth system models.

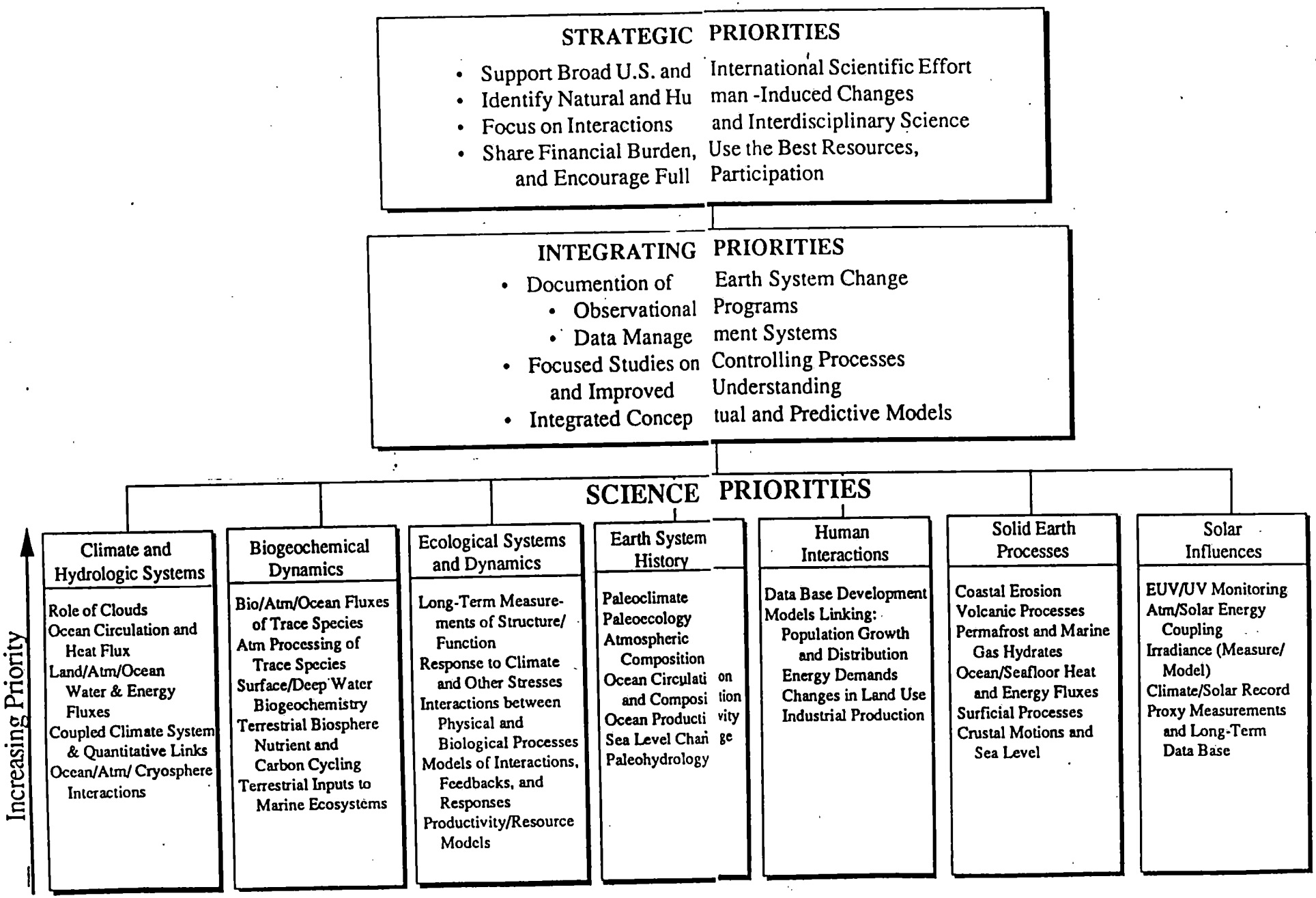
Again, the ultimate focus is on providing policy-relevant information about the current and anticipated state of the global environment.

Finally, the priority framework provides a relative ranking among the seven interdisciplinary science elements which characterize the USGCRP and within those science elements, identifies the most pressing scientific undertainties in the context of the Program's ultimate goal of predicting significant changes in the global environment. Improving our ability to anticipate, assess and address the issues associated with climate system changes are given

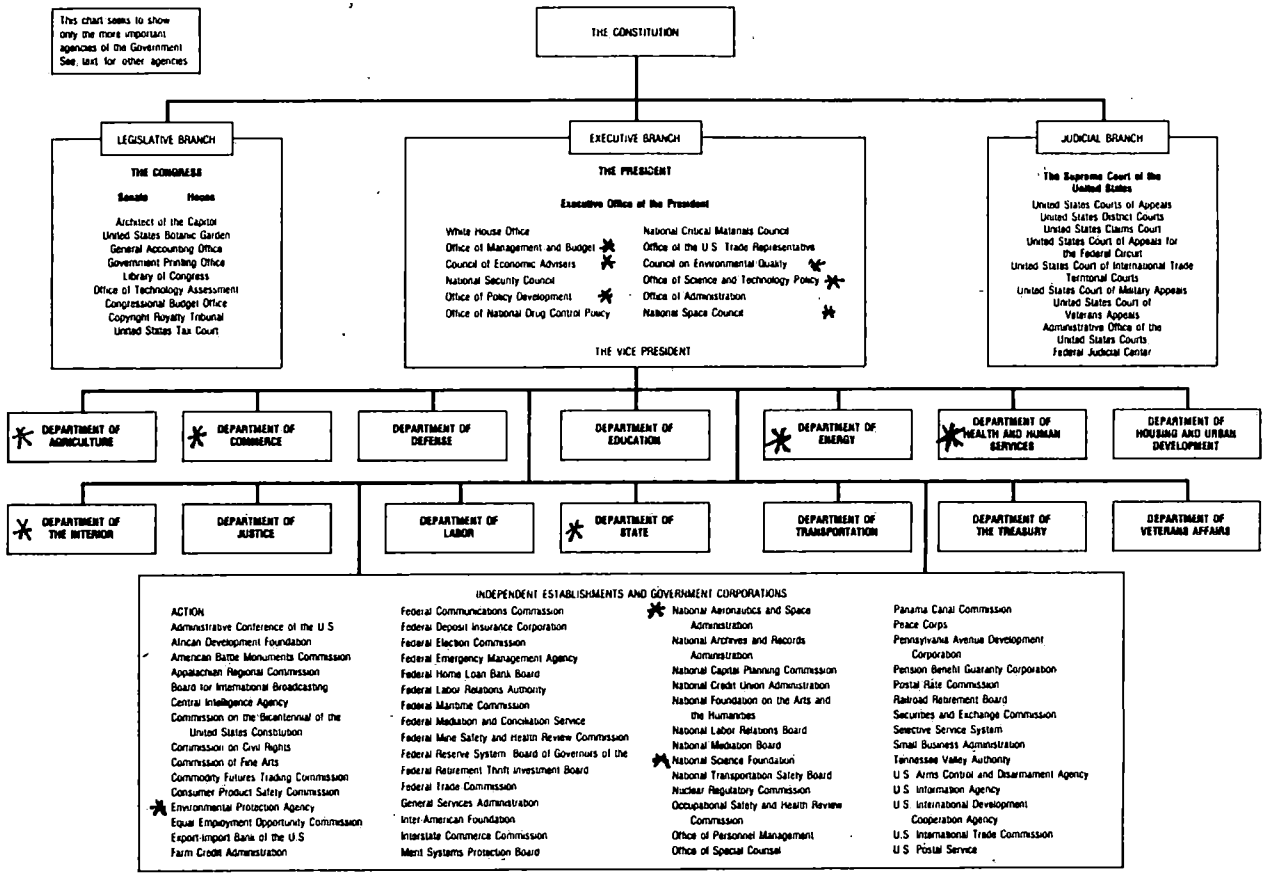
the highest priority in the Program although CES recognizes the need to maintain an appropriate level of effort in all seven science elements including adequate support for the data and information management activities required by the Program. The individual science priorities in the current research plan probably represent the most dynamic feature of the USGCRP. As new insights in earth system processes are gained, and new problems and research needs are identified in response to that new understanding, the details of the science priorities will change. In essence, the evolution of the science prioritie will be a measure of the success of the U.S. Global Change Research Program.

Figure 1

U.S. Global Change Research Program Priority Framework



THE GOVERNMENT OF THE UNITED STATES



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responsiveness to the overarching goal of the USGCRP:

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Figure 1
U.S. Global Change Research Program Priority Framework

STRATEGIC PRIORITIES

- Support Broad U.S. and International Scientific Effort
- Identify Natural and Hu man -Induced Changes
- Focus on Interactions and Interdisciplinary Science
- Share Financial Burden, Use the Best Resources, and Encourage Full Participation

INTEGRATING PRIORITIES

- Documention of Earth System Change
  - Observational Programs
  - Data Manage ment Systems
- Focused Studies on Controlling Processes and Improved Understanding
- Integrated Concep tual and Predictive Models

SCIENCE PRIORITIES

Increasing Priority

Climate and Hydrologic Systems

- Role of Clouds
- Ocean Circulation and Heat Flux
- Land/Atm/Ocean Water & Energy Fluxes
- Coupled Climate System & Quantitative Links
- Ocean/Atm/ Cryosphere Interactions

Biogeochemical Dynamics

- Bio/Atm/Ocean Fluxes of Trace Species
- Atm Processing of Trace Species
- Surface/Deep Water Biogeochemistry
- Terrestrial Biosphere Nutrient and Carbon Cycling
- Terrestrial Inputs to Marine Ecosystems

Ecological Systems and Dynamics

- Long-Term Measure- ments of Structure/ Function
- Response to Climate and Other Stresses
- Interactions between Physical and Biological Processes
- Models of Interactions, Feedbacks, and Responses
- Productivity/Resource Models

Earth System History

- Paleoclimate
- Paleoecology
- Atmospheric Composition
- Ocean Circulati on and Composi tion
- Ocean Producti vity
- Sea Level Chan ge
- Paleohydrology

Human Interactions

- Data Base Development
- Models Linking:
  - Population Growth and Distribution
  - Energy Demands
  - Changes in Land Use
  - Industrial Production

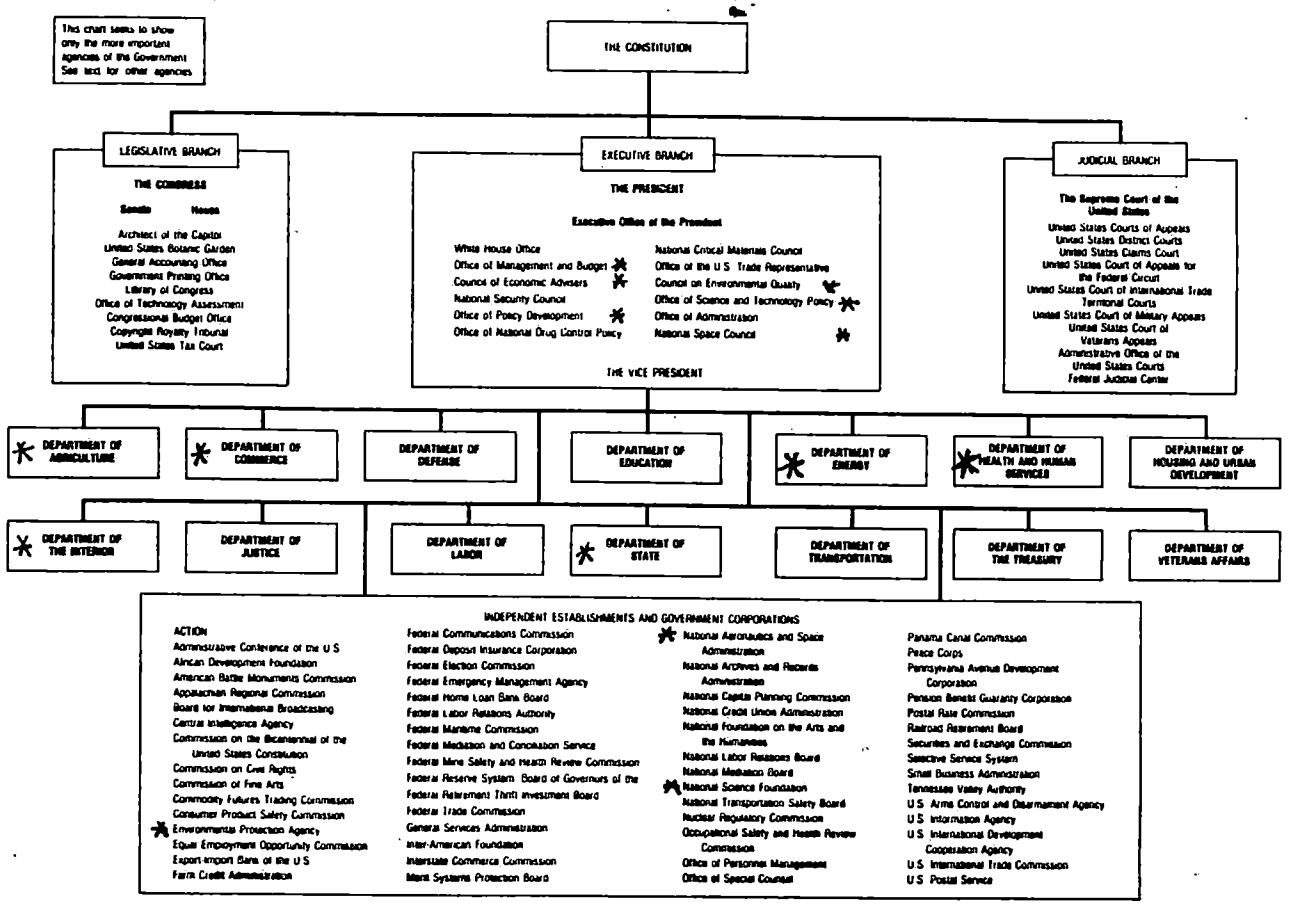
Solid Earth Processes

- Coastal Erosion
- Volcanic Processes
- Permafrost and Marine Gas Hydrates
- Ocean/Seafloor Heat and Energy Fluxes
- Surficial Processes
- Crustal Motions and Sea Level

Solar Influences

- EUV/UV Monitoring
- Atm/Solar Energy Coupling
- Irradiance (Measure/ Model)
- Climate/Solar Record
- Proxy Measurements and Long-Term Data Base

THE GOVERNMENT OF THE UNITED STATES



Grady
Reilly
Watkins
DeLand, etc.

Opening

- The United States is strongly committed to environmental protection: the best protection policies are those which are based on sound science and economic principles consistent with economic growth and free markets

- The stakes are too high, the consequences too significant for anything less

- We are doing serious analytic work to advance the state of our scientific understanding:

  --US Global Change Research Program: $1 billion

  --Mission to Planet Earth: will initiate the US Earth Orbiting System to advance the state of knowledge about the planet we share

- On the economic side, we are intensively studying the economics of possible strategies and developing real data on the costs of various approaches

- Even as we continue our research, we are taking ~~further~~ steps to protect the environment, steps that have economic as well as environmental benefits:

  --Clean Air Act Legislation:
  - -encourages emissions trading, using market driven solutions to enhance air quality
  - -energy efficiency
  - -clean coal technology

  --National Energy Strategy
  - -comprehensive blueprint for addressing future energy needs in environmentally sound manner by increasing energy efficiency and the use of renewable resources

  --Environmentally sound technology development

  --Energy Efficiency Program

  --Alternative Energy Sources ??

  --Forestry: America the Beautiful program

  --Phase-out CFCs and development of safe substitutes

- This is a high priority for my Administration, and together, here we can explore the problems and concerns posed by environmental issues.

Closing

- We have ~~heard~~ learned much about global climate change these past two days
- We understand what drives our atmospheric system yet we do not fully understand how ~~man's actions~~ natural and human activity may affect this system
- We have shared our scientific knowledge and debated our assumptions; and we have begun to explore the economics
- Much remains to be done. Many questions remain to be answered.
- We must continue to seek hard data, accurate models and new ways to improve the science
- We must intensify our efforts to improve our economic models
- Nothing presented here indicates that we are facing an imminent crisis: we should not proceed with unnecessary haste - the potential for severe economic and social disruption is too great....
- We must match policy commitments to emerging scientific knowledge and reconcile environmental protection with the benefits of continued economic development
- This is not to say we should sit idly by: we must fulfill our stewardship obligations
- But we also have a responsibility to do it right
- Believe we should proceed:
- With respect to our understanding of all aspects of climate change, look forward to reviewing the IPCC Interim Assessment.
- From our discussions here, it is clear that we must continue and expand our research and monitoring; believe existing IPCC structure provides a sound framework for this
- We believe a framework convention provides the best means to continue this important analytic work,
- Such a framework convention would commit us to cooperate in continuing our research and monitoring efforts

- Actions, if needed, could be developed subsequently, but only as part of a comprehensive approach that addresses the system, sources and sinks, as a whole

- Reiterate invitation to host first session of the negotiations in the US

- In the interim, have an insurance strategy: take those actions that have benefits distinct from climate change, such as energy efficiency and conservation, phasing out the use of CFCs and forestry programs

- These actions have economic as well as environmental benefits and it is unlikely that we would ever regret having taken them

Dale

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
WASHINGTON, D.C. 20500

Michael R. Deland
Chairman

(202) 395-5080

April 10, 1990

Mr. Matt Wald
New York Times
229 West 43rd Street
New York, NY 10036

Dear Matt:

I never before have been afforded the luxury of responding to written questions from the press. While in theory it should have provided me with moments to reflect, in practice it means that once again I'm "shooting from the hip," this time into my dictaphone rather than your recorder! My instinctive reactions to your thoughtful questions are as follows:

1. What is the most promising change of the last 20 years?

In 1970, we as a nation were grappling with the fundamental question: Do we need to act to protect the environment? Today the question is much different: What is the most effective way to protect our environment? That is an enormous -- and positive -- change. An "environmental ethic" has emerged both nationally and internationally. Environmental quality is no longer a "fringe issue," but rather is "mainstream." More and more families and communities are starting to recycle, just as more and more businesses are investing in pollution prevention programs. They are doing so, not only because they would like to be viewed as responsible corporate citizens, but because they have found that pollution prevention not only protects the environment, it "pays."

In short, the environment is now an integral part of the political and economic agendas of the major global powers and is increasingly ingrained in individuals consciousnesses. When viewed in a historical perspective, environmental issues have become integral to the societal agenda in a remarkably -- perhaps unprecedented -- short period of time.

More specifically, success stories abound. For example, this country has taken the initiative to ban

the use of environment-degrading and health-threatening materials. While lead is a cheap octane booster, the United States has banned lead from gasoline. Consequently, in 1987 the total amount of lead emitted into the air nationwide was 60 percent lower than in 1970. DDT, asbestos, and PCBs are other examples.

2. What is the most ominous change of the last 20 years?

The most ominous change is the dramatic acceleration of extinction of both plant and animal species. The destruction of rainforests, the loss of biodiversity and widespread environmental squalor in developing countries, all suggest that people living in those areas face a difficult future. There are grave implications for the developed world as well.

3. What change do we need most in the next 20 years? What can we realistically expect to achieve?

We need to make some fundamental changes in "lifestyles" here at home -- mine and yours -- and worldwide as well. We need to prevent pollution at the source rather than trying to control it at the end of the pipe or stack. We need to reduce -- and dramatically so -- the amount of waste, both hazardous and solid, that we produce.

We need to ingrain energy efficiency into our business and private lives. Individual homes, communities of homes, and industries need to be designed so energy use is minimized. Happily, we are increasingly finding that just as "pollution prevention pays," so too does energy efficiency pay. For example, utilities in this country are now subsidizing energy efficient lighting in buildings and the installation of insulation because it is in their economic interest to do so.

A sound and safe environment and a flourishing economy are two sides of the same coin. As more and more people realize that changes in lifestyle do not result in less enjoyment or less leisure, but in cleaner air and water and better health, we will realize remarkable progress over the next 20 years as well.

4. What single fact, anecdote, trend or set of statistics best illustrates environmental progress or degradation over the last 20 years?

The Montreal Protocol, signed in September 1987, is the first multi-lateral agreement to control a global pollutant that was negotiated in anticipation of an environmental problem. It is also one that recognizes the importance of special considerations for developing countries. Similarly, the Paris Economic Summit in July 1989 elevated environmental issues to the forefront of international diplomatic concerns.

On the negative side, the global loss of species and the drastic shrinking of genetic possibilities stand out as the most ominous degradation.

I hope these thoughts are of some help. I would be delighted to discuss them further with you if that would be helpful.

Good luck and, as always, very best regards.

Sincerely,

Michael R. Deland

we could make 20% CO_2 reductions
relatively quickly.

Secretary Baker

Current
Policy
No. 1254

Diplomacy for the Environment

United States Department of State
Bureau of Public Affairs
Washington, D.C.

Following is an address by Secretary Baker before the National Governors Association, February 26, 1990, Washington, D.C.

I'm pleased to have this opportunity to talk to you today about the environment. It is a subject that is important to me personally and also very important for the 50 states, the territories, and for our foreign policy.

A little history may be in order. In 1852, Chief Seattle responded to a request of the U.S. Government to purchase some tribal lands for the arriving pioneers. The chief replied: "The Earth does not belong to man, man belongs to the Earth. All things are connected like the blood that unites us all: man did not weave the web of life, he is merely a strand in it." And the chief warned, "Whatever he does to the web, he does to himself."

The settlers kept moving West—my great-grandfather among them. These independent, hard-working, and courageous people helped to make our great nation what it is today. Even for those of us whose ancestors did not take part in the westward saga, the pioneers still epitomize the essence of the American spirit.

Yet, by century's close, it had already become evident to many Americans—from the developed East and the developing West alike—that America's bounty was not inexhaustible. It had become apparent that we needed to take responsibility for protecting and replenishing our natural resources so that future generations could enjoy them.

In 1908 at the White House, President Theodore Roosevelt convened a conference on the conservation of natural resources—the first of its kind not only in the United States, but in the world. It was known as the Conference of Governors. And it is fair to say that the conference was the single greatest stimulus to the creation of a responsible national environmental policy for the United States.

Now, as we plan ahead for the next century, we must remember the lessons of the 19th and the 20th centuries.

From America's native peoples, we have learned that we cannot take nature for granted. We must cherish it and respect its God-given dignity.

From our forefathers, we have learned that nature is not a cornucopia of unending supply. We must give back to the Earth if we are to continue to draw from it.

From the history of the conservation movement in the United States, we have learned that state and federal governments, business and labor, national organizations, and individual citizens must work together if we are to craft effective environmental policies.

Finally, we know from our own experience in this interdependent world that we must "think local and act global." We cannot serve America's environmental interests effectively unless we address worldwide environmental concerns. That is where foreign policy enters the picture. And that's what I'd like to talk about today.

The Environment and U.S. Foreign Policy

The foreign policy objectives of the United States are grounded in our basic values. We seek to encourage democracy, foster prosperity through economic liberty, ensure security, and improve effective international cooperation that addresses our common interests. What is not well-

known, however, is that our environmental concerns have a major role to play in the achievement of each of these objectives: democracy, prosperity, security, cooperation, the environment—they are all interconnected. That is why the President and I are committed to ensuring that environmental issues are fully integrated into our diplomatic efforts. This is the greening of our foreign policy.

Democracy and the Environment

So first, I would like to discuss how our efforts to consolidate democracy are linked to our environmental efforts. Democracies—dependent as they are on an informed citizenry, an open society, and accountability in government—afford the greatest scope for responsible environmental action. The conservation movement is one of the greatest success stories for grassroots democracy in the United States. When we defend and promote democratic and environmental values, we express the essence of what we believe is essential for all nations to make progress—developed and developing nations alike.

Let me give you a vivid example of how democrats and environmentalists make common cause. In Eastern Europe, environmental concerns were championed by democratic opposition groups long before the people power revolutions of last fall. In fact, environmental issues helped galvanize the push for democracy. It was an international environmental conference in Sofia, Bulgaria, which helped to spark the popular revolution. "The Ecoglasnost Association," formed in anticipation of that conference, is now one of Bulgaria's largest grassroots organizations and democratic opposition groups. So in Bulgaria, Ecoglasnost gave the term "Green Revolution" a whole new meaning.

The environment is clearly one of those points of mutual advantage between East and West that the President and I are pledged to seek as we try to leave the cold war behind. To help the East Europeans help themselves in the crucial area of environment, we are offering our whole experience in dealing with these issues. We are offering to the emerging democracies grants and concessional loans; joint projects, training and technology; as well as guidance in drafting laws and regulations.

For instance, we have proposed a joint U.S.-Czechoslovak study to determine the most cost-effective way to deal with Czechoslovakia's serious air pollution problems. We are providing clean-coal technology to Poland, in part to arrest the tragic defacement of Krakow's historic architectural treasures—treasures literally being eaten away, day by day. For the region as a whole, we have promoted participation in the Budapest Regional Environmental Center, first announced by President Bush last July. With the Soviet Union, Foreign Minister Shevardnadze has agreed to my request to add to our meetings a fifth major agenda item on transnational concerns. Environment is the most prominent issue in these ongoing discussions.

The sum total of all these projects will reinforce the trends toward democracy in the East—that is, governments responsible to the people and the concerns of the people.

That brings us to our second major objective: promoting prosperity and economic liberty. Just as political freedom and economic liberty go hand in hand, so, too, do sustained growth and a healthy environment. Strong economies provide the material means with which to protect the environment. These relationships are symbiotic. They are expressed by the concept called "sustainable development."

Sustainable development, to put it simply, is a way to fulfill the requirements of the present without compromising the future. When policies of sustainable development are followed, our economic and our environmental objectives are both achieved. In fact, America's entire approach to bilateral and multilateral assistance is based on the concept of sustainable development.

Providing market-based incentives, eliminating structural impediments, and ending international trade practices that distort global markets—all will generate an economic dynamism that benefits the developed and developing world alike.

Bilateral and Multilateral Efforts

Let me cite a few examples of how we are making the concept of sustain-able development work through our bilateral assistance efforts. In Rwanda, we are sponsoring a project linking the economic benefits of tourism with the conservation of two unique, species-rich protected areas. In other developing countries around the world, we are fostering biodiversity. By so doing, we can increase the availability of natural products for commercial purposes. Life-saving pharmaceuticals and other marketable goods such as food and dyes can result. An ongoing AID [Agency for International Development] project in Indonesia focuses on the management and conservation of exotic native fruits, which may prove marketable. This project also promotes the management practices needed to stem the wanton destruction of tropical forests.

Innovative efforts, such as debt-for-nature swaps, are also important. These, like all other debt reduction efforts, must involve basic structural reform if they are to succeed. Debt swaps are not the panacea for debt reduction, nor can they single-handedly solve environmental problems, but debt swaps can help with both.

On the multilateral level, the development banks can play a key role in promoting environmentally sustainable growth. We will continue to encourage the multilateral development banks to strengthen their policies, staff, and training. We hope other donor countries will join our efforts to integrate environmental assessments into all operations of the development banks.

I know that there are dramatic calls by some for the establishment of new financial institutions or mechanisms to

provide environmental assistance. But before we spend our scarce resources on creating new bureaucracies, it makes good sense to make maximum use of the multilateral tools already in existence and to reinforce existing institutions.

Similarly, before we dedicate additional resources toward international environmental efforts, we will need to know how much is required. Substantial funding for environmental projects is already available. We fully recognize, however, that developing countries may need some additional aid in order to meet the incremental costs associated with fulfilling their international environmental obligations.

Our third key objective is ensuring global security. Solid democracies and sound economies cannot grow in unsafe surroundings. We have long worked in partnership with friendly nations to protect ourselves against traditional security threats from hostile governments. But in today's world, traditional concepts of threats to the security of our citizens need to be updated and extended to include the new transnational dangers—environmental degradation among them.

Environmental Threats Are Everyone's Concern

Environmental threats respect no border. They threaten human lives and violate the territorial integrity of states from both within and without. Chernobyl—a classic example of the ills of the stagnant Brezhnev era—showed how lives can be needlessly endangered when governments fail to act quickly and responsibly to protect their own citizens and the people of neighboring countries.

Not surprisingly, the drug cartels that threaten the health of the world community also damage the environment. As I pointed out at the UN Special Session on Narcotics last week, traffickers in the Andes are destroying vast tracts of forest for their drug labs and are dumping millions of gallons of precursor chemicals into rivers.

Forty years ago, we and our NATO partners pledged to "safeguard the common heritage and civilization" of Europe against our common enemies. As the President pointed out, Europe's environment is the common heritage of all Europeans, and we all must work to protect it. As we have seen, defending Europe's environment from the threat of pollution is just another way for the West to help the peoples of the East realize their dream of a Europe whole and free.

Our fourth objective is enhancing effective international cooperation that addresses our common interests. As we have seen, many of today's problems—environmental problems especially—have worldwide consequences. They demand global solutions. All nations share responsibility for the protection of the international community.

No nation alone, however great, can dictate fully the course of human events nor fully protect its natural resources. And no nation, however small, is without the power to act for the health of the global community. All countries must act responsibly and work together.

I am glad to say that more than ever before, nations all over the world are working together on global environmental problems. Let me give you two examples. One is global climate change. Just a few weeks ago, the President addressed the Intergovernmental Panel on Climate Change. He was the first head of state to speak before the panel. And his presence demonstrated the seriousness with which our government regards this question as well as our dedication to finding appropriate scientific, economic, and environmental solutions. The President reiterated our policy toward climate change. We call it the "no regrets" policy, and we encourage other nations to adopt a similar approach.

Just what do we mean by "no regrets"? We mean that while we are pursuing the serious scientific research that is critical to any responsible approach, we're also hedging our bets in an economically sound way. We mean that the United States is making a major financial commitment to analyze these scientific issues, increasing our funding for the U.S. Global Change Research Program to over $1 billion. And we mean that we are prepared to take actions that are fully justified in their own right and which have the added advantage of coping with greenhouse gases. They're precisely the policies we will never have cause to regret. Specifically:

- We are committed to phasing out chlorofluorocarbons (CFCs) by the year 2000 to protect the ozone layer. CFCs also contribute significantly to the "greenhouse" effect.

- Next, the President has launched a major reforestation initiative called "America the Beautiful." Under this multiyear program, our citizens will plant 1 billion trees each year in partnership with the government and busines. The trees will provide habitats for wildlife, stem soil erosion, provide recreational facilities, offer employment, and generate forest products. At the same time, the trees will help absorb carbon dioxide, a major "greenhouse" gas.

- Finally, we are dedicated to a program of energy conservation and energy efficiency. This contributes to efficient use of scarce energy supplies, reduces our dependence on foreign energy sources, and saves us all money—citizens, government, and industry alike. Moreover, decreasing the use of the fossil fuels will reduce "greenhouse" gas emissions.

If the results of international scientific research demonstrate that climatic conditions will not change in a significant way, we will have "no regrets" for these actions because they provided other benefits. If, on the other hand, the findings of our research turn out to be more troublesome, we will have taken prudent steps toward solving the problem in a cost-effective way. We urge other nations to join us in our "no regrets" efforts.

A final example of global cooperation involves a denizen of the animal family—a party animal. Some might say he is a partisan creature, but

he has bipartisan virtues. Sadly, he is listed among the severely endangered species. Even the Democrats among us agree that if we let our old friend the elephant pass from the earth, we will all be diminished. Therefore, last summer the United States led the way in banning the international trade in ivory. Now, a global effort is underway. Most other nations have joined us. And although some trading in ivory continues, I believe we can all work together to develop an enforcement system that saves the African elephant.

Conclusion

The environmental efforts that I have described here today are illustrative of the many ways the Bush Administration is acting to protect the environment nationally and internationally. This morning, I have not even begun to touch upon our no-net-loss of wetlands policy, our opening of formal discussions with Canada on acid rain, or our driftnet resolution that was adopted unanimously by the United Nations. Nor have I touched upon another major environmental initiative of this Administration: crafting a revised Clean Air Act with incentives for our private sector to find creative, market-driven solutions to enhance air quality. And I am very hopeful that we will soon be able to sign the Basel convention, which controls exports of hazardous wastes.

The United States is doing all of these things because it serves our national interest to do them. We are also doing them because they are fundamentally the right thing to do. The great early pioneers of American conservation recognized these truths, and they found effective ways to act upon them. Their views didn't always prevail with the officials of their era, and they certainly didn't always agree with one another. Controversies that raged around the Governor's Conference back in 1908 continue down to this day. Indeed, environmental issues have never been simple; they never will be. Environmental problems are complex and sometimes slow to develop. And sometimes, we are even slower to recognize them.

Yet despite the intense debates, despite all the uncertainties, despite the sheer complexities involved, there remains before us, as before all peoples, the unquestioned responsibility to act. Emerson, the 19th century American essayist and poet, put it this way: "We do not inherit the Earth from our ancestors, we borrow it from our children."

This is a sacred debt that must be honored. The splendor of nature enfolds and unites all of humankind. Now, together, the earth's peoples must work, so that this precious web of life shall embrace, in beauty and in peace, all the generations to come. ■

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FORWARD STEPS: CONF. PROPOSALS / OUTCOMES

REPORT.410

THE WHITE HOUSE
WASHINGTON, D.C.

The White House Conference on Science and Economics Research Related to Global Change

DRAFT OF CO-CHAIRMEN'S CONFERENCE REPORT

GOALS AND OBJECTIVES OF THE CONFERENCE:

A White House Conference, initiated by President George Bush, on Science and Economics Research Related to Global Change was held in Washington, D.C., April 16-18, 1990. Conference Co-Chairmen were, the Chairman of the President's Council of Economic Advisers, Dr. Michael J. Boskin, the Assistant to the President for Science and Technology, Dr. D. Allan Bromley, and the Chairman of the White House Council on Environmental Quality, Mr. Michael R. Deland. Seventeen nations and the leadership of the E.C. and the OECD sent ministerial-level delegations to the Conference (See Appendix I for a List of Delegates). The Conference sought to add a integrating focus for international thought on Global Change, by introducing the concept of **"Global Stewardship"**, and by adding a new dimension to the international dialogue on Global Change -- **the proposition that economics, both analysis and research on broad economic policy and on economic consequences of policy options, is an essential link between the science of Global Change and policy alternatives.**

the "strong force" binding

GLOBAL STEWARDSHIP

(INSERT GLOBAL STEWARDSHIP TEXT HERE)

THE CONFERENCE AGENDA

To address the substantive Conference goals, the agenda focussed the presentations and discussions on:

- **Science and economics research** issues relevant to policy on global change,
- Important next steps that substantially **enhance and broaden international understanding** of science and economic research issues that relate to global change,
- **The special role that economics plays** in integrating the science of Global Change with the policy process,
- **Demonstrating linkages between science and economics** research results and both domestic and international **policy processes,** and
- **Framing** the initial steps towards **strategies for implementing joint international science and economics research efforts.**

Tuesday
April 10, 1990
9:08 am

The Conference focussed on "Global Change," a scope of research interests that evolved out of the sciences that are concerned with understanding the fundamental processes that govern the way the global Earth system functions. Global Change encompasses such diverse and interrelated issues as ozone depletion, greenhouse gases, climate change, food security, water supply, sea level changes, wetlands, deforestation, biodiversity, population changes, and energy demands.

The Conference was conceived as an integral part of the on-going international process to understand the science of and policy options relating to global environment issues. The need to substantially improve understanding of both the science and economics of global change has been noted by virtually all world leaders. The Conference, therefore, focused on scientific and economic research issues as a complement to the on-going Intergovernmental Panel on Climate Change (IPCC) and other international forums that seek to address the research agenda for Global Change.

The Conference provided a forum of international leaders to address a variety of complex science and economics research issues central to the policy process, for example:

* **How well can we predict temperature trends in the decades ahead?**
* **How "good" are our global-scale models, such as models to predict temperature changes?**
* **How well can we predict the interconnections between global environmental change and the resulting social and economic impacts?**
* **What are the economic costs of adapting to or mitigating global change?**
* **How "good" are the economic models used to compute these costs?**

By having ministerial-level discussions of such questions, it was hoped that nations might join together to enhance cooperative international research programs that focus on rapid improvement of both scientific and economic knowledge.

To address these complex and interrelated issues, ministerial-level delegations were invited to the Conference from a representative group of nations. The Conference was conceived with the idea that a small representative group of countries would participate. Their selection was based on the simple criteria that the meeting should be modest in size and include countries or organizations of countries that have substantial populations, large land masses, industrialized economies or heavy future energy needs, major research infrastructures, or have provided international leadership on issues related to climate and global change. A representative group of countries was selected, including:

1. Australia
2. Brazil
3. Canada
4. Federal Republic of Germany
5. France
6. India
7. Indonesia
8. Italy
9. Japan
10. Mexico
11. Netherlands

12. Nigeria
13. Norway
14. Poland
15. Soviet Union
16. United Kingdom
17. Zaire
18. European Community
19. OECD

CONFERENCE PLENARY AND WORKING GROUP SESSIONS

The Conference Plenary and Working Group Sessions provided an opportunity for delegates to address the critical science and economics research issues related to Global Change. The agenda was designed to provide a forum to:

- Substantially increase collective understanding of the critical scientific, economic, and environmental research agenda central to the needs of future global change policy development.
- Identify the uncertainties in both scientific and economics knowledge critical understanding changes in the global environment of the planet,
- Increase mutual understanding of and sensitivity to scientific and economic research efforts between both of those research communities.
- Increase sensitivity by the two research communities to the policy needs in the environmental and energy arena, and visa versa.
- Foster the concept of the importance of a solid and well implemented scientific and economics research effort, as a pre-requisite for and parallel complement to, the evolving efforts by nations to address the international policy questions of global environmental changes.
- Enhance communications and establish a broader "network" of among national leaders, concerned with and responsible for, the research and policy agenda related to global change. The Conference sought to provide a forum to forge partnerships between the scientific and technical research communities and the policy-makers.

To provide a vehicle to focus on these vital issues, the Conference Program was designed around a balance between several Plenary Sessions and concurrent Working Groups that addressed three major themes:

- **Theme I: The Science and Economics Research Challenge**
- **Theme II: Integrating Science and Economics Research in the Policy Process**
- **Theme III: Building Partnerships for Science and Economics Research**

PLENARY SESSIONS

The program for the Conference was divided into three broad components: (i) One half day of **Opening Plenary Sessions,** (ii) two half days of **Working Groups Sessions,** and (iii) a half day of integrating and **Summary Plenary Sessions.**

OPENING PLENARY SESSIONS

Opening: The Conference was opened with a presentation by Secretary of the Treasury, Nicholas F. Brady. The welcome addressed focussed on .....Include Summary of Brady's Remarks.

Address by President George Bush: The President of the United States, George Bush spoke to the Conference and his central messages was .....Include a Summary of President Bush's Speech. Full Text of the President's Speech is appended in Appendix A.

Remarks by _____, Delegate from _____. The Honorable _____, from _____, provided the Conference with a visiting delegation perspective on the Conference, during which .....Include a Summary of his remarks. Include full text if available in the Appendices.

Central Themes of the Conference: The Three Conference Co-Chairmen gave major addresses on the three Conference Themes, the purpose of which was to outline the central issues of the Conference and to provide a focus on each Theme for the Working Group Sessions. The full text of these three speeches is appended in Appendix B.

Theme I: The Science and Economics Research Challenge. Dr. D. Allan Bromley .... Include a Summary of Bromley's Speech....

Theme II: Integrating Science and Economics Research in the Policy Process. Dr. Michael J. Boskin ..... Include a Summary of Boskin's Speech....

Theme III: Building Partnerships for Science and Economics Research. Mr. Michael R. Deland ..... Include a Summary of Deland Speech...

Visiting Delegations Perspectives on the Themes. Three delegates formed a Panel to discuss the Themes and to give several visiting delegations views on the Themes of the Conference.

- o Foreign Delegate - Include Short Summary Here
- o Foreign Delegate - Include Short Summary Here
- o Foreign Delegate - Include Short Summary Here

(Include full text if available in Appendices)

MAJOR ADDRESSES

There were two major addresses given during the Conference Luncheons.

- o Admin. William Reilly - Include a Summary of that Address
- o Sec. James D. Watkins - Include a Summary of that Address

The full text of both of these address is included in Appendix C.

WORKING GROUP SESSIONS

The Conference agenda was organized so that delegates were divided into three Working Groups (Working Groups A, B, and C), each of which consisted of a mix of ministerial-level delegates from science, economics, and the environment agencies of government, and in some cases from energy agencies. All countries were represented in each Working Group. The list of Working Groups is contained in Appendix D. Four Working Group Sessions met sequentially, two on Tuesday afternoon of April 17 and two on Wednesday morning of April 18. The first sessions were devoted to the three Conference Themes and the fourth was designed as a session to integrate the discussions and to prepare a written summary of the Working Group deliberations as a contribution to the Co-Chairmen's Conference Report. Those reports are summarized herein.

Working Group A: Summary Report of Working Group "A"

Working Group B: Summary Report of Working Group "B"

Working Group C: Summary Report of Working Group "C

SUMMARY PLENARY SESSIONS

SUMMARIES OF CONCLUDING ADDRESSES AND PRESENTATIONS

1.) **Foreign Delegations Summary of Conference:** Three visiting delegates reviewed the results of the Conference from their perspective, a summary of those remarks follow. ...Include the comments here. (Include full text if available in Appendices)

2.) **Working Group Leader Summaries of the Conference:** The three Working Groups gave summaries of their deliberations, a summary of which follows. .....Include it here. (Include full text if available in Appendices)

3.) **Conference Co-Chairmen Summaries of the Conference:** The three Conference Co-Chairmen outlined their summary views on the Conference, a summary of those comments follow. .....Include those here. (Include full text if available in Appendices)

4.) **Closing Remarks by President George Bush:** The President of the United States, George Bush presented his closing remarks to the Conference. .....Include a Summary of President Bush's Speech..... Full Text of the President's Remarks is appended in Appendix A with the Opening Address.

SUMMARIES OF PROPOSALS FOR ACTION OFFERED DURING THE CONFERENCE

The delegates of the Conference concluded that several specific actions, developed during the Conference should be addressed in the period immediately after the Conference. These include:

1.) The Working Groups considered a proposal by the U.S. to endorse the principles contained in a **"Charter for Cooperation in Science and Economics Research Related to Global Change"**, the draft of which is contained in Appendix E. The general consensus of the Conference was .....Include the specific results of discussions on

including any recommended action steps.

2.) The U.S. proposed an initiative designed to initiate international and jointly sponsored research "centers" that focus research on the science and economics of global change. The purpose of these centers, which might be called **International Institutes for Research on the Science and Economics of Global Change,** is to develop internationally recognized "Center of Excellence" where both resident and visiting scholars address key research topics that contribute research results to the international policy process. A draft of the U.S. proposal is contained in Appendix F. The Working Groups discussed this proposal and concluded ..... Include the results of those discussions here.....

3.) The U.S. proposed an initiative to increase communications among nations engaged in research on global change. The U.S. proposal suggested that nations join together in what might be called a **"Global Change Communications Network".** The proposal suggested that a joint effort be undertaken that builds on the available technology for data and information transfer, electronic mail, and other telecommunications technologies. A draft of the concept is enclosed in Appendix G. The Working Groups discussed this matter and concluded that.....Include the results of those discussions here.

4.) The U.S. proposed that the Conference consider endorsing a **"Statement of Principle" for developing an international Strategy for Cooperation in Scientific and Economic Research in Global Change.** The draft "Statement" is attached in Appendix H. The "Statement of Principles" outlines the basis for developing a strategy among nations for a cooperative international effort to implement joint scientific and economics research programs, including sharing of scientific and economic data, coordinating the development of international global observing systems, and facilitating joint research efforts to substantially improve the capabilities of models to predict controlling global and regional environmental process (i.e. GCM's). The "Statement" outlines the essential ingredients for an overall strategy to implement cooperative research internationally. The focus would be on research efforts that can be substantially enhanced by joint efforts that build on the expertise, experience, and data available of each participating country. The U.S. suggested that if the "Statement of Principles" is endorsed by the Conference, then a Task Team of interested nations would prepare a **Draft Strategy,** within a few months, for consideration by government agencies responsible for implementing Global Change research programs and projects. The proposal suggested that such a Strategy then could lead to what might be called, an "International Global Change Research Program". The proposal suggested that such a more fully coordinated international research effort could substantially assist the on-going policy debate and could support other up-coming international meetings, such as the IPCC and the Second World Climate Conference. The proposal builds upon existing discussions initiated by the International Council of Scientific Unions (ICSU) during its recent Annual Meeting in Lisbon, in October, 1989. The proposal is intended to fully facilitate the implementation of the research programs of the World Climate Research Program (WCRP), the International Geosphere-Biosphere Program (IGBP), and others. The Working Groups considered the proposal and concluded .....Include the results of the Working Group discussions here.

5.) Other proposals - include here.

File = REPORT.410

APPENDIX A

PRESIDENT'S TWO SPEECHES
(To be Added at Conference)

APPENDIX B

THREE CO-CHAIRS THEME SPEECHES
(To be Added at Conference)

APPENDIX C

LUNCHEON SPEECHES
(By Wm. Reilly and James Watkins)
(To be Added at Conference)

APPENDIX D

WORKING GROUPS MEMBERSHIP LISTS
(To be Added at Conference)

APPENDIX E

CHARTER FOR COOPERATION
in the
Science and Economics Research Related to Global Change"

Government officials of Science, Economics, and the Environment from eighteen nations, the European Community (EC), and the Organization for Economic Cooperation and Development (OECD) gathered in Washington, D.C. on April 16-18, 1990, to attend a White House Conference on Science and Economics Research Related to Global Change. The Conference was designed to address important next steps for substantially enhancing and broadening international understanding of science and economic research related to Global Change. The delegates to the Conference noted that;

WHEREAS:

- Scientific evidence demonstrates that the **Earth and its environment are changing** on time and spacial scales unknown to humankind,
- **Scientific uncertainty remains** as to the contributions made by natural variability in Earth system processes and those made by impacts from anthropogenic sources, hence limiting the ability of science to predict, with acceptable accuracy, the future behavior of the Earth system,
- Gaps in scientific understanding substantially **limit the abilities of nations to determine the economic and societal impacts** of global changes in the environment,
- World leaders are considering unprecedented postures and actions to **address the potential economic and social implications** of these changes, and
- These national and international developments, taken in total, have placed **global environmental issues central on the agenda of international affairs.**

THEREFORE:

The nations gathered at the White House Conference on Science and Economics Research Related to Global Change will seek to:

- Increase and coordinate their science and economics research programs with internationally planned research efforts,
- Work together to develop national science and economic research programs that complement and contribute to a coherent international effort,
- Work to enhance existing international mechanisms for planning and implementing science and economics research programs, and to foster, when necessary and appropriate new mechanisms to foster cooperation among the world's governments and international agencies,
- Work toward full participation of all nations in the formulation, refining, and implementation of the science and economics research agenda,
- Encourage the nations of the world to contribute resources and personnel to the research agenda in measure and kind reflecting national capabilities,

Tuesday
April 10, 1990
9:08 am

- Collaborate with other nations in support of education, training, and human resources development that is focussed on the research agenda and that supports full participation by developing countries, and

- Work toward developing cooperative access to pertinent research facilities and research data and information by all nations and toward developing indigenous research activities relevant to the global environment change research program in all participating nations.

FILE = CHARTER.410

APPENDIX F

INTERNATIONAL INSTITUTE CONCEPT PAPER

APPENDIX G

GLOBAL CHANGE COMMUNICATIONS NETWORK CONCEPT PAPER

APPENDIX H

STATEMENT OF PRINCIPLES
FOR
IMPLEMENTATION STRATEGIES FOR COOPERATIVE RESEARCH PROGRAMS

APPENDIX I

LIST OF DELEGATIONS
(To be Added at Conference)

THE WHITE HOUSE

10 April 1990

Dear Ambassador Lake,

Please accept my sincere thanks for your gracious hospitality. It was good to meet you and Paul Spencer and to learn even more about my family's home.

Please stay in touch. I look forward to seeing you soon. Warmest regards.

Sincerely,
Joe Watkins

McGroarty/Dooley
April 5, 1990
5:00 pm
[~~climate~~ change]

PRESIDENTIAL REMARKS: WHITE HOUSE CONFERENCE ON ~~CLIMATE~~ GLOBAL CHANGE
J.W. MARRIOTT
APRIL 17, 1990
X:XX A.M.

Thank you. [Introductory acknowledgements.]

Environment//// Here in the United States, we've moved one step closer to a landmark. Two weeks ago, our package of amendments to the Clean Air Act cleared the Senate -- with overwhelming support. Last week, the House Committee . //

As always, where there's compromise, there are critics. Some say we've gone too far -- ~~that////~~ others . And for the first time in 13 long years, we will before the end of 1990.

Tougher tailpipe standards -- and stronger regulations on toxic chemicals. Provisions to expand the use of alternative fuels, and the best-available pollution control technologies. Strong steps to cut emissions that cause acid rain. And of course, a full range of penalties for polluters who fail to clean up their act.

And I don't have to tell this audience what it means to cut carbon dioxide emissions by xx million tons by the year 2000.

We've made headway on this key environmental issue. I want to speak this morning about what we can do -- what all of you can do over the course of the next two days to advance our understanding on this critical question of ~~climate~~ global change.

Secretary Baker

Current Policy No. 1154

New Horizons in Europe

United States Department of State
Bureau of Public Affairs
Washington, D.C.

Following is an address by Secretary James A. Baker, III, at the Vienna ministerial meeting signaling the March 9 opening of two new security negotiations in Europe, talks on confidence- and security-building measures (CSBMs) and separate talks on conventional armed forces in Europe (CFE), on March 6, 1989.

We meet here today in a historic setting. Vienna, of course, is a living monument to the creativity of Western culture. This city is also a crossroads of civilization. It reminds us that Europe and the achievements of Europe have always gone beyond the limits of geography to influence the wider world.

But Vienna also bears witness to vanished hopes. Negotiations and agreements intended to bring enduring peace to Europe have been discarded too often in war. Too often the lack of security in Europe has meant a lack of security for the entire world. That is why we are *meeting* here to negotiate. Our purpose is to improve the security of Europe thereby also strengthening the foundations of world peace.

I believe that we need a larger perspective, a common vision of where we are headed and why, if we are to succeed.

East-West Visions

After the Second World War, Europe and the world were confronted by two distinctly opposing views. The United States and its allies in Western Europe held the vision of free peoples, living under the rule of the law, their individual freedoms protected, and their democratic governments responsible to those people.

We believed, and we continue to believe, that freedom of speech, and of religion, freedom from fear and freedom of opportunity, were and are the natural rights of free men everywhere. We were certain, and we continue to be certain, that free markets and individual initiatives are the surest routes to social and economic progress.

We sought, and we continue to seek, our security in a coalition of free nations drawn together by common values, not only mutual interests. And we envisioned then, as we envision now, a Europe at peace—its nations free to develop in diversity but united against war.

Our vision was not the only vision. There was another view opposed to the values most cherished by the West. And the competition between the two visions gave us the difficult legacy with which we live today: a Europe, forcibly divided against the will of its peoples; a Europe, the most heavily armed continent in the world.

Now, as we approach the end of this decade, new horizons are beckoning, horizons that offer us the opportunity to go beyond the conflicts of the past. The other vision is changing. It is changing because we in the West have been faithful to our own vision. And it is changing because realism has begun to triumph in the Soviet Union.

Perestroika, glasnost, and democratization are the slogans of the "new thinking." There are encouraging developments in human rights and in the emphasis upon the rule of law. Economies once rigidly fixed in the grip of centralized control are being loosened and a role for individual initiative has been decreed. Recently, [Soviet] General Secretary Gorbachev has declared, "World politics, too, should be guided by the primacy of universal human values." The rhetoric of Soviet foreign policy is being reshaped with less emphasis on the use of force; [Foreign] Minister Shevardnadze affirmed that again today and, that's very good.

No one can foretell where this process will lead or even whether it will endure. Yet we cannot deny the reality of what is actually happening in Europe today. Dostoevsky, in his novel *The Possessed,* wrote that "The fire is in the minds of men, not in the roofs of buildings." The revolutionary changes in that part of Europe still behind a rusting Iron Curtain are changes above all in the minds of men, in their vision of the future. People want freedom: freedom of the mind; freedom in the home; freedom in the workplace and free governments. And these freedoms will heal the wounds inflicted by stagnation and tyranny.

A Europe of Freedoms

I propose that we dedicate ourselves to creating a new Europe—a Europe based on these freedoms:

- The freedom of all Europeans to have a say in decisions which affect their lives, including freedom of the workplace. The legality of Solidarity,

for example, should really be the norm and not the subject for negotiations.

• The freedom of all Europeans to express their political differences, when all ideas are welcome and human rights are truly inviolable. Monitors of the Helsinki agreements, for example, should be honored and not hunted by their governments.

• The freedom of all Europeans to exchange ideas and information and to exercise their right to freedom of movement. The researcher in Prague, for example, should be able to find the books he needs. Barbed wire should not separate cousins in Hamburg from cousins in Dresden. And a wall should not divide Berlin, continuing, as we've seen just in the past month, to cost the lives of people seeking freedom.

• Finally, the freedom of all Europeans to be safe from military intimidation or attack. Those in the West should be free of the fear that the massive forces under Soviet command might invade them. Those in the East should be free of the fear that armed Soviet intervention, justified by the Brezhnev doctrine, would be used again to deny them choice.

"New thinking" and the Brezhnev doctrine are in fundamental conflict. We call today upon General Secretary Gorbachev to renounce the Brezhnev doctrine—beyond any shadow of a doubt. Let the "new thinking" sweep away this vestige from the era of stagnation.

These four freedoms are inseparable. They are the principles for the new Europe; they are the keys that open the door to the European house of the future. As the American President Abraham Lincoln said, "A house divided against itself cannot stand." A continent divided by a wall cannot be secure. A secure and prosperous Europe can never be built on the basis of artificial barriers, fear, and the denial of independence.

I am happy to report that we have made some progress toward realizing the new Europe of the freedoms—progress upon which we all can build. The Conference on Security and Cooperation in Europe—through the Helsinki, Madrid, Stockholm, and now the Vienna documents—has defined ever more precisely the obligations of states. We have emphasized a new freedom for individuals and the expanded concept of openness and confidence-building measures in the field of security. We support this process. The Helsinki Final Act embodies our vision of Europe. And NATO's security dimension has always had the prevention of war as its only purpose.

Economic and Environmental Initiatives

Economic change is also a marked feature of the new Europe. The creation of a single market by 1992, looking outward to benefit all who wish to trade, would surely fulfill the hopes of those postwar visionaries who rightfully saw economic union as a buttress of peace and freedom. Centralized economies are slowly divesting the straitjacket of outmoded Marxist-Leninist theories. And the desire for increased commercial contact is strong and growing ever stronger. There is also a genuine possibility for all industrialized nations, both East and West, to work together on newly recognized transnational problems.

Dangers to our environment, for example, risk the most fundamental security of all the earth's citizens. Just last week, to protect the globe's ozone layer, the European Community and the United States decided to end the use of all chlorofluorocarbons (CFCs) by the year 2000, assuming adequate substitutes can be found—as we believe they can. We hope the Soviet Union will consider joining us in the spirit of "new thinking."

Reducing Military Confrontation

This is progress. But while the old era apparently recedes before the horizons of the new Europe, those horizons are still too distant. The arms and the armies still face each other. An Iron Curtain still divides this continent. Too many governments have followed their solemn signature on human rights pledges with violent suppression of dissent.

And so, as we eye the horizon, important questions remain unanswered. Will the new rhetoric be translated into new actions or will we see a repetition of the past—of hopes disappointed once more?

Will East and West, together, be able to dismantle the barriers thrown up by the old era of competing visions? Will these barriers finally be removed; will the Berlin Wall and the barbed wire and the watch towers finally be relegated to history? Will the Soviet Union demilitarize its foreign policy in Europe; will it cease to threaten democracy's house with tens of thousands of tanks?

I was encouraged by what [Foreign] Minister Shevardnadze said earlier today as he spoke of far-reaching reductions. In recent years, we have seen reasons to be hopeful about the new Soviet thinking. But both realism and prudence require that we test the new thinking to make sure that it means new policy and, above all, changes in military deployments. We have sought to discover whether East and West could take steps together—irreversible steps—that lead toward the Europe of the freedoms. And we have also sought to reduce the level of military confrontation.

Here, too, there is progress to report. Responding to an American proposal, the Soviet Union joined the United States in achieving an intermediate-range nuclear forces treaty that provides for the elimination of an entire class of nuclear-capable missiles. The treaty contains important precedents, especially in the areas of verification and asymetrical reductions to equality. We have also made encouraging progress in the START [strategic arms reduction talks] talks toward reducing strategic forces. And we look forward, once our review is completed, to further steps on the road toward arms reduction and arms control.

Chemical Weapons Elimination

President Bush has declared that the control and elimination of chemical weapons is a high priority for the United States. Since 1984, when he tabled a draft treaty to eliminate chemical weapons from the face of the earth on an effectively verifiable basis, the United States has exercised leadership in the Geneva negotiations. We will continue to be at the forefront of these efforts in the future as well. However, until we eliminate these weapons in a verifiable way, the United States will maintain a minimal chemical deterrent.

Recently, we were gratified by the response to President Reagan's call for a conference on the use of chemical weapons—and the success of that conference under the leadership of the Government of France. Clearly, some nations are ready for action.

The United States is prepared to lead in dealing with this problem. And so I am happy to announce that as one of his first acts, President Bush has directed our new Administration to explore ways to accelerate the removal of our existing chemical weapons from Germany. The early removal of these weapons will require available safe storage and the development of practical plans to destroy them.

But unilateral action is not enough. The Soviet Union has enormous stocks of chemical weapons threatening Europe. We, therefore, call on the Soviets to join us, to accelerate the destruction of their enormous stockpile of these frightening weapons.

Finally, we must address the threat of chemical weapons proliferation. We can build on our recent success in Paris. We propose that we bring together governments and representatives of the international chemical industry. We have been discussing with Australia the general question of proliferation and the importance of holding such a conference. For a number of years, Australia has played a leading role internationally in trying to prevent the spread of chemical weapons, including as leader of the Australia group of Western chemical-producing states. I am pleased to tell you, therefore, that the Government of Australia has agreed to take the initiative in organizing such a conference.

Its purpose will be to discuss the growing problem of the movement of chemical weapons precursors and technology in international commerce. We hope to establish better means of communication about this deadly trade.

Conventional Military Imbalances

Progress on nuclear arms control and chemical weapons, however, is not sufficient. We shall never be able to set East-West relations on an irreversible course toward enduring improvement unless we deal with the huge conventional military imbalances in Europe. We can define the issue simply: a vast force, spearheaded by heavily armored units and supported by massive firepower, has been fielded by the Soviet Union and its allies. That force points West.

We in the West have faced this threat since the dawn of the cold war. Today, Soviet and Warsaw Pact military forces go far beyond those conceivably needed for defense. Warsaw Pact tanks outnumber NATO tanks by over 3 to 1, Warsaw Pact artillery exceeds NATO's artillery by 3 to 1, and the Warsaw Pact holds more than a 2-to-1 advantage over NATO's armored troop carriers.

These ratios speak for themselves. And as NATO has pointed out, these are forces best suited to an invasion of Western Europe.

It is this array of Soviet armed might that divides Europe against its will and holds European hopes hostage to possibly hostile Soviet intentions.

Lately, we have heard that Soviet military doctrine is changing to meet a standard called "reasonable sufficiency." And in December at the United Nations, General Secretary Gorbachev declared the Soviet intention to withdraw 50,000 men, 5,000 tanks, and other selected equipment from certain areas of Eastern Europe. Several East European governments have also announced unilateral force reductions.

That's a start, a very good start. It's a very hopeful start, and, of course, we are watching to see the words become deeds. And equally clear is the necessity to go further. Even after these reductions, the Warsaw Pact would retain a 2-to-1 edge in tanks and artillery. The Warsaw Pact's conventional military preponderance, especially in the spearheads of attack, is, in fact, what makes an invasion possible.

These are hard facts. These are the facts that have to be changed if our negotiations are to be successful and if the foundations of a new Europe are to endure. The arms control process must now be focused strongly on this East-West imbalance.

The United States, together with the other Western participants in these talks, has developed serious proposals to end disparities in conventional ground forces and to introduce far-reaching confidence-building and stabilizing measures.

Our approach focuses on the achievement of significant reductions in key military capabilities that are designed for invasion. For example, we propose an overall limit on the total armament in Europe and that no more than 40,000 tanks should be deployed by the 23 participating states in the CFE negotiations. In addition, Western participants are prepared to introduce new confidence-building measures in the near future, aimed at increasing transparency and reducing the possibility of surprise attack. Ultimately, of course, stability will be achieved when no country is able to dominate by force of arms.

Let me emphasize once more, however, that change in the military balance is only one part of the process. Only when the causes of the historic division of Europe have been removed, when we have achieved the free flow of people and information, when citizens everywhere enjoy free expression, only then will it be possible to eliminate totally the military confrontation. In other words, we cannot remove the symptoms, unless we deal fundamentally with the causes. I am encouraged that increasingly people from both East and West understand that relationship. We must all work to bring about far-reaching changes that end the division of this continent.

The United States is committed to working with reasonable men and women in all countries to achieve success. We approach the negotiations, which will begin a few days from now in these very halls, with a clear goal, solid principles, and well-defined objectives.

Our goal in these negotiations, as in all arms control negotiations, will be to prevent war—any war, nuclear or conventional—deter aggression, and increase stability at lower levels of armed forces. We shall judge every proposal not simply by the numbers of weapons reduced but by the impact on deterrence and stability.

To achieve this goal, we reaffirm the unity of purpose between the United States and its European allies. We have long recognized, as NATO Secretary General Manfred Woerner said, that "Europe needs America as America needs Europe.... Separate, we would become victims of world historical development; together we can determine the course of world history for the better."

Our negotiating objectives are well defined.

First, as I mentioned earlier, the NATO allies have called for equal ceilings in key items of equipment at levels below current NATO forces. This would be the best step toward a secure Europe at lower levels of arms.

Second, no state should possess capabilities designed primarily for invasion.

Third, a regime of mutual openness and transparency about military matters should be expanded which can foster confidence, clarify intentions, and thereby strenghten stability.

In addition, we hope that all states will adopt doctrines and force structures which faithfully reflect defensive intentions.

As these negotiations unfold, we and our allies will explore every opportunity for progress. The current force levels and force structures in Europe are not engraved in stone. They are the product of history, the results of conflict. And they can be changed.

If the past is any guide, however, we can expect many proposals that promise the perfection of disarmament if we would only abandon the pragmatism of deterrence. To paraphrase Winston Churchill, the counsel of perfection is admirable in a clergyman but impractical in a statesman. The opportunities are too precious to be squandered in sweeping but impractical proposals. Instead, let us do the work of peace carefully, progressing step by step and verifying each step.

Conclusion

I have spoken today of the new Europe, of the freedoms, of the new horizons beckoning to a continent divided 40 years ago because of a conflict of visions. As that conflict weakens, it may be possible to remove the old obstacles thrown up in Europe's path. That is our task. We must remove at last the conventional force imbalances and curtains of secrecy that have so long imperiled European security and, with it, world peace.

This essential step will not be easy. It will produce new challenges and perhaps some difficult moments. But we cannot desist from the task.

I have argued that a clearer understanding of the Europe of the future will ease the burden. Already, we can glimpse part of that horizon of a peaceful and prosperous Europe for which so many have sacrificed. Yet though it beckons, we know that nothing can be taken for granted. It falls to us to take the next step, if not the final one, on this journey.

Prophecy is God's gift to but a few, yet imagination is the birthright of every human being. We can but dimly see the future through the mists of change, yet we can all imagine the world we would like to see. That is the summons of our undertaking. Let us, therefore, go forward together to build that Europe we would like to see—a free, open, secure, and prosperous Europe; a whole Europe, ennobling by example all mankind. ■

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Washington, D.C. 20520

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PRESS
DEPARTMENT OF STATE

PR NO. 11
January 30, 1989

REMARKS BY
THE HONORABLE JAMES A. BAKER III
SECRETARY OF STATE
BEFORE THE
RESPONSE STRATEGIES WORKING GROUP
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
DEPARTMENT OF STATE
JANUARY 30, 1989

Thank you Fred Bernthal, Professor Bolin, ladies and gentlemen. I am very pleased to have the opportunity to join you this morning, however briefly, and to welcome you to the Department of State. You are the first official group that I've had the pleasure of welcoming to the Department.

I would also like to welcome Bill Reilly, who is here with us this morning -- President of the World Wildlife Fund and the Conservation Foundation. Bill has let President Bush talk him into becoming the nominee for the post of Administrator of the United States Environmental Protection Agency, and it's my fervent hope, Bill, that nothing you hear at this conference this morning will cause you to change your mind.

The truth is, though, as I don't need to tell those of you who are here, we face some very difficult problems. It is also true, though, that we now recognize them to be problems, and in my experience in government that is at least half of the battle.

Some months ago President Bush said, "We face the prospect of being trapped on a boat that we have irreparably damaged -- not by the cataclysm of war, but by the slow neglect of a vessel we believed to be impervious to our abuse."

The establishment of the Intergovernment Panel on Climate Change and this meeting of the Panel's Response Strategies Working Group, I think, shows beyond a doubt that this is a transnational issue. We are all in the same boat. And as I put it in my testimony to the Senate recently, "The tides and the winds can spread environmental damages to continents and hemispheres far removed from the immediate disasters."

So, if I may borrow a phrase from the environmentalists, the political ecology is now ripe for action. We know that we need to act, and we also know that we need to act together. That is what this meeting is all about.

But I would take it even a step further. One of the big advantages of being Secretary of State is that because I am not a scientist, I am, therefore, not called upon to assess the evidence, especially on global climate change. Yet it is also clear, I think, that we face more than simply a scientific problem. It is also a diplomatic problem of when and how we take action. And here, if I might, I would like to make four points.

The first is that we can probably not afford to wait until all of the uncertainties have been resolved before we do act. Time will not make the problem go away.

The second is that while scientists refine the state of our knowledge, we should focus immediately on prudent steps that are already justified on grounds other than climate change. These include reducing CFC emissions, greater energy efficiency and reforestation.

The third is that whatever global solutions to global climate change are considered, they should be as specific and cost-effective as they can possibly be.

The fourth is that those solutions will be most effective if they transcend the great fault line of our times, the need to reconcile the transcendent requirements for both economic development and a safe environment.

Without in any way downgrading the difficulty of the task, I would conclude, ladies and gentlemen, by noting that progress generally results when common interests are joined to a common understanding. This meeting and others like it will play a crucial role in moving us all toward that common understanding of what we must do to protect and to preserve our environment.

Thank you very much for having me this morning, and Godspeed.

* * * *

CONFERENCE "EVENTS" WHERE OUTCOMES CAN BE NURTURED.

There are sixteen focal events, listed in the order of their occurrence, during the Conference where a potential exists for creating or nurturing a Conference outcome or product. These are:

1. Sec. Mosbacher's Hosting of the Opening Reception
2. Sec. Brady's Conference Opening Remarks
3. The Stating of the Conf. Goals/Objectives by the Conf. Co-Chairmen
4. President Bush's Opening Welcome to the Delegates
5. The Theme I Presentation by D. Allan Bromley
6. Working Group Session I - Addressing Theme I
7. Lunch Speech by William K. Reilly
8. The Theme II Presentation by Michael J. Boskin
9. Working Group Session II - Addressing Theme II
10. Dinner Remarks - Vice President or the Co-Chairmen
11. Address by Bert Bolin
12. The Theme III Presentation by Michael R. Deland
13. Working Group Session III - Addressing Theme III
14. Lunch Speech by Adm. James D. Watkins (Ret)
15. Reports from Each Working Group, both oral and written
16. Summary Remarks by Conference Co-Chairmen
17. Closing Remarks by President Bush

CANDIDATE IDEAS FOR CONFERENCE OUTCOME/PRODUCTS

The overall outcome/products from the Conference should address the three tactical objectives for the Conference, namely:

1. To provide an occasion for the President to demonstrate America's ~~willingness to play a~~ leadership role in organizing ongoing international efforts to respond to potential risks and opportunities associated with Global Change.

2. To provide a setting for the President to present America's overarching vision of how environmental, ~~economic,~~ and related environmental needs and interests might best be balanced in the future given the emergence of worldwide concern about the potential of global environmental change.

   → dangerous world

3. To address the Major Foci (as listed on page one of this document) of the Conference, and in particular, to facilitate the development of a strategy for integrating worldwide scientific and economic research on global change issues and to establish and share research priorities for action by and among the participating countries.

The candidates (note: these might be rank ordered eventually, however, they are not so listed here - these are not in priority order) for outcome/products are:

OVERARCHING THEME TO GUIDE ALL OUTCOME/PRODUCTS

1. Develop and integrate into various parts of the Conference the concept of "Global Stewardship", as an integrating concept for world leaders. See attached draft, Attachment A. The concept of Global Stewardship was first articulated by President Bush at the Paris Economic Summit in July 1989 - see attached text of News Conference. The Global Stewardship concept will be integrated into a variety of speeches and presentations by the U.S., throughout the Conference. The Content Integration Team will develop the strategy for doing this by COB March 30.

IMPORTANT OUTCOME/PRODUCTS

2. Focus on the central purpose of the Conference, to provide:

- o A substantially enhanced understanding of the scientific, economic, and environmental research agenda central to the needs of future global change policy development.

- o A substantive understanding of the uncertainties in both scientific and economics knowledge of the central issues associated with the changes in the global environment of the planet,

- o Increased mutual understanding of and sensitivity to the substances of scientific and economic research between both of those research communities.

- o Increased sensitivity by the two research communities to the policy needs evolving in such areas as environmental and energy policy, and vis verse.

- o Foster the concept of the need for a solid and well implemented scientific and economics research effort, as a pre-requisite for and parallel complement to, the evolving efforts by nations to address the international policy questions of global environmental changes.

- o Enhance the evolving communication and network of among national leaders, concerned with and responsible for, the research and policy agenda related to global change. More particularly, this Conference provides a "first-ever" opportunity to forge a partnership between the scientific and technical research communities and the policy-makers.

To provide a vehicle to focus on these vital issues, it is propose a "Charter for Cooperation in the Science and Economics Research Related to Global Change" be develop, a sort of "magna charta" for Global Change Research that integrates the concepts outlined above and demonstrates a commitment by the participating nations,

How 'bout a "Declamation of Interdependence"

to implement a world-wide program of global change research. A draft for such a Charter will be produced by COB March 30.

3. Demonstrate and detail, through the US/GCRP, the commitment of the U.S. to a comprehensive research program in the science and economics of Global Change, that is linked to and supports the policy process, both domestically and internationally. The US/GCRP FY91 Document and the July 1989 US/GCRP Research Plan will be used for the text materials. The Content Integration Team will draft an outline for do so by COB March 30.

4. Thoughtfully outline and "Showcase" the efforts that the U.S. has implemented that directly address the broad agenda of global change, i.e., energy conservation initiatives, etc. The Content Integration Team will draft an outline for meeting this objective by COB March 30.

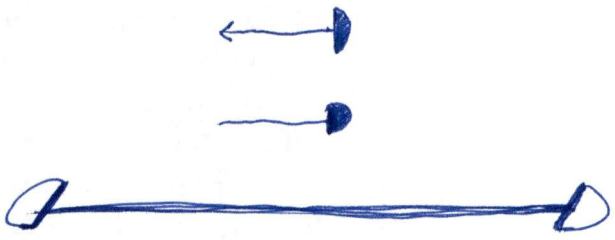
5. Propose initiatives that demonstrate the U.S.'s willingness to foster and provide leadership for the concept of an international partnership in global change research, such as an International Institute for Research in the Science and Economics of Global Change. A preliminary draft of the concept is contained in Attachment B. A more detailed draft, with an analysis of the policy and budgetary issues, will be developed by COB March 30.

6. Propose initiatives that facilitate enhanced communications amongst the partners in international global change research, both science and economics, with such approaches as the "Global Change Communications Network", that builds on the available technology for data and information transfer, electronic mail and telecommunications technologies. A draft of the concept is enclosed in Attachment C. A more detailed draft will be completed by COB March 30.

7. It is proposed that the U.S. prepare and place before the Conference a a "Statement of Principle" for a Strategy for Cooperation in Scientific and Economic Research in Global Change, with the goal that the Conference endorse it. The "Statement of Principles" would outline the strategy for international cooperation to implement joint research efforts, including

sharing of scientific and appropriate economic data, methodologies for the implemenation of a global observing system which builds upon the "statemens on cooperation adopted by the G-7 at the Paris Summit, and joint efforts to substantially enhance the capabilities of models to predict controlling global environmental process that are key to policy process. Hence, if adopted, the "Statement" would outline an agreement in principle to cooperate internationally to join together the expertise, experience, and data available of each participating country in a more integrated and coherent fashion. Therefore, the plan for the Conference, is to review, amend as appropriate, and then endorse the "Statement of Principles" for developing during the 3-6 months following the Conference, a strategy and plan for implementing cooperative research programs. Thus a process would be established for further development and "in-country" review so that by mid-summer 1990 a strategy document would exist. Such a "Strategy Document", when completed, could be used in other fora in which "global change" agenda is a central issue, e.g., Summit meetings, the IPCC process, the Second World Climate Conference, etc.. It is posed that the recognition by this Conference of what might be called an "International Global Change Research Program" is an essential next step in supporting the needs of many nations to addressed key policy issues related to Global Change. A draft of the "Statement of Principles" will be completed by COB March 30.

File = OUTCOME.325



not always true that it's better to "start sooner rather than later!"

Can lock-in bad ways.... foreclose better ones....

climate change....

"Run with the Lemmings!"

Would be ironic if ~~but~~ for enviro reasons we created a central control system over so many facets of our life.

DELEGATE ATTENDANCE SUMMARY
5 April 1990 (Time:1700)

The following is a current status report of countries attending the White House Conference on Global Change as of **500 PM on 5 April 1990.**

I. TOTAL COUNTRIES ATTENDING:

1. **Australia***
2. Brazil (2)
3. Canada (4)
4. FRG (10) **new**
5. France (10)
6. India (4)
7. Indonesia (10)
8. Italy (10)
9. Japan (10) **new**
10. Mexico (10)
11. Netherlands (10)
12. **Nigeria***
13. Norway (10) **new**
14. OECD (5)
15. Poland (10) **new**
16. U.K. (8)
17. USA (10)
18. USSR (10) **new**
19. Zaire (1)
20. EC (6)

Total Countries Attending: 20

Total of number of delegates to-date: 140

*** Bold type no data to date**

II. TOTAL NUMBER OF COUNTRIES SUBMITTING:

A. Tentative delegation list:

- **Total: 8**
- **Partial: 5**
- **None: 2**

B. Confirmed delegation list:

- OECD
- **FRG (new)**
- Indonesia
- **Norway (new)**
- **USA (new)**

C. Total number of developing countries:

- **6 LDC's**
- **Poland**

III. PERSONAL/CONTENT DATA:

A. Personal: 0

B. Written Content:
- OECD
- U.K.
- Australia
- **FRG Position Paper (new)**

C. Oral: Norway

IV. RECENT DEVELOPMENTS:

A. FRG: Position Paper. FRG has laid a marker by formal letter to Dr. Bromley by sending a formal position paper:

- "necessary actions must not be deferred or delayed, merely because it has been possible to clarify conclusively all the complicated scientific interrelationships associated with an environment threat"
- "...the risks threatening the earth's atmosphere necessitates immediate and extensive action at national and international levels"
- "..the government is convinced that immediate measures must be taken...such as the limitations of CO_2 emissions, the conservation of forests and the reduction of emissions from agriculture and waste management"
- "...the federal government therefore proposes that WHC also deal with response strategies and immediate measures in a plenary discussion...it therefore requests that the conference agenda be adapted accordingly."

PRELIMINARY

DELEGATION LIST

CURRENT AS OF

APRIL 6, 1990; 12:00 NOON

Additions: Canada

BRAZIL

(tentative)

Name	Title
Jose Lutzenberger	Environment Secretary
Jose Goldemberg	Science Secretary

CANADA

(tentative)

Name	Title
Lucien Bouchard	Federal Environment Minister
Jak Epp	Energy Minister
Dr. Geraldine Kenney Wallace	Chair, Science Council of Canada
Dr. Arthur W. May	President, Natural Sciences and Engineering Research Council
Dr. Anne White	Chair, IGBP Committee
Liz Dowdswell	Administrator, Environment of Canada for Atmospheric Environmnet Service
Judith Maxwell	Chair, Economic Council of Canada
Mr. Olton	Administrator, Energy Policy Department of Energy Mines and Resources
George Anderson	Administrator, Department of Finance
Derek Burney	Ambassador to the United States

EUROPEAN COMMUNITY

(tentative)

Name	Title
Laurens Jan Brinkhorst	Director-General for Environment, Nuclear Safety and Civil Protection
Jurgen Henningsen	Director for Environmental Quality and Natural Resources
Michael Emerson	Director for Economic Evaluation of Community Policies, Directorate-General for Economic and Financial Affairs
Philippe Bourdeau	Director for Environment and Non-Nuclear Energy Sources, Directorate-General for Science, Research and Development
Stanley Johnson	Director for Energy Policy, Directorate-General for Energy
David Wright	Central Advisory Group, Secretariat-General of the Commission

FEDERAL REPUBLIC OF GERMANY

(Confirmed)

Name	Title
Professor Dr. Klaus Topfer	Federal Minister for the Environment, Nature Protection and Nuclear Safety
Dr. Gebhard Ziller	State Secretary, Ministry for Research and Technology
Dr. Wilhelm Knittel	State Secretary, Ministry of Transportation
Baldur Wagner	Assistant Secretary, Federal Chancellery
Dr. Mario Graf von Matuschka	Assistant Secretary, Foreign Ministry
Dr. Horst Glatzel	Deputy Assistant Secretary, Federal Chancellery
Walter Lotz	Deputy Assistant Secretary, Ministry of Economics
Professor Dr. Ansgar Vogel	Deputy Assistant Secretary, Ministry for Environment, Nature Protection, and Nuclear Safety
Dietrich Kupfer	Director, Office of International Cooperation, Ministry for Environment, Nature Protection and Nuclear Safety
Professor Dr. Hartmut Gross	Scientist, Max Planck Society, Hamburg

FRANCE

(tentative)

Name	Title
Minister Hubert Curien	Minister of Research and Technology
Minister Brice Lalonde	Secretary of State for the Environment
Jean Audouze	Science Advisor to the President
Claude Alegre	Special Advisor to the Minister of Education
Ambassador Jean Ripert	Ministry of Foreign Affairs (Environment)
Yves Martin	Chairman of the Interministry Committee on Greenhouse
Madame Borione	Ministry of Foreign Affairs
Andre LeBeau	General Director of the Meteorological Center
M. Nasse	Ministry of Economy and Budget
Sylvie Faucheux	Professor of Economy at Paris I

INDIA

(tentative)

Name	Title
Ms. Maneka Gandhi	Minister of State for Environment and Forests
Vasant Gowarikar	Secretary of Department of Science and Technology
Mahesh Prasad	Secretary of Ministry of Environment and Forests
Dr. A.P. Mitra	Director General of Council for Science and Industrial Research

INDONESIA

(confirmed)

Name	Title
Prof. Dr. Ing. B.J. Habibie	Minister of State for Research and Technology; Chairman of the Agency for the Assessment and Application of Technology
Prof. Dr. Samaun Samadikun	Chairman of the Indonesian Institute of Science
Prof. Dr. John A. Katili	Deputy Chairman of the National Research Council
Prof. Dr. Gunawan Satari	Permanent Secretary, Ministry of State for Research and Technology
Mr. Poedji Kuntarso, MA	Director General for Foreign Economic Relations; Ministry of Foreign Affairs
Prof. Dr. Rustam Didong	Deputy Chairman (Economics), National Development Planning Agency
Prof. Dr. Harsono Wiryosumarto	Deputy Chairman (Technology Development); Agency for the Assessment and Application of Technology
Prof. Dr. S.B. Joedono	Assistant Minister (Industry, Energy and Mining), Office of the Coordinating Minister for the Economy, Finance, Industry and Development Supervision

INDONESIA

(continued)

Name	Title
Dr. M. Alwi Dahlan	Assistant Minister (Population), Office of the Minister of State for Population and the Environment
His Excellency Abdulrachman Ramly	Ambassador of the Republic of Indonesia to the United States of America

ITALY

(tentative)

Name	Title
Hon. Adolfo Battaglia	Minister of Industry, Head of Delegation
Prof. Umberto Colombo	Director of the National Agency for Nuclear and Renewable Energies
Prof. Giuseppe Biorci	Vice President of the National Research Council
Prof. Giuseppe Bianchi	Director General for Energy Sources, Ministry of Industry
Prof. Antonio Praturlon	President of the CNR Committee on Geological Sciences
Prof. Roberto Frassetto	CNR Institute of the Dynamics of Great Masses
Prof. Emilio Gerelli	Economic Counselor to the Minister of Environment
Dr. Corrado Clini	Director General for Pollution Prevention, Ministry of Environment
Prof. Guido Visconti	Department of Physics, University of L'Aquila
Dr. Giovanni Sacco	Vice Director General of Treasury, Ministry of Treasury

JAPAN

(tentative)

Name	Title
Ishimatsu Kitagawa	Minister of Environment
Shigeto Nagano	Parliamentary Vice Minister of Science and Technology
Koji Watanabe	Deputy Minister, Ministry of Foreign Affairs
Tadashi Yasuhara	Director General, Planning and Coordination Bureau, Environment Agency
Dr. Michio Hashimoto	Advisor to the Minister of Environment
Sousaburo Okamatsu	Director General, Industrial Location and Environmental Protection Bureau, Ministry of International Trade and Industry
Keiichi Yokobori	Executive Director, Research Institute of International Trade and Industry, Ministry of International Trade and Industry
Mr. Yoshikawa	Deputy Director General, Planning Bureau, Economic Planning Agency
Hiroto Ishida	Deputy Director General, Office of Minister of Science and Technology, Science and Technology Agency
Yuji Ikeda	Deputy Director General, United Nations Bureau, Ministry of Foreign Affairs

MEXICO

(tentative)

Name	Title
Lic. Patricio Chirinos	Secretary of Urban Development and Ecology
Dr. Jose Sarukhan	Rector, National Autonomous University
Dr. Herminio Blanco	Undersecretary for Foreign Commerce, Secretariat of Commerce and Industrial Development
Ing. Alberto Escofet	Undersecretary for Energy, Secretariat of Energy, Mines and Parastatal Industries
Lic. Jose Angel Gurria	Undersecretary for International Financial Affairs, Secretariat of the Treasury
Fis. Sergio Reyes	Undersecretary for Ecology
Amb. Alberto Szekely	Legal Counsel, Secretariat of Foreign Affairs
Dr. Julian Adem	Director, Center for Atmospheric Studies, National Autonomous University
Dr. Manuel Ortega	Director General, National Council for Science and Technology
Hector Santana	Staff Aide to Secretary Chirinos

THE NETHERLANDS

(tentative)

Name	Title
Hans Alders	Minister for Housing, Physical Planning and Environment
Dr. B.C.J. Zoeteman	Deputy Director-General for Environment
Dr. Pier Vellinga	Coordinator for National Climate Programs
N.D. Van Egmond	Director for Chemistry and Physics, State Institute for Public Health and Environmental Hygiene
I.G. Roos	Directorate-General for European Cooperation, Ministry of Foreign Affairs
Dr. H.M. Fijnaut	Director of the Royal Dutch Meteorological Institute
Dr. A.P.M. Baede	Head of the Department for Dynamical Meteorology
D.F.W.T. Pietermaat	Environmental Coordinator in the Directorate-General for Energy, Ministry of Economic Affairs
Prof. J.B. Opschoor	Professor of Ecology, Free University, Amsterdam

NORWAY

(tentative)

Name	Title
Kristin Hille Valla	Minister of Environment
Einar Steensnaes	Minister of Education and Science
Ambassador Kjeld Vibe	Norwegian Ambassador to the United States
Oddmund Graham	Secretary General, Ministry of Environment
Kaare Bryn	Director General, Ministry of Foreign Affairs
Dr. Tore Olsen	Director General, Ministry of Education and Research
Per M. Bakken	Coordinator, Air Pollution, Ministry of Environment
Lorents Lorentsen	Director of Research, Central Bureau of Statistics
Professor Dr. Ivar Isaksen	University of Oslo
Leif Westegaard	Science Officer, Norwegian Embassy in Washington

THE OECD

(tentative)

Name	Title
Robert Cornell	Deputy Secretary-General
William L. Long	Director for Environment
John Ferriter	Deputy Executive Director, International Energy Agency
Andrew Dean	Administrator, Department for Economic Affairs and Statistics
George Kowalski	Head of the Division of Economic Analysis, International Energy Agency

POLAND

(tentative)

Name	Title
Jan Janowski	Deputy Prime Minister; Head of the Agency for Science and Technological Progress and Application
Andrezejewski	Deputy Minister of the Environment
Tadeusz Diem	Deputy Minister of Education
Mr. Rybicki	Central Planning Office
Kazimierz Duchowski	Director, Department of Economic Cooperation, Ministry of Foreign Affairs
Mr. Wiackowski	Chairman, Parliamentary Commission on Environmental Protection
Professor Stakel	Polish Academy of Sciences
Mr. Sadowski	Institute of Metallurgy and Water Management
Wlodzimierz Bojarski	Member of the Senate
Jan Kinast	Polish Ambassador to the United States

SOVIET UNION

(tentative)

Name	Title
Nikolay P. Laverov	Chairman, U.S.S.R. State Committee on Science and Technology
Yuriy Izrael	Chairman, State Committee for Hydrometeorology
V. F. Kostin	Deputy Chairman, State Committee for Nature Protection
Aleksander P. Metalnikov	Deputy Chairman, State Committee for Hydrometeorology
A. A. Troitsky	Deputy Chairman, State Planning Committee
V. M. Kotliakov	Director, Institute of Geography, U.S.S.R. Academy of Sciences
Yu. L. Golubev	Assistant to the Chairman, State Committee for Hydrometeorology
Yu. V. Vakaljuk	Chief, Division of Global Geophysical Problems, Climate Change and Economic Consequences, State Committee for Hydrometeorology
B. V. Pikhanov	State Committee for Hydrometeorology, Department of International Cooperation
Mrs. N. Yu. Vail	State Committee for Hydrometeorology, Department of International Cooperation

UNITED KINGDOM

(tentative)

Name	Title
David Trippier RD, JP, MP	Minister for the Environment and Countryside
Sir John Fairclough	Chief Scientific Adviser, the Cabinet Office
Sir Crispin C.C. Tickell, GCMG, KCVO	United Kingdom Permanent Representative to the United Nations
Dr. John T. Houghton CBE	Director-General, Meteorological Office
J.G. Odling-Smee	Deputy Chief Economic Adviser; HM Treasury
Dr. David J. Fisk	Chief Scientist, Department of Environment
Dr. W. David Evans	Chief Scientist, Department of Energy
Dr. Eileen Buttle	Secretary, Natural Environment Research Council

UNITED STATES OF AMERICA

(confirmed)

Name	Title
Nicholas F. Brady	Secretary of the Treasury
Manuel Lujan, Jr.	Secretary of the Interior
Clayton Yeutter	Secretary of Agriculture
Robert A. Mosbacher	Secretary of Commerce
Admiral James D. Watkins (Ret)	Secretary of Energy
William K. Reilly	Administrator, Environmental Protection Agency
Richard H. Truly	Administrator, National Aeronautics and Space Administration
John A. Knauss	Under Secretary of Commerce for Oceans and Atmosphere; and Director, National Oceanic and Atmospheric Administration
Erich Bloch	Director, National Science Foundation
Richard Schmalensee	Member, Council of Economic Advisers

ZAIRE

(tentative)

Name	Title
Citoyen Lobo Kanza Kanza	Secretary of State (Deputy Minister); Ministry of Environment and Conservation of Nature

FACT SHEET
for
THE WHITE HOUSE CONFERENCE
on
SCIENCE AND ECONOMICS RESEARCH
RELATED TO GLOBAL CHANGE

April 17-18, 1990
Washington, D.C.

On February 5, 1990, the President invited the Heads of State from seventeen countries, the European Community (EC) and the Organization for Economic Cooperation and Development (OECD) to send ministerial-level delegates to a White House Conference on Science and Economics Research Related to Global Change.

The Conference will be held in Washington, D.C. on April 17-18, 1990.

The President formalized his intention to host such a Conference on this subject during his Summit meeting with President Gorbachev, on December 4, 1989, and later on Monday, February 5, 1990, during his speech to the United Nations Intergovernmental Panel on Climate Change.

The Conference is designed to address important next steps for substantially enhancing and broadening international understanding of science and economics research related to global change. The Conference seeks to frame a strategy for implementing joint international science and economics research efforts. It also seeks for the first time to integrate and link science and economic research results to both the domestic and international policy process.

The Conference focuses on "Global Change," a scope of research that has evolved out of the science that concerns itself with understanding the natural processes that govern the way the Earth functions as well as economics research related to global change. .

The conference is conceived as an integral part of the ongoing international process of trying to understand changes in the global environment. The need for substantially improved understanding of both the science and economics of global change has been noted by virtually all world leaders. This Conference will focus on science and economics research as a complementary effort to the on-going Intergovernmental Panel on Climate Change (IPCC). The President strongly supports the IPCC efforts and expects that the results of the Conference will contribute to the on-going international debate on climate change issues. Dr. Bert Bolin of the Intergovernmental Panel on Climate Change has been invited to take an active role in the Conference.

The Conference will convene a delegation of three ministerial-level officials from a representative group of nations, each representing a relevant discipline, (i.e., science, economics, energy and the environment). Participants were invited on

the basis that the meeting should include countries or representatives of country interests that have substantial populations, large land masses, industrialized economies or heavy future energy needs, substantial research infrastructures, or have provided international leadership on issues related to climate and global changed. The President has asked the Heads of State of the following countries and organizations to send a delegation:

1. Australia
2. Brazil
3. Canada
4. Federal Republic of Germany
5. France
6. India
7. Indonesia
8. Italy
9. Japan
10. Mexico
11. Netherlands
12. Nigeria
13. Norway
14. Poland
15. Soviet Union
16. United Kingdom
17. Zaire
18. European Community (EC)
19. Organization for Economic Cooperation and Development (OECD)

It is expected that each country or organization will send a ministerial-level official to represent their relevant agencies including science, economics, energy and the environment. It is suggested that one delegate in each of the three areas will be an individual who is currently active in science or economics research. It is recognized that the delegations are likely to have one "at-large" member. Thus, the total delegation size should not exceed ten per country. Once the delegations are determined, it is planned to consult with these countries on agenda details.

The U.S. delegation will be:

Secretary of the Treasury - Nicholas F. Brady

Secretary of Interior - Manuel Lujan, Jr.

Secretary of Agriculture - Clayton Yeutter

Secretary of Commerce - Robert A. Mosbacher

Secretary of Energy - Admiral James D. Watkins (Ret)

Administrator, Environmental Protection Agency - William K. Reilly

Administrator, National Aeronautics and Space Administration - Richard H. Truly

Under Secretary of Commerce for Oceans and Atmosphere; and Director, National Oceanic and Atmospheric Administration - John A. Knauss

Director, National Science Foundation - Erich Bloch

Member, Council of Economic Advisors - Richard Schmalensee

Conference Co-Chairmen:

Chairman, Council Economic Advisors - Michael J. Boskin

Assistant to the President for Science and Technology - D. Allan Bromley

Chairman, Council on Environmental Quality - Michael R. Deland

The Conference is designed to be a forum to bring a number of ministerial-level leaders together to enhance international cooperation and to build the basis for joint efforts in these vital areas. It is hoped that the delegates, working together, will agree upon those areas of opportunity for cooperative action in the areas of science and economics research. The goal would be to address three major themes:

- Uncertain Change: The Science and Economics Research Challenge
- Integrating Science and Economics Research in the Policy Process; and
- Building Partnerships for Science and Economics Research.

The Conference provides a forum for international leaders to consider and discuss research questions that are critical to the policy process, such as:

* How well can we predict temperature trends in the decades ahead?
* How "good" are our global-scale models, such as models to predict temperature changes?

* How well can we predict the interconnections between global environment change and the resulting social and economic impacts?
* What are the economic consequences of adapting to or mitigating global change?
* How "good" are the models used to assess these economic consequences and their impact on the well-being of humanity?

By addressing such questions, it is hoped that the nations might agree to support joint international research efforts related to global change that focus on rapid improvement of both scientific and economic knowledge and developing the necessary infrastructure, including:

- Establishing a more formal international mechanism to improve the coordination of global change science and economic research programs, and
- Participating in cooperative research efforts, such as the World Ocean Circulation Experiment and cooperative economic projects of the OECD.

The Conference is a White House Conference, initiated by the President. Hence, the President has appointed three members of the Executive Office of the President in the relevant areas to be the co-chairmen of the Conference. The three co-chairmen are: The Chairman of the President's Council of Economic Advisors, Dr. Michael J. Boskin; the President's Science Advisor and Director of the Office of Science and Technology Policy, Dr. D. Allan Bromley; and the Chairman of the President's Council on Environmental Quality, Mr. Michael R. Deland.

The President stated, "this conference is a vital next step in a joint international approach to address changes in the global environment."

As of 4/6; 9:00 p.m.

HEADS OF DELEGATIONS

COUNTRY	NAME OF DELEGATE	TITLE
Australia		
Brazil		
Canada	Lucien Bouchard	Federal Environment Minister
Federal Republic of Germany	Klaus Toepfer	Federal Environment Minister
France	Hubert Curien	Minister of Research & Technology
India	Maneka Gandhi	Min. of State for Environment
Indonesia	B.J. Habibie	Min. of State for Res. & Tech.
Italy	Adolfo Battaglia	Minister of Industry
Japan	Ishimatsu Kitagawa	Minister of Environment
Mexico	Patricio Chirinos	Sec. of Urban Dev. & Ecology
Netherlands	Hans Alders	Minister of Environment
Nigeria		
Norway	Kristin Hille Valla	Minister of Environment
Poland	Jan Janowski	(also Head of S&T Cooperation) Deputy Prime Minister
Soviet Union	Nikolay Laverov	Chmn. St. Cmte. Sci. & Tech.
United Kingdom	David Trippier	Minister for Environment
United States	Nicholas Brady	Secretary of Treasury
Zaire	Citoyen Lobo Kanza Kanza	Depty. Minister of Environment
European Community (EC)	**Laurens Jan Brinkhorst	Director-General for Environment
OECD	Robert Cornell	Deputy Secretary-General

**Some confusion between EC and Irish. We now have 14 names; also indications that delegation head might be Filippo Maria Pandolfi, Commissioner (Vice President) in charge of Science, Research and Development.

4/6/90
THE WALL STREET JOURNAL

Clean-Air Game: Green Machine Routs Bush Team

John Sununu at least deserves credit for candor. The White House chief of staff was talking to business lobbyists assembled for a clean-air pep talk last month, and it wasn't going well.

The visitors were bewildered and angry. They'd endorsed George Bush's original clean-air bill. But now they felt betrayed by the White House embrace of a Senate "compromise" far more expensive and regulatory. After a shouting match with lobbyist William Fay, Mr. Sununu replied that sometimes you just have "to punt."

The football metaphor perfectly captures the White House performance on the politics of clean air. Drug czar William Bennett likes to say that politics, like football, comes down to "time of possession." If you're not moving the ball on your opponents, they're moving it on you. Despite all the self-congratulation, the Bush White House on clean air has resembled Northwestern containing Notre Dame.

The official White House line is that this week's Senate bill is a big victory, of course. Privately, White House sources will concede that its January veto threat against a bill costing more than $19 million has been breached, though they add they had no political choice.

Potomac Watch

By Paul A. Gigot

Even more privately, many White House officials agree that the business lobbies have a right to be angry. The most influential environmental skeptics, budget director Richard Darman and chief economist Michael Boskin, didn't wield much clout on this one. The administration's greens and White House process-is-policy aide Roger Porter did the negotiating.

Anecdotes suggest the breadth of the clean-air rout: Though the devil is always in the regulatory details, the White House left the drafting of its own bill to what Mr. Sununu would later call "unnamed bureaucrats" at the Environmental Protection Agency. They obliged with an onerous regulation on clean-air permits.

This early blunder led to the ludicrous scene this week of the White House lobbying the Senate to pass an amendment repudiating the White House's own proposal. Not surprisingly, the Senate hanged Mr. Bush with his own rope, 51-49.

The administration also blinked on a last-minute amendment that dictates an entirely new gasoline (and, not coincidentally, a new subsidy for the ethanol industry). White House officials had once called such an amendment veto-bait. But after Senate minority leader Bob Dole joined the cause, the same officials dropped out of sight.

Oil companies say this gasoline redesign will raise prices from 15 to 25 cents a gallon, even if the new formula works. Supporters say the cost is only a penny a gallon. Compromise and assume it's a mere eight cents a gallon. That's still a hefty gasoline tax, a direct transfer of wealth from working-class drivers to Archer-Daniels-Midland Co., the principal maker of ethanol. Clean air has nothing to do with it.

These and other stories have eliminated any credibility from a White House veto threat. Sen. Steve Symms (R., Idaho) hoped to kill the bill by supporting an expensive amendment (sponsored by Robert Byrd of West Virginia) to compensate coal miners thrown out of work. Mr. Sununu called to twist his arm. He told the senator that even the Byrd amendment wouldn't prompt a veto—the opposite of what the administration was saying in public.

White House officials say they'll do better in the House, relying on their alliance with Democratic Rep. John Dingell of Detroit. But their embrace of the Senate bill has given Mr. Dingell less latitude. No politician now wants to be less "green" than the White House, so the greens need to make fewer concessions. "It's as if they played a game of chess without thinking they had a second move," says Mr. Fay, the business lobbyist.

It may be true, as many in the White House argue, that by anteing up on clean air, Mr. Bush proves his green credentials and so can resist green extremists in the future. Robert Teeter, the White House pollster, has numbers showing Mr. Bush with low credibility on the environment.

But Karlyn Keene, who follows public opinion for the American Enterprise Institute, thinks that misreads the public mind. A consensus clearly exists on preserving the environment as an end, but the public is far less clear about means. Ms. Keene says George Bush has more leverage to negotiate a better bill than his advisers understand.

More disappointing for the long run, no one in this administration has made a case for an alternative environmentalism—one that speaks of the ecological benefits of growth and new technologies, or of the disaster that befell Eastern Europe from the same sort of command-and-control economics many environmentalists now want.

Instead, Mr. Bush has implicitly embraced the apocalyptic assumptions of the greens. This week, he was planting a tree for clean air and decrying "extremists" on all sides—as if the owner of a polluting dry-cleaning business is somehow a radical. His EPA director, William Reilly, raised the specter of 50,000 "premature deaths" from air pollution, just the sort of unproved scare statistic used by the greens. The environmentalists are winning a political grand slam: a bill that has enormous economic costs but that the public sees described as too "weak."

Messrs. Reilly and Bush like to say they favor environmental "stewardship." It's a good word, a Bush kind of word, suggesting moderation and a check on democracy's tendency toward extremism in the name of desirable goals like clean air. Yet both men have embraced the green movement's rhetoric. They've flunked the steward's test.

Photocopy-Preservation

THE WALL STREET JOURNAL TUESDAY, FEBRUARY 6, 1990

Scientific Faddism

George Bush went over to Georgetown University yesterday to address a U.N.-sponsored group of environmentalists gathered to discuss the subject of global warming. All he said was: "Wherever possible we believe that market mechanisms should be applied and that our policies must be consistent with economic growth and free-market principles in all countries." Based on the reaction, you would have thought the President had held up a mirror in front of a vampire convention.

Market mechanisms? Economic growth? "Aaaaaaahhhhh!" shrieked the environmental elite. Or, as David Becker of the Sierra Club so plainly put it: "It was a gross disappointment. There was more talk in the speech about economics than about the environment." What more does anyone need to know about the environmentalist gestalt?

Congress and the administration are embarking on consideration of the Clean Air bill. If the past is prelude, science and economics are in for a rough ride.

We've been round the track with many scientific fads recently, such as "nuclear winter" and the asbestos panic. Early on, the system always seems to promote the fads and suppress the science.

Carl Sagan's nuclear winter postulations, much ballyhood when they first appeared, have now been dismissed by most of the scientific community. The idea was that a sudden release of smoke, caused by burning cities in a nuclear war, would have a drastic *cooling* effect on the atmosphere, and that the human race would eventually be annihilated by the temperature drop. It turns out that the assumptions and estimates upon which the computer models were based were deeply flawed.

Today, estimates of post-nuclear war cooling have moderated. "It's nice to see these guys acting like scientists again," one researcher told the New York Times. In the nuclear winter delusion, only the credibility of a few arms control hysterics suffered. But another false alarm—the asbestos scare—shows that the costs of scientific faddism can be enormous.

Congress passed a law banning asbestos, and schools have spent billions removing it. Scientists are now calling this episode a "panic," and suggesting that the money was wasted.

A major study, just published in Science magazine, confirms the conclusions of a half-dozen other studies of asbestos, including a recent one by Harvard's Energy and Environmental Policy Center, which reached essentially the same conclusions.

In their Science article, researchers from Johns Hopkins, Yale and other institutions confronted the asbestos issue head on: "Does airborne asbestos present a risk to the health of individuals in schools and other buildings? The available data do not indicate that asbestos-associated malignancies or functional impairment will occur as a result of exposure in most airborne concentrations of asbestos in buildings." The study pointed out that the incidence of asbestos-related lung cancer occurred mainly among asbestos workers and primarily those who also smoked. This is a long way from Johnny sitting in a classroom.

"Clearly, the asbestos panic in the U.S. must be curtailed," the scientists concluded, noting that the only time serious health risks are created is when asbestos is ripped out of the walls as part of the removal process and thereby released into air. But removal is what the regulations mandate. The EPA estimates that it will cost $53 billion over 30 years to comply with federal asbestos removal mandates.

The National School Boards Association has estimated the asbestos-removal costs for elementary and secondary schools to be about $6 billion. Put differently, instead of hiring new teachers, upgrading their curricula, initiating anti-drug programs or improving facilities, many schools have been forced to squander their money on a federally declared, nonexistent health threat.

The man most responsible for the law that led to this monumental waste is former Congressman James Florio, who was recently inaugurated as Governor of New Jersey, and was last seen laying hands on the state's auto insurance system.

The global-warming issue suggests that a similar process is under way again. The comments of skeptical scientists have received more attention than in the past, but on balance the debate still plays on the level of religious belief. Mr. Bush's chief of staff, John Sununu, is being roundly attacked in Washington for doubting the global-warming models of various agency bureaucrats. We hope the White House hangs tough on this one. The cost of the asbestos fad was simply too high.

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March 30, 1990, Friday, Final Edition

SECTION: Part A; Pg. A1

LENGTH: 919 words

HEADLINE: NASA satellites find no sign of 'greenhouse' warming

BYLINE: Ronald A. Taylor; THE WASHINGTON TIMES

BODY:

Satellites taking the most precise global temperature measurements ever have found no evidence of global warming from the "greenhouse effect" during the last decade, according to a National Aeronautics and Space Administration analysis.

The data, collected from 1979 through 1988 by the TIROS-N series of weather satellites, proved that the Earth's temperature can be measured accurately by instruments probing the atmosphere from space, two scientists say in a paper to be published today in Science.

The study also provides a glimpse from space of global temperatures during the period 1979-88 - one of the hottest decades, with six of the warmest years on record.

"We found that the Earth's atmosphere goes through fairly large year-to-year changes in temperature and over that 10-year period we saw no long-term warming or cooling trend," said Roy W. Spencer of the Marshall Space Flight Center in Huntsville, Ala, study co-author.

But co-author John Christy, a climate research scientist at the University of Alabama in Huntsville, cautioned against misuse of the findings. "About the long-term global warming it does not say anything," he said. "It says for this particular snapshot you are not able to find it, but that does not mean that it is not occurring or that within a few more years we might be able to actually see it."

He added: "This does not prove that there is not a global warming. If these data are used in any kind of anti-environment statement, then I will be tremendously disappointed." He said other aspects of the environment are being affected by an excess of greenhouse gases in the atmosphere.

Instead of measuring surface temperatures, the satellites read temperatures in the troposphere, roughly 20,000 feet above the surface, as they spun around the globe 14 times a day. Looking at chunks of the atmosphere 100 miles wide and six miles deep, the satellites were able to collect usually unavailable data from water surfaces.

Most other studies of temperature trends, some extending over more than a century, have come from the records of ground-based thermometers. These readings did not reflect the global temperature because they did not include the huge area covered by oceans.

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The TIROS data also detected a cooling in the tropics from 1984 to 1986 and a "warm event" in the northern hemisphere during 1987 and 1988. On a global basis, the study found, the warmest years, in descending order, were 1987, 1988, 1983 and 1980. The coolest years were 1984, 1985 and 1986.

The findings quickly became part of growing skepticism over the need for an immediate end to the burning of coal, oil and other fossil fuels.

"It merely confirms something that people who've examined the records have known for a long time - that it did not warm up in the 1980s," said University of Virginia climatologist Patrick Michaels. "When are we going to come down on the side of reason and logic? That's what I want to know. . . . The policy cart is way ahead of the science horse on this."

Emissions from burning fossil fuels are linked to what scientists describe as the greenhouse effect. If the planet's atmosphere is overloaded by those gases, scientists and environmentalists worry, global warming could disrupt life on Earth.

While opponents of quick action to control the greenhouse effect insisted that the study buttresses their case, climate scientists questioned the length of the study. "Ten years is not long enough," said NASA climate program chief John Theon.

Mr. Christy said he does not expect conclusive statistical evidence of global warming until the turn of the century.

"The climate may never be affected by the greenhouse effect," he said. "However, there are enough other things that are part of our own biological system that we must pay attention to what we are doing to the environment.

"The atmospheric composition is changing. Carbon dioxide is increasing, chlorofluorocarbons are increasing, other pollutants are increasing. We are losing our forests around the world. The environmental concerns are tremendous."

Global temperature is not the sole indicator of global warming, said World Resources Institute climate expert James McKenzie. "It's not that any year is going to be totally different, it's just that more and more often you're going to get hotter summers, more drought on average, more storms," he said. "It's a matter of 'You bet your climate.' Which way do you want to bet?"

The climate changes may occur far more quickly, some atmospheric scientists say. Analysis of air trapped inside glaciers shows that past ice ages occurred very quickly, said Walter Broecker, climatology professor at Columbia University.

There is evidence from past glaciation that strongly suggests the climate change came "in large jumps," he said, adding: "We think that these are due to reorganizations of the ocean-atmospheric system. One of the things we have to think about for the future is that this kind of thing might occur."

****CHART

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NO PROOF OF GLOBAL WARMING

Both ground temperatures and readings from the government's TIROS-N satellite from the 1979-1988 period show no conclusive global warming trend.

The satellite study confirmed wide variations in average temperatures during that period. Adding to the confusion, wide variations in temperature extremes occurred during the decade with record years for heat occuring in 1987, 1988, 1983 and 1980. The coolest years were 1984, 1985 and 1986.

GRAPHIC: Chart, NO PROOF OF GLOBAL WARMING, By Henry Christopher/The Washington Times

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March 10, 1990, Saturday, Final Edition

SECTION: FIRST SECTION; PAGE A1

LENGTH: 1473 words

HEADLINE: Carbon Dioxide Curbs May Not Halt Warming

SERIES: Occasional

BYLINE: William Booth, Washington Post Staff Writer

BODY:

Efforts to save the world from global warming by reducing greenhouse gases will not stop temperatures from rising but instead may only delay warming by a decade or two, according to energy experts and atmospheric scientists.

To slow the worldwide warming that many climate experts fear will accelerate during the next century, environmentalists, several European governments and some U.S. legislators are calling for a 20 percent reduction by the year 2000 in emissions of carbon dioxide, which collects in the atmosphere and traps heat, causing the so-called greenhouse effect. The supreme byproduct of the industrial world, carbon dioxide is produced by burning almost anything, especially fossil fuels such as coal and gasoline.

Yet a 20 percent reduction may have a barely noticeable effect on climate change in the short term, according to John Firor of the National Center for Atmospheric Research in Colorado, whose 1988 editorial in a scientific journal became the foundation for calls to reduce carbon dioxide emissions.

"What do we get for all this effort? The answer is going to be a little weak. We'll be ahead a few tenths of a degree. My instinct is that this is not going to impress a congressman very much," Firor said.

Firor's rough calculations indicate that if carbon dioxide were reduced by 20 percent, the Earth would still warm by about one-third of a degree Fahrenheit per decade. If nothing were done and carbon dioxide levels continued to climb, the world would warm by about one-half of a degree Fahrenheit each decade, according to a computer simulation.

Many climate researchers agree that the world will grow warmer, but they disagree on the amount of warming and when the change will be detectable.

"We're not talking about stopping the warming by any means, but we're talking about slowing the warming down. We're going to need all the time we can get," Firor said. "To sell the idea, you have to convince them that stabilizing the atmosphere is important and that if you can slow down the rate of change, that's very important, too."

Firor and other scientists say that slowing down the warming by a decade or two may give plants and animals, as well as agriculture, more time to adjust to new conditions, which could include rising sea levels and changes in rainfall and temperature patterns.

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Firor said the world might eventually have to cut its carbon dioxide production by half in order to stabilize the gas in the atmosphere but that this might not happen until the world had already warmed an average of 4 or 5 degrees Fahrenheit, an increase that still could have significant and perhaps catastrophic effects. In fact, scientists say it might even be necessary to reduce emissions by as much as 90 percent to reverse warming and to restore the climate to that of pre-industrial times before man-made carbon dioxide began accumulating in the atmosphere.

Yet because carbon dioxide emissions are so fundamental to industrial society as it is currently constituted, it is far from certain that emissions could be reduced by even 20 percent in the current decade, let alone cut in half by early in the next century. Many experts say reducing carbon dioxide would mean nothing less than a profound change in the way the world produces and uses energy.

"It's like going to war, except there's no enemy," said one researcher.

To investigate the technical feasibility of such dramatic cuts, at least a dozen studies are underway by federal agencies and private environmental and energy groups.

While they are still extremely preliminary, the studies offer a kind of first draft for a new and more efficient world, where people would drive gas-stingy cars or pay hefty "carbon dioxide taxes" to operate gas-guzzlers; where coal-fired electricity-generating stations would be shut down and replaced by a combination of solar energy collection farms, huge biomass burners and nuclear plants; where such everyday appliances as refrigerators and lightbulbs would be tens to hundreds of times more efficient.

Environmentalists have argued that increasing efficiency and switching away from dirty sources of energy such as coal is economically sound and ecologically important regardless of whether global warming scenarios prove correct.

"Can it be done? Yes it can, because it is both trivial and lucrative," said Arthur Rosenfeld, an energy expert and physicist at the University of California at Berkeley.

But there is tremendous disagreement about the cost and disruption to society of such reductions. Recent calculations by a Stanford economist and colleagues put the price tag at more than $ 3 trillion. Other economists project the cost to be far less. Indeed, a National Academy of Sciences panel is meeting next week to investigate whether it is possible to estimate costs of reducing carbon dioxide and the other greenhouse gases.

"Is change affordable? That is the big issue," said Barry McNutt of the Energy Department's Office of Policy, Planning and Analysis. "I don't think a single study has good cost estimates."

On a recent television news talk show, White House chief of staff John H. Sununu, in explaining his alteration of a speech President Bush delivered to the International Panel on Climate Change -- a wording change that environmentalists criticized -- said, "There's a little tendency by some of the faceless bureaucrats on the environmental side to try and create a policy in this country that cuts off our use of coal, oil and natural gas. I don't think America wants not to be able to use their automobiles."

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In fact, few energy experts are talking about Americans giving up their cars. Rather, they're talking about Americans giving up big cars.

Because there is not enough time to develop exotic new fuels such as nuclear fusion or perhaps even to gain wide public and economic acceptance for atomic energy and solar cells, the centerpiece of most studies is conservation of energy through increased efficiency.

In the residential sector, analysts say there would have to be vigorous campaigns to get people to buy more efficient water heaters, lights, freezers, refrigerators, space heaters and air conditioners. But even if everyone changed their appliances and lightbulbs tomorrow, Dick Rowberg of the Congressional Research Service said, this would reduce carbon dioxide emissions at best by only a few percent.

In the commerical sectors, builders would be required to use energy-saving windows, super-efficient air-conditioning systems and new types of lighting. Marc Ross of the University of Michigan believes that a substanial reduction is possible in the industrial sector if manufacturing plants were forced or encouraged to switch from coal to natural gas, and to increase overall efficiency by redesigning production systems so as to recycle more materials and waste less.

Like the other researchers, Ross targets coal for severe reductions. A large part of U.S. electricity is generated by burning coal, which emits large amounts of carbon dioxide.

Curiously, however, in a speech last month spoke before the World Coal Conference in New Orleans, Deputy Energy Secretary W. Henson Moore gave a endorsement of the future of coal in the United States, even after acknowledging the threat of greenhouse warming.

Some analysts have also suggested that a massive effort to reforest the planet be undertaken. But Gregg Marland of Oak Ridge National Laboratory, who with physicist Freeman Dyson first suggested planting trees, calculated that quite a few trees would have to be planted to take up the excess carbon dioxide being pumped into the atmosphere.

For example, to soak up all the excess carbon dioxide the world produces each year, it would be necessary to plant a tree farm the size of Australia. Once the trees matured, and stopped taking up more carbon dioxide, another forest would have to be planted.

Even Bush's modest proposal to plant a billion trees, Marland calculated, would have no more effect than if each American turned off a 100-watt bulb for 90 minutes a day.

"My overall view is that it [reducing carbon dioxide] will be very difficult and very expensive," said William Fulkerson of the Energy Department's Oak Ridge National Laboratory in Tennesse. "It's not any accident that the world depends on fossil fuel. We're still hooked on fossil fuel because it is marvelous."

And yet, even the pessimists agree that something must be done. If not, they note, carbon dioxide levels will keep growing beyond the doubling that is forecast for the middle of the next century. That doubling point has been

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taken as a convenient measure to factor into the predictions, but it is arbitrary and, in the absence of controls, both carbon dioxide and global warming would continue to increase as long as energy use grows.

GRAPHIC: CHART, GLOBAL BARBON DIOXIDE EMISSIONS.(DATA FROM CHART NOT SHOWN.), TWP

TYPE: NATIONAL NEWS

SUBJECT: OZONE LAYER DETERIORATION; AIR POLLUTION; POLLUTION CONTROL AND ABATEMENT; GREENHOUSE EFFECT; ENVIRONMENTAL REGULATION

NAMED-PERSONS: JOHN FIROR

ENHANCEMENT: CARBON-DIOXIDE

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Public Papers of the Presidents

Remarks to the Intergovernmental Panel on Climate Change

25 Weekly Comp. Pres. Doc. 176

February 5, 1990

LENGTH: 1951 words

Thank you, Dr. Bolin, and thank you for all you're doing in leading this very important effort here. To Professor Obasi and Dr. Tolba and all the delegates of the World Meteorological Organization and the UNEP, the United Nations Environment Programme, let me commend all of you for coming together to examine an issue of such great importance.

I also want to salute Bill Reilly, our able EPA [Environmental Protection Agency]Administrator. He will become the next Cabinet official in the U.S. Government. I want to thank Assistant Secretary [of State]Bernthal for his leadership from the U.S. side of things and also salute my able Science Advisor, who is with us today, Dr. Bromley, who many of you know.

The recommendations that this distinguished organization makes can have a profound effect on the world's environmental and economic policy. By being here today, I hope to underscore my country's and my own personal concern about your work, about environmental stewardship, and to reaffirm our commitment to finding responsible solutions. It's both an honor and a pleasure to be the first American President to speak to this organization, as its work takes shape.

You're called upon to deliver recommendations which strike a difficult and yet critical international bargain: a convergence between global environmental policy and global economic policy, a bargain where both perspectives benefit and neither is compromised. As experts, you understand that economic growth and environmental integrity need not be contradictory priorities. One reinforces and complements the other; each, a partner. Both are crucial. A sound environment is the basis for the continuity and quality of human life and enterprise. Clearly, strong economies allow nations to fulfill the obligations of environmental stewardship. Where there is economic strength, such protection is possible. But where there is poverty, the competition for resources gets much tougher; stewardship suffers.

For all of these reasons, I sincerely believe we must do everything in our power to promote global cooperation: for environmental protection and economic growth, for intelligent management of our natural resources and efficient use of our industrial capacity, and for sustainable and environmentally sensitive development around the world.

The United States is strongly committed to the IPCC process of international cooperation on global climate change. We consider it vital that the community of nations be drawn together in an orderly, disciplined, rational way to review the history of our global environment, to assess thepotential for future climate change, and to develop effective programs. The state of the science, the social and economic impacts, and the appropriate strategies all are crucial components to a global resolution. The stakes here are very high; the consequences, very significant.

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The United States remains committed to aggressive and thoughtful action on environmental issues. Last week, in my State of the Union Address, I spoke of stewardship because I believe it's something we owe ourselves, our children, and their children. So, we are renewing the ethic of stewardship in our domestic programs; in our work to forge international agreements; inour assistance to developing and East-bloc nations; and here, by chairing the Response Strategies Working Group.

I have just submitted a budget to our Congress for fiscal 1991. It includes over $2billion in new spending to protect the environment. And underscoring our commitment to your efforts, I am pleased to note that funding for the U.S. Global Change Research Program will increase by nearly 60 percent, to over $1 billion. That commitment, by far the largest ever made by any nation, reflects our determination to improve our understanding of the science of climate change. We are working with our neighbors around the world to enhance global monitoring and data management, improve analysis, reduce the uncertainty of predictive models, and conduct regular reassessments of the state of science.

Our program allows NASA [National Aeronautics and Space Administration] and her sister agencies and all our international partners to move forward with the Mission to Planet Earth. That will initiate the U.S. Earth Observing System, in cooperation with Europe and Japan, to advance the state of knowledge about the planet we share. Furthermore, even as we wait for the benefits of this research, the United States has already taken many steps in our country that bring both economic and environmental benefits, steps that make sense on their own merits in terms of responsibility and efficiency, which help reduce emissions of CFC's [chlorofluorocarbons] and carbon dioxide and other pollutants now entering the atmosphere. Let me outline them very briefly:

We are pursuing new technology development that will increase the efficiency of our energy use and thus reduce total emissions.

We're crafting a revised Clean Air Act with incentives for our private sector to find creative, market-driven solutions to enhance air quality.

We've launched a major reforestation initiative to plant a billion trees a year on the private land across America.

And we're working out a comprehensive review and revision of our national energy strategy, with initiatives to increase energy efficiency and the use of renewable sources.

These efforts, already underway, are the heart of a $336 million Department of Energy program and are expected to produce energy savings through the year 2000 of over $30 billion while achieving significant pollution reduction. Quite a return on investment.

We're also working, through diplomatic channels with our colleagues in other countries and through innovative measures like debt-for-nature swaps, to do more than simply reduce global deforestation. We hope to reverse it, turn it around, not unilaterally but by working with our international neighbors.

The economics of our response strategies to climate change are getting intensive study here in our country, in the United States. We're developing real data on the costs of various strategies, assessing new measures, and

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encouraging other nations to follow suit. And we look forward to sharing this knowledge and technical support with our international colleagues. As we work to create policy and agreements on action, we want to encourage the most creative, effective approaches. Wherever possible, we believe that market mechanisms should be applied and that our policies must be consistent with economic growth and free-market principles in all countries. Our development efforts and our dialog can help us reach effective and acceptable solutions.

Last December at Malta, in my meeting with President Gorbachev, I proposed that the United States offer a venue for the first negotiating session for a framework convention, once the IPCC completes its work. I reiterate that invitation here and look forward to your cooperation in that agenda.

We all know that human activities are changing the atmosphere in unexpected and in unprecedented ways. Much remains to be done. Many questions remain to be answered. Together, we have a responsibility to ourselves and the generations to come to fulfill our stewardship obligations. But that responsibility demands that we do it right. We acknowledge a broad spectrum of views on these issues, but our respect for a diversity of perspective does not diminish our recognition of our obligation or soften our will to produce policies that work. Some may be tempted to exploit legitimate concerns for political positioning. Our responsibility is to maintain the quality of our approach, our commitment to sound science, and an open mind to policy options.

So, the United States will continue its efforts to improve our understanding of climate change -- to seek hard data, accurate models, and new ways to improve the science -- and determine how best to meet these tremendous challenges. Where politics and opinion have outpaced the science, we are accelerating our support of the technology to bridge that gap. And we are committed to coming together periodically for international assessments of where we stand. Therefore, this spring the United States will host a White House conference on science and economic research on the environment, convening top officials from a representative group of nations, to bring together the three essential disciplines: science, economics, and ecology. They will share their knowledge, assumptions, and state-of-the-art research models to outline our understanding and help focus our efforts. I look forward, personally, to participating in this seminar and to learning from its deliberations.

Our goal continues to be matching policy commitments to emerging scientific knowledge and a reconciling of environmental protection to the continued benefits of economic development. And as Secretary [of State] Baker observed a year ago, whatever global solutions to climate change are considered, they should be as specific and as cost-effective as they can possiblybe. If we hope to promote environmental protection and economic growth around the world, it will be important not to work in conflict but with our industrial sectors. That will mean moving beyond the practice of command, control, and compliance toward a new kind of environmental cooperation and toward an emphasis on pollution prevention rather than mere mitigation and litigation. Many of our industries, in fact, are already providing crucial research and solutions.

One corporation, for example -- and there are others, but I'll single out one of them -- 3M started an in-house program called Pollution Prevention Pays -- one company. And that has saved the company well over a half a billion dollars since 1975, prevented 112,000 tons of air pollutants, 15,000 tons of water pollutants, and almost 400,000 tons of sludge and solid waste from being

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released into the environment. They've done it by rewarding employees for coming up with ideas, and they have clearly demonstrated the benefits of doing it right.

Where developing nations are concerned, I know some argue that we'll have to abandon the free-market principles of prosperous economies. In fact, we think it's all the more crucial in the developing countries to harness incentives of the free enterprise system in the service of the environment. I believe we should make use of what we know. We know that the future of the Earth must not be compromised. We bear a sacred trust in our tenancy here and a covenant with those most precious to us: our children and theirs. We also understand the efficiency of incentives and that well-informed free markets yield the most creative solutions. We must now apply the wisdom of that system, the power of those forces, in defense of the environment we cherish.

Working together, with good faith and earnest dialog, I believe we can reconcile vitality with environmental protection. And so, let me commend you on your outstanding work and wish you all deliberate speed in your efforts to address a very difficult, but very important, human concern.

Thank you all very much. It is a great pleasure to be the first President to address this distinguished group. Thank you very much.

Note: The President spoke at 10:20 a.m. at Georgetown University's Leavey Center. In his remarks, he referred to Bert Bolin, Chairman of the Intergovernmental Panel on Climate Change; G.O.P. Obasi, Secretary-General of the World Meteorlogical Organizations; and M. K. Tolba, Executive Director of the United Nations Environment Programme.

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Econ. Rept – on Global Climate Chage.

→ Baker....

1) → Envirо. qual + ec. growth

ec. growth – means food for hungry.
..unmet aspirations, need.

4 pts. →

→ human consq. of global change.

ENERGY:

PRODUCTION, CONSUMPTION, AND CONSEQUENCES

John L. Helm
Editor

National Academy of Engineering

NATIONAL ACADEMY PRESS
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Pp. 75–84. Washington, D.C.: National Academy Press.

Global Environmental Forces

THOMAS C. SCHELLING

Greenhouse warming is global in at least two respects. First, carbon dioxide (CO_2) and the other gases released or withheld anywhere on earth disperse rapidly into the global inventory. The location of origin makes no difference. Second, the effect will be a change in global circulation of air and water. Although the mean rise in atmospheric temperature is commonly used as an index of climate change, the change in temperature differential between equatorial and polar regions may be a better measure of global environmental forces.

The standard point estimate of global warming for a doubling of the concentration of CO_2 in the atmosphere is 3°C (National Research Council, 1982). But it is usually estimated that the warming in the polar regions associated with this 3-degree average change might be 8 or 10 degrees, whereas the change in atmospheric temperature near the equator might be closer to 1 degree (National Research Council, 1982). Offhand this sounds like a welcome dispersion of temperature change: it will mainly get warmer where it is already very cold and warm up the least where it is already hot. But more significant is that it is the temperature gradients between equatorial and polar regions that drive the winds, which in turn drive the oceans, and a change of 7 or 8 degrees in the mean temperature *difference* will change the atmospheric and oceanic circulation much more than would a uniform global rise in atmospheric temperature. Most climates may get warmer, some will undoubtedly become cooler. But the observed changes will include not only temperature and temperature variation from season to season and year to year but also, probably more importantly, the amounts,

the seasonal distribution, and the year-to-year variation in rainfall, snow, wind, fog, sunlight, humidity, and storms.

For the purpose of comparing forthcoming changes in climate with changes experienced in the past, the mean global atmospheric temperature is probably not only a reliable index but something of a measure of magnitude. Using the commonly accepted 3-degree rise from a doubling of the atmospheric concentration as an approximation to what may be forthcoming, the ensuing temperature will not only be well outside the range of atmospheric temperatures experienced in the past 10,000 years but may be several times the range of temperature variation experienced in that time. This observation is frequently expressed, and correctly, as a change in climate greater than any that mankind has experienced since the dawn of history. It is expressed more accurately as changes in *climates*—plural not singular—because different climates around the globe will change differently.

Without belittling the unprecedented nature of such climate changes or the prospect of some change that is not gradual but catastrophic, it is fair to point out that most people will not undergo in the next 100 years changes in their local climates more drastic than the changes in climate that people have undergone during the past 100 years. No climate changes are forecast that compare with moving from Boston to Irvine, California, or even perhaps from Irvine to Los Angeles. The Goths and the Vandals, the Romans and the Vikings, the Tartars and the Huns migrated through more drastic changes than any currently anticipated; Europeans who migrated to North and South America similarly underwent drastic climate changes. In this country in 1860 barely 2 percent of the population lived outside the humid continental or subtropical climates; in 1980 the percentages outside these zones had increased from 2 percent to 22 percent.

Furthermore the microclimates of urbanized Tokyo, Mexico City, and Los Angeles have not deterred their population growth; the microclimates of London and Pittsburgh changed dramatically during the century before 1950 and have changed again almost as dramatically since then. Even urbanization itself, without the associated air pollution, changes the conditions created by climate. Most Americans, Europeans, and Japanese never experience muddy roads anymore.

The expectation is that climates will change gradually, both over time and over space (National Research Council, 1983:Ch. 1–3). The climate of Nebraska may gradually change into the current climate of Kansas, not into the climate of Massachusetts or Oregon. Climates will "migrate." This expectation is on the whole reassuring, but it could be mistaken. The models used in the computer simulation of climate may be incapable of producing discontinuities because the current state of meteorological knowledge is confined to continuous processes. There may be no reason to expect

discontinuities, but the fact that the models produce no discontinuities may reflect an inability to design models based on the state of the art that can discover such phenomena.

Aside from a possible rise in ocean level, which I shall discuss presently, the most predictable physical and economic consequences of climate change will be in agriculture. By "predictable" I mean not that the actual changes can be predicted but that it can be reliably predicted that there will be changes. These will be changes in rainfall, winter snow for summer irrigation, humidity, daylight and cloud cover, and perhaps the health and comfort of livestock.

There is no reason to believe that the revolutionary improvements in agricultural productivity that have developed over the past 75 years and that in many cases have spread worldwide will not continue. Depletion of soils may continue, but control over plant and animal genetics and the possible production of new proteins may drastically change for the better what crops people will grow and what foods they will eat 50 or 100 years from now. An increase in the cost of food production by 5 or 10 percent, even 20 percent, which would be a somewhat extravagant estimate, may easily be offset many times over by another century's improvements in agricultural productivity.

There will undoubtedly continue to be parts of the world that are intractably poor and dependent for a livelihood largely on local production of food or other climatically dependent crops. These countries may have little of the capacity to adapt that the more advanced countries can afford. So even if the damage to food production may not average enough on a global scale to be cause for alarm—may not even be noticeable—there may be particular areas in which the damage to agriculture coupled with population growth could severely retard progress. (Population growth may be the more serious.) This situation may demand foreign aid to the poorest countries. I would neither expect nor recommend foreign aid directly related to hardships induced by climate change, but rather aid to the poorest.

What I have said so far will sound to many readers as insufficiently alarmist. "Optimistic" it may appear. One reason for the unexcited tone, which I shall elaborate shortly, is pessimism, not optimism. I do not believe that serious measures will be taken over the next quarter century to curtail the emissions of carbon into the atmosphere. I do not believe that even an alarmist appraisal will lead to a substantial policy response. I therefore do not believe that exaggerating the dangers will serve a useful purpose.

But there is, I acknowledge, another reason why my assessment is so mild. As I mentioned earlier, I am attempting to assess predicted changes, and it may be that our climate models predict only what we understand well enough to include in the models. Maybe we are also good at adapting to

phenomena we understand, as well as good at predicting them; and the ones we do not understand well enough to predict will cause difficulty because we do not understand them well enough to adapt. In other words, there is bias in our assessment of dangers: those we understand well enough to perceive we understand well enough to overcome, those that we have no hints of may be the dangers we would least know how to meet and overcome. Reduced rainfall in Kansas 25 or 50 years from now we may adapt to with moisture-conserving agricultural techniques, genetically altered crops that require less moisture, or the acquisition and transport of water. The phenomenon is familiar, the adaptations are familiar, and the predictions are based on familiar principles of meteorology. The "collapse" of the West Antarctic Ice Sheet would be an altogether different phenomenon.

As recently as 15 or 20 years ago, the accepted estimates were that the grounded ice—ice resting on the sea bottom and rising a kilometer or more above sea level—might, with a warming of the oceans attendant upon a warming of the atmosphere, slide or glaciate into the ocean within 75 years, causing a 20-foot rise in sea level. Like seismology in response to the test-ban controversy of the 1950s, glaciology has advanced in the past decade or two, assisted by satellite sensing, and the currently accepted estimates are that if that grounded ice should be added to the ocean level it is likely to be gradual and to take several hundred years. The urgency of that particular danger is thus reduced by an order of magnitude (unless further rapid advances in the relevant glaciology bring comparable changes in estimates back in the opposite direction). What is worrisome is that there may be other phenomena, perhaps, like the ocean level, not being perceived as "climatic," that could be as devastating as a 20-foot rise in sea level and that will not, upon further inspection, yield to more benign estimates.

When asked for an example, I can of course protect myself by pointing out that predicting the unpredictable, foreseeing the unforeseen, especially as an amateur, cannot be demanded of me. But when I am in a mood to worry I think about possible changes in the Gulf Stream and the Japanese current. The current global circulation models, as I understand it, do not include changes in the direction and velocity of ocean currents, and I am not sure that enough is known about the response of ocean currents to changes in wind patterns to predict whether there may be *catastrophes*, that is, flipflops from one equilibrium to another, rather than gradual change. Thus, there may be a missing feedback loop from warming to winds to currents to climate that, when added to the current models, will produce something more worrisome than the migration of the climate of Kansas to South Dakota.

As I said at the outset, the problem is global; and that is why it is exceedingly unlikely that anything substantial will be done to curtail fossil

fuel emissions. Any nation that attempts to mitigate changes in climate through a unilateral program of energy conservation or fuel switching (or expensively scrubbing CO_2 from smokestacks) in the absence of some international rationing or compensation arrangement, pays alone the cost of its program while sharing the benefits with the rest of the world. Consider the Federal Republic of Germany, which accounts for about 4 percent of world's energy consumption and just about 4 percent of each of the three fossil fuels, coal, oil, and natural gas. If that country took the drastic step of reducing by one-third its consumption of fossil fuels, the cost in lost productivity and consumer welfare, even if it were done gradually over a period of two decades, could be equivalent to 3–4 percent of its gross national product while the concentration of CO_2 in the atmosphere would be reduced by barely 1 percent. Even for the United States, the largest energy consumer of all, phasing in a one-third cutback in fossil fuel consumption over the next 20 years at a cost perhaps equivalent to $150 billion or $200 billion per year at today's prices and income levels, would reduce emissions worldwide by less than 10 percent. The time to a doubling of CO_2 in the atmosphere might be reduced from something like 85 years to 80 years. I think it is a fair estimate that for no *individual* country, with the arguable exception of the United States, is it economical to curtail CO_2 emissions unilaterally in the interest of retarding climate change.

Any significant effort to curtail emissions would require an international rationing regime, covering the larger fraction of world energy consumption, to ration the consumption of energy, or the consumption of fossil fuels, or the consumption of carbon, in some manner that could confidently be expected to remain in force long enough to be effective, say 50 years or more. It would have to include the Soviet Union, it would have to include the People's Republic of China, and it may well have to include the Organization of Petroleum Exporting Countries (OPEC). It would require mandating compliance on the part of scores of nations that would greatly prefer to be outside the regime. And it would require for many nations trading urgently needed economic growth now for the dubious future benefits of a rationing scheme that depended on a more disparate membership than even that of OPEC. Eventually, because most of the world's known coal resources are in the Soviet Union, China, and the United States, the scheme would require those three nations to collaborate effectively and indefinitely as a cartel.

The political likelihood of solid and confidently expected collaboration of that kind would be approximately zero if energy were a homogeneous commodity consumed uniformly worldwide. But to put in effect a rationing scheme the impact of which will begin to hurt and be effective only after several decades of energy growth would require dealing with economic growth itself, and that in turn requires attention to things like population

growth (Ausubel and Nordhaus, 1983; Nordhaus and Yohe, 1983). Do the Chinese claim that a policy of zero population growth is more than sufficient as a curtailment of energy use and that their country should therefore be exempt? Do the countries in the Organization for Economic Cooperation and Development participate as a unit, negotiating long-term shares in energy growth? Is there any chance they could be more successful than they have been with defense budgets, oil imports, or agricultural trade?

My pessimistic conclusion is that nothing of the sort is going to happen. I do not believe the Montreal Protocol on Substances that Deplete the Ozone Layer, signed in September 1987, is any harbinger for suppression of CO_2. Economically what is at stake is two or three orders of magnitude greater for fossil fuels than for chlorofluorocarbons (CFCs) and the prospects for technological replacement of CFCs are much brighter. (The Ozone Protocol does illustrate the need for worldwide collaboration to make restrictions worthwhile: the treaty takes effect only when ratified by nations representing two-thirds of world consumption.)

If world politics change as much in the next 75 years as in the past 75, a global fuel regime of some kind may become possible, but none is now foreseeable. If I am wrong, and world rationing of fossil fuels becomes economically and politically feasible, we shall still face the prospects for climate change. There is absolutely no possibility that fossil fuel emissions can cease altogether in the foreseeable future, and even the most optimistic could hardly hope that fuel emissions would stop growing within the foreseeable future. A most ambitious goal might be to reduce by half the growth rate in fossil fuel emissions. (As the fraction of fossil fuels represented by petroleum and natural gas declines over the coming century, fossil fuel consumption will have to increase at less than half the unrestricted growth rate in order that carbon emissions be only half what they might otherwise be.) A not unreasonable estimate, for purposes of illustration only, of growth in fossil fuel consumption over the next half century might be 2 percent per year, a rate at which the atmospheric concentration of CO_2 might double in about 85 years, reaching 50 percent elevation in about 50 years. Holding emissions to 1 percent growth would carry us beyond the middle of the next century before we reached concentrations half again as great as today's. The implied curtailment in emissions, at 1 percent compared with 2 percent, would be 10 percent at the end of the first decade, 25 percent at the end of three decades, and 40 percent by the end of five decades. That seems to me to be the outside limit to what might be economically acceptable worldwide. (How that 40 percent aggregate curtailment would be shared among consuming nations I hesitate even to conjecture.)

National programs to phase in nuclear power to replace fossil fuels for electricity, even for the production of hydrogen fuels, may again become popular. But it is still hard to measure the half-life of anxiety resulting from

the accidents at Three Mile Island and Chernobyl. Any new reactors will have to be economical as well as clean. Cutting the growth of emissions from 2 percent to 1 percent may well require all electric power capacity in the future to be nuclear.

Energy conservation measures deserve emphatic attention, but investments in conservation will mainly be limited to what the private economy finds economical. National or international policy will probably be limited to research, development, demonstration, and technology transmission. Energy-efficient investments may yet get a boost from another doubling or more of the price of crude oil, but that is probably not a boost to be hoped for.

What else may be done to cope with the greenhouse problem? CO_2 can be removed from the atmosphere by increasing the mass of living vegetation or by "refossilizing" timber, burying it underground or in the ocean or coating it so that it cannot oxidize. And CO_2 can be scrubbed from smokestacks at very substantial expense. Probably at enormous expense, some attenuation could be achieved in this fashion. (Some small increase in the carbon density of forests may result naturally from the enhancement of CO_2 in the atmosphere.) The concentration of CO_2 will therefore certainly increase, and at an increasing rate, and I consider it unlikely that we shall be rescued much before the concentration has nearly doubled.

The main response will be adaptation, and most of that by ordinary people and businesses. Some of the adaptation will be by governments, but local and regional governments as much as national governments. There will be changing climates to cope with, changing urbanization, changing population densities, and in most countries probably drastic changes in the ways that people live and work and transport themselves, perhaps significant changes in what they eat. Much of the adaptation will seem generally "environmental" rather than specifically climate oriented. And, of course, there is continuous adaptation to climate even when it is not changing: we change the technology and the efficacy with which we heat ourselves and cool ourselves and clean our air and protect ourselves from storms and cope with droughts and floods and dispose of snow. The pace of change may be such that people will find themselves adapting to *climate* rather than to *changing climate*. Just as businesses shift to take advantage of better productive climates, they will keep shifting to better climates with perhaps small regard for the prospects of changing climates in given locations.

There remains to be discussed a response to climate change that receives so little attention that it deserves emphasis here—direct intervention in weather and climate. When Thomas F. Malone was chairman of the Committee on Atmospheric Sciences of the National Research Council, he wrote, 20 years ago, "The possibility that large effects may be produced

from relatively modest but highly selective human interventions opens up the possibility that weather and climate modification may some day be operationally feasible" (Malone, 1968:1136). And of the modification of hurricanes he said, "If five years are allowed for the development of an adequate mathematical model, five more years for assessing the consequences of interventions of various kinds, and then ten years of field experimentation for validation, it seems unreasonable to expect much before 1990, with the probabilities fair to good that a proven technology will exist by the year 2000." He added, "The probability of success in broad climate modification is likely to exceed 50 percent by the year 2018" (1968:1138), that being the 50-year mark from the time he wrote.

Most experiments with weather modification or with changing geographical features that may lead to climate change have been local and regional. That has been true of cloud seeding and would be true of the manipulation of hurricanes. In a discussion of greenhouse warming, the possibility of global intervention has to be considered. An important kind of human intervention in global climate may be efforts to change the radiation balance itself. We know it can be done: we are doing it. That is what the greenhouse discussion is all about. The fact that we are doing it unintentionally, and the fact that the consequences may not be welcome, do not contradict that we know how, at some expense if necessary, to change the world's climate more than it has changed in the last 10,000 years.

Warming the atmosphere currently is more economical than cooling it because it happens as a by-product of energy consumption that would be costly to reduce or terminate. If we were faced with a "little Ice Age" over the next century, we might be glad to get some of that CO_2 in the atmosphere at no cost and without having to negotiate climate change diplomatically.

But we know that, in principle, cooling could be arranged. Volcanic eruptions have done it. Discussions of "nuclear winter" took seriously the possibility that human activity might lower global temperatures cataclysmically. Considering the development of nuclear energy in both its explosive and its controlled uses and the feat of landing a team on the moon and returning it safely, and that we now know how to warm the earth's atmosphere and possibly to cool it (though through unacceptable means), we should not rule out that technologies for global cooling, perhaps by injecting the right particulates into the stratosphere, perhaps by subtler means, will become economical during coming decades.

A more benign example, compared with nuclear winter or induced volcanic eruptions, may be the manipulation of cloud cover. Let me again quote Thomas Malone (1968:1135).

> A characteristic of the atmosphere that frustrates the weather forecaster while providing a basis for optimism on the part of the weather modifier is a tendency

> for the processes in the atmosphere to demonstrate certain traits of instability. . . . For example, a small puffy-type cloud may grow to a towering thunderstorm in a matter of hours; a gentle zephyr in tropical latitudes may develop into a "killer" hurricane in a matter of days; and a small low-pressure center may grow to a vigorous extratropical cyclone within a single day. . . . An avenue may be opened up by which great effects may be produced from relatively modest but highly selective human interventions.

If somebody learned in the next 50 years how to affect the extent and global distribution of certain kinds of cloud cover, incoming radiation may become manipulable by nations, international agencies, or even interested private organizations, depending on the nature of the technology, its expense, and perhaps geographical considerations.

It is difficult to mention such a possibility without appearing to recommend it, or to use it as a "technological fix" in the future to divert attention from some need for immediate policy intervention. I am not recommending, I am predicting. Independently of CO_2, we have to consider that weather and climate modification may become feasible in a period of time no longer than the elapsed time since electronics, genetics, antibiotics, and nuclear fission were unimagined. The greenhouse warming may generate an interest among most nations in moderating the changed radiation balance, and if it proves more expensive to facilitate outgoing radiation than to obstruct incoming, there may be powerful motives for considering it. And if the technique for moderating incoming radiation were globally uniform or nearly so, an international agreement would have only to decide how to share the costs, a unidimensional problem compared with sharing the reduction of emissions.

If intervention is more regional than global, or global but not uniform in its distribution, intervention could become exceedingly controversial. Mexico and China are counting on those hurricanes—they are an essential source of rainfall for crops—whereas the Cubans, Filipinos, Japanese, and residents of the Texas coast would suppress them if they knew how.

In closing I must say a word about sea level. I believe the current wisdom is that we may be in for rising sea level that could be on the order of a meter per century for several centuries (Robin, 1986). Anything upwards of a meter, perhaps even half a meter, would primarily be due to the collapse of the West Antarctic Ice Sheet. The full 20-foot rise corresponding to the complete disappearance of that body of ice would put the White House rose garden under water, make Beacon Hill in Boston an island, and isolate the southern third of Florida by making the middle third disappear under water.

A country like the United States should be able to adapt (eventually by doing, perhaps, what the Dutch have been doing for centuries—constructing dikes). No such "easy" solution is available to a country like Bangladesh, which is densely populated in large areas that would be inundated by the

full sea level rise, and which could not be protected with dikes. (If dikes were erected along the coastline to protect against seawater flooding, the area would simply be flooded with fresh water that could not flow out to sea.)

If current estimates hold up, the potential devastation of rising sea level will mainly be 100 years away, and the government of Bangladesh should worry much more about population and productivity than climate change. If the more prosperous nations were prepared to help Bangladesh at great expense to themselves, aid now would probably appeal more to Bangladesh than heroic efforts to forestall floods a century hence. (That country already has floods to cope with in this century!)

Estimates of rising sea levels depend not only on thermal warming of the oceans, melting of glaciers, and what happens to the West Antarctic Ice Sheet; they can also depend on what happens to the Antarctic climate. There has been some conjecture that a warming of the South Polar air may lead to greater snowfall on Antarctica. The area of Antarctica is about one-fortieth the area of the oceans; a 1-centimeter rise in ocean level would be offset by a 40-centimeter rise in the water content of the snowfall on Antarctica, or an average snowfall of 4 meters per year. Storing water as ice on Antarctica might be the ideal solution to the water-level problem. Even the people most offended at the thought of deliberately tampering with our climate to offset the greenhouse gases may agree that learning to make it snow on Antarctica is a worthwhile project for the next century.

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ECONOMICS AND POLICY OF CLIMATE CHANGE

Survey of the State of the Art

The White House
April 6, 1990

WARNING LABEL ON GLOBAL WARMING:

THIS TOPIC CONTAINS ENORMOUS UNCERTAINTY.

WE KNOW ALMOST NOTHING.

EXHIBIT 1

GLOBAL WARMING ECONOMICS

- Growing Concerns on Climate Change

- Key questions:
  1. Science and Economic Outlook
  2. Damages from Climate Change
  3. Costs of Slowing Climate Change

- Policy Cart in front of Science Horse

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EXHIBIT 2

SCIENTIFIC ASSUMPTIONS

- STIPULATE THE USUAL IMPACT OF GASES ON CLIMATE CHANGE:
  - 3o C warming from 2 X CO2
  - Likely to occur in 2075-2100
- MAJOR GREENHOUSE GASES
  - Proliferation of GHGs
  - But CO2 the Major Warmer
- ENORMOUS UNCERTAINTY IN ALL PROJECTIONS

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EXHIBIT 3

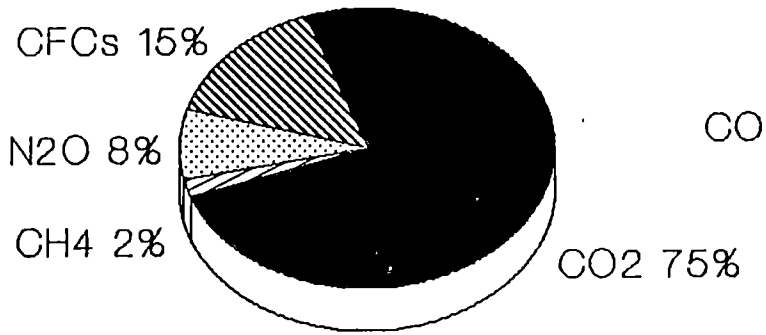
Estimated Atmospheric Concentrations of Important Greenhouse Gases

Greenhouse gas	*Level (parts per billion)*			*Growth (percent per year)*	
	1850	*1986*	*2100*	*1850–1986*	*1986–2100*
Carbon dioxide					
(thousands)	290	348	630	0.16	0.52
Methane	880	1675	3100	0.56	0.54
Nitrogen oxides	285	340	380	0.15	0.10
Chlorofluorocarbons	0	0.62	2.90	. . .	1.37

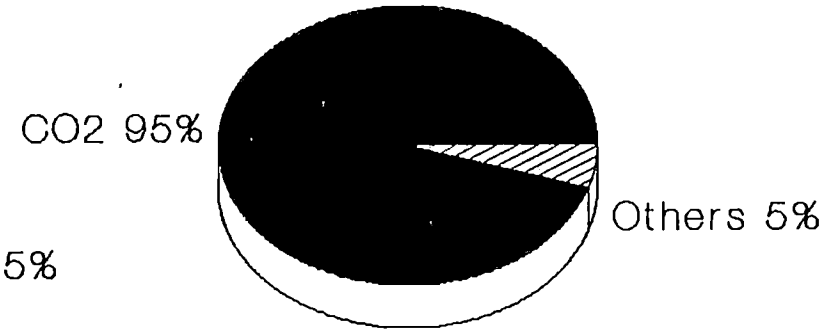
EXHIBIT 4

TOTAL WARMING POTENTIAL

Greenhouse Gases Emissions



1985



1985-2100

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EXHIBIT 5

Estimated Contribution of Different Greenhouse Gases to Global Warming for Concentration Changes, 1985–2100

Greenhouse gas	*Relative contribution (percent)*		*Source of emission*
	Instantaneous	*Total*	
Sources by chemical compound			
CO_2	76.1	94.7	Largely from combustion of fossil fuels
Methane	9.6	0.8	Poorly understood; from a wide variety of biological and agricultural activities
CFCs	11.6	3.3	Wholly industrial, including solvents and refrigerants
Nitrous oxides	2.7	1.2	From fertilizers and energy use
Sources by economic activity			
Energy	62.8	76.2	CO_2 emissions, nitrous oxides, methane
Agriculture	20.6	19.8	CO_2, methane, nitrous oxides
Industry	0.7	0.1	Methane
Natural	4.3	0.7	Methane, nitrous oxides
Other	11.6	3.3	Chlorofluorocarbons

EXHIBIT 6

Calculated Change in Temperature, 1800–2100

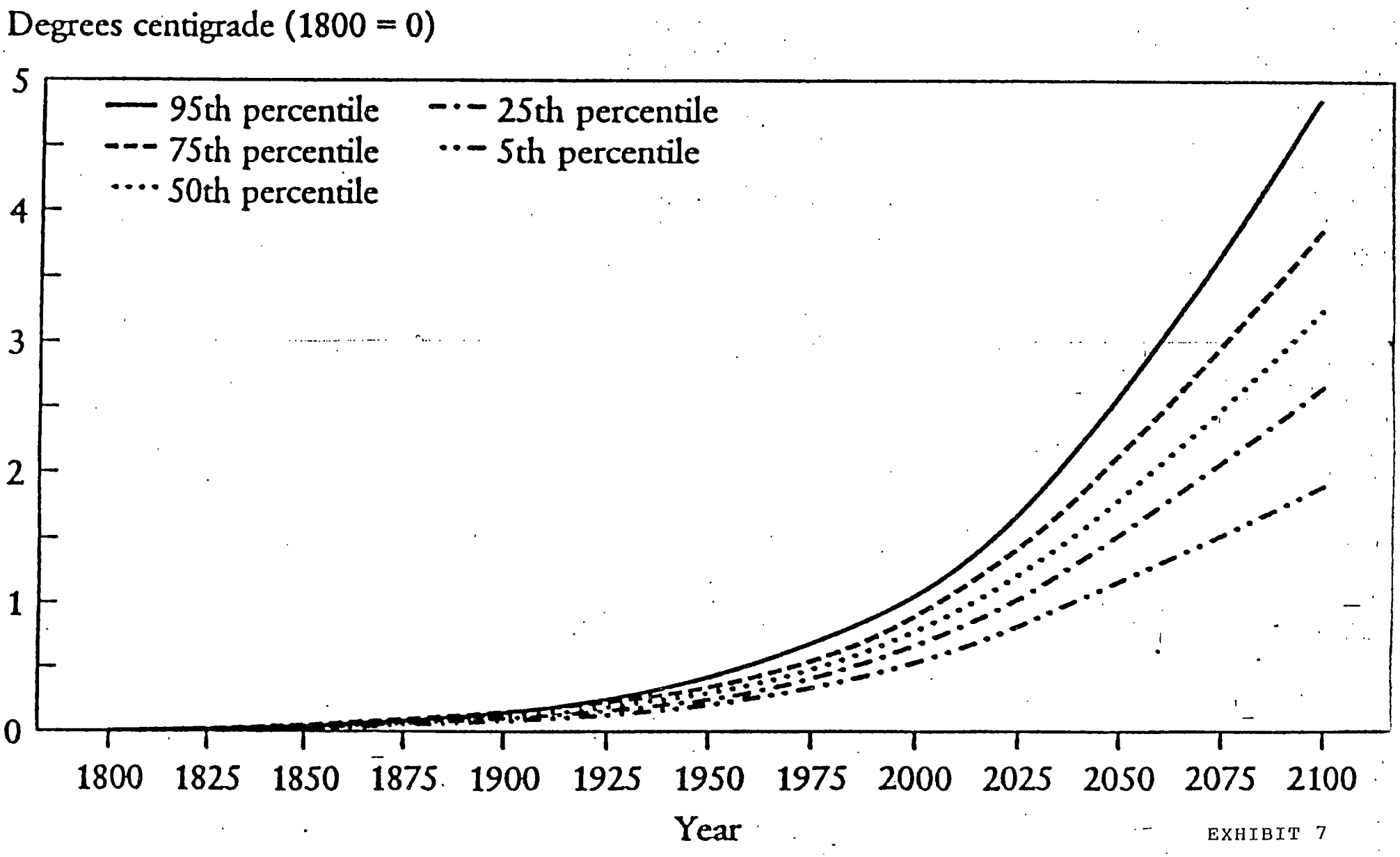


EXHIBIT 7

Actual Global Mean Surface Temperature and Estimated Distribution of Greenhouse Warming, 1850–2000[a]

Degrees centigrade (1880-90 = 0)

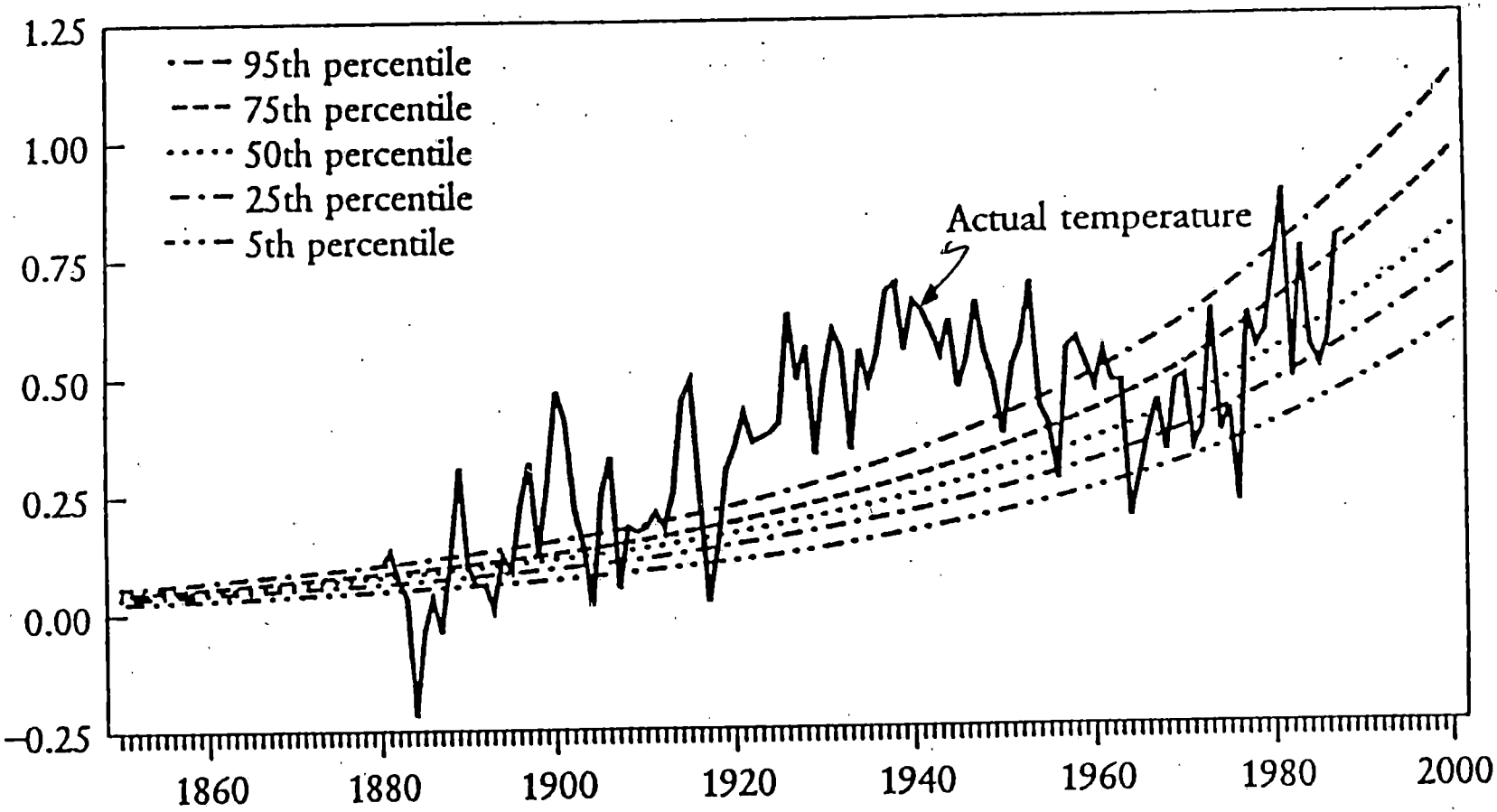


EXHIBIT 8

GNP BY CLIMATE SENSITIVITY

Estimates for United States, 1981

Sector	Percent of GNP
Potential Severe Impact (Farms, Forestry,...)	3 %
Potential Moderate Impact (Energy, Water, Real Estate,...)	10 %
Negligible Direct Effect (Manufacturing, Finance, Trade, Insurance,...)	87 %

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EXHIBIT 9

Breakdown of Economic Activity by Vulnerability to Climatic Change, 1981

Sector	*National income*	
	Value (billions of dollars)	*Percentage of total*
Total national income	2,414.1	100.0
Potentially severe effect	**74.8**	**3.1**
Farms	67.1	2.8
Forestry, fisheries, other	7.7	0.3
Moderate potential effect	**243.6**	**10.1**
Construction	109.1	4.5
Water transportation	6.3	0.3
Energy and utilities[a]		
Energy (electric, gas, oil)	45.9	1.9
Water and sanitary	5.7	0.2
Real estate		
Land-rent component[b]	51.2	2.1
Hotels, lodging, recreation	25.4	1.1
Negligible effect	**2,095.7**	**86.8**
Mining	45.1	1.9
Manufacturing	581.3	24.1
Other transportation and communication	132.6	5.5
Finance, insurance, and balance real estate	274.8	11.4
Trade	349.4	14.5
Other services	325.2	13.5
Government services	337.0	14.0
Rest of world	50.3	2.1

EXHIBIT 10

Impact Estimates for Different Sectors, for Doubling of CO_2

SECTORS	Billions (1981 $)
Severely impacted Sectors	
Farms	
Impact of Greenhouse Warming and CO_2 Fertilization	+12 to -12
Forestry, fisheries, other	small
Moderately Impacted Sectors	
Construction	positive
Water transportation	?
Energy and Utilities	
Energy (electric, gas, oil)	
Electricity demand	1.65
Non-electric space heat	-1.16
Water and sanitary	negative
Real Estate	
Land-rent component	
Estimate of damage from sealevel rise	
Loss of land	0.48
Protection of sheltered areas	0.90
Protection of open coasts	4.80
Hotels, lodging, recreation	?
TOTAL	
Central Estimate	
Billions, 1981 level of national income	6.67
Percent of national income	0.28

EXHIBIT 11

VULNERABILITY TO CLIMATE CHANGE

Measured By Share of Agriculture in GDP

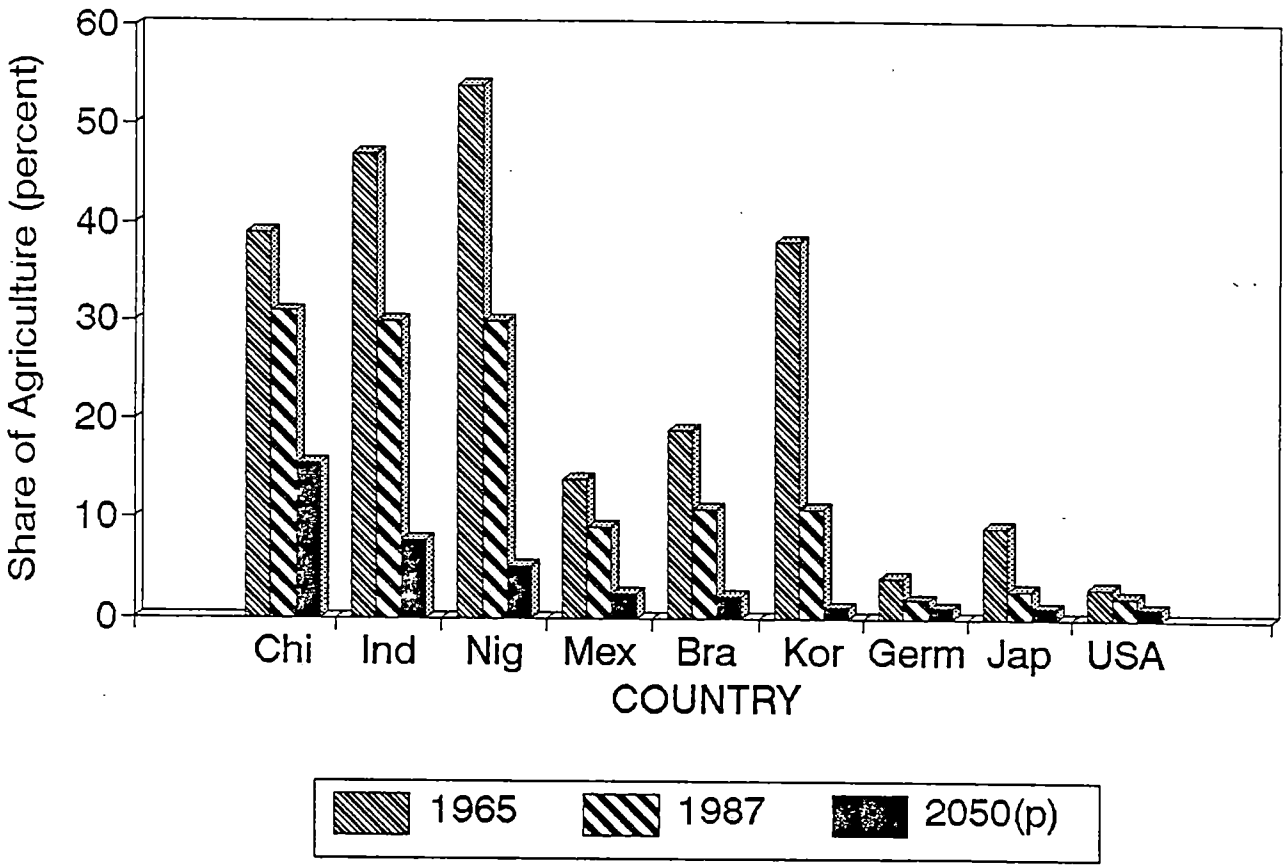


EXHIBIT 12

ALTERNATIVE RESPONSES
To Threat of Greenhouse Warming

- PREVENTIVE MEASURES
  - Reduce Emissions of CFC and CO_2
  - Forestry Options
- OFFSET CLIMATIC EFFECTS
  - Climate Engineering
- ADAPT TO WARMER CLIMATE
  - Market Adaptations
  - Government Policies
- MAJOR TIMING DIFFERENCES

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EXHIBIT 13

OPTIONS FOR EMISSIONS

Three Major Strategies

- REDUCE CFCs:
  -Substitute new materials

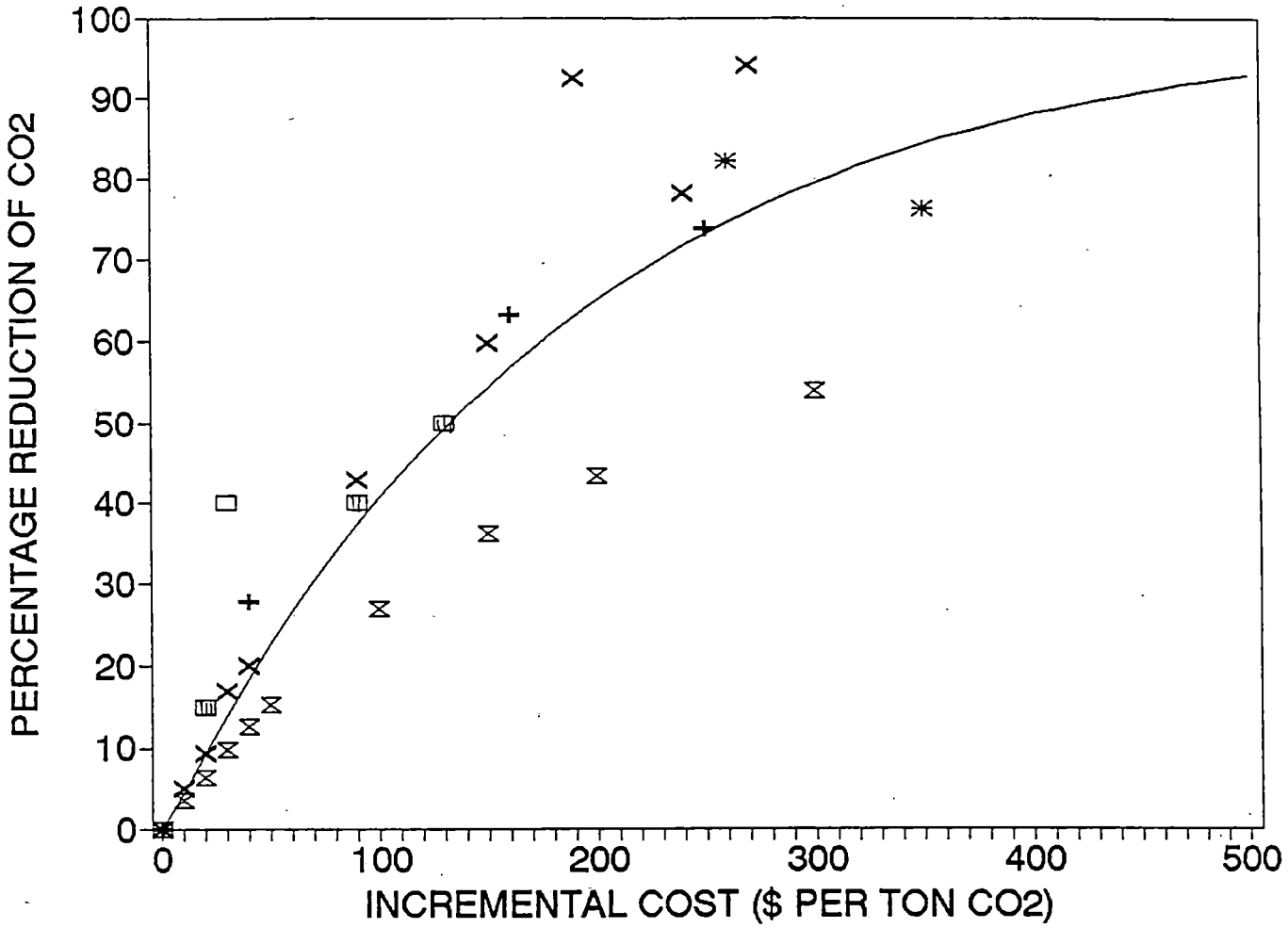
- REDUCING CO2 FROM ENERGY:
  - Conservation, fuel switching, new technologies

- FORESTRY OPTIONS
  - Slow deforestation
  - "Pickle trees" ?

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EXHIBIT 14

ESTIMATES OF COST OF CO2 REDUCTION



⧖ N-Y (behavioral) + N-Wm (new tech) □ E-R (behavioral)
✳ M-R (linear prog) × N-Arg (linear prog) —— AVERAGE

EXHIBIT 15

Total Global Cost of Greenhouse Gas Reduction

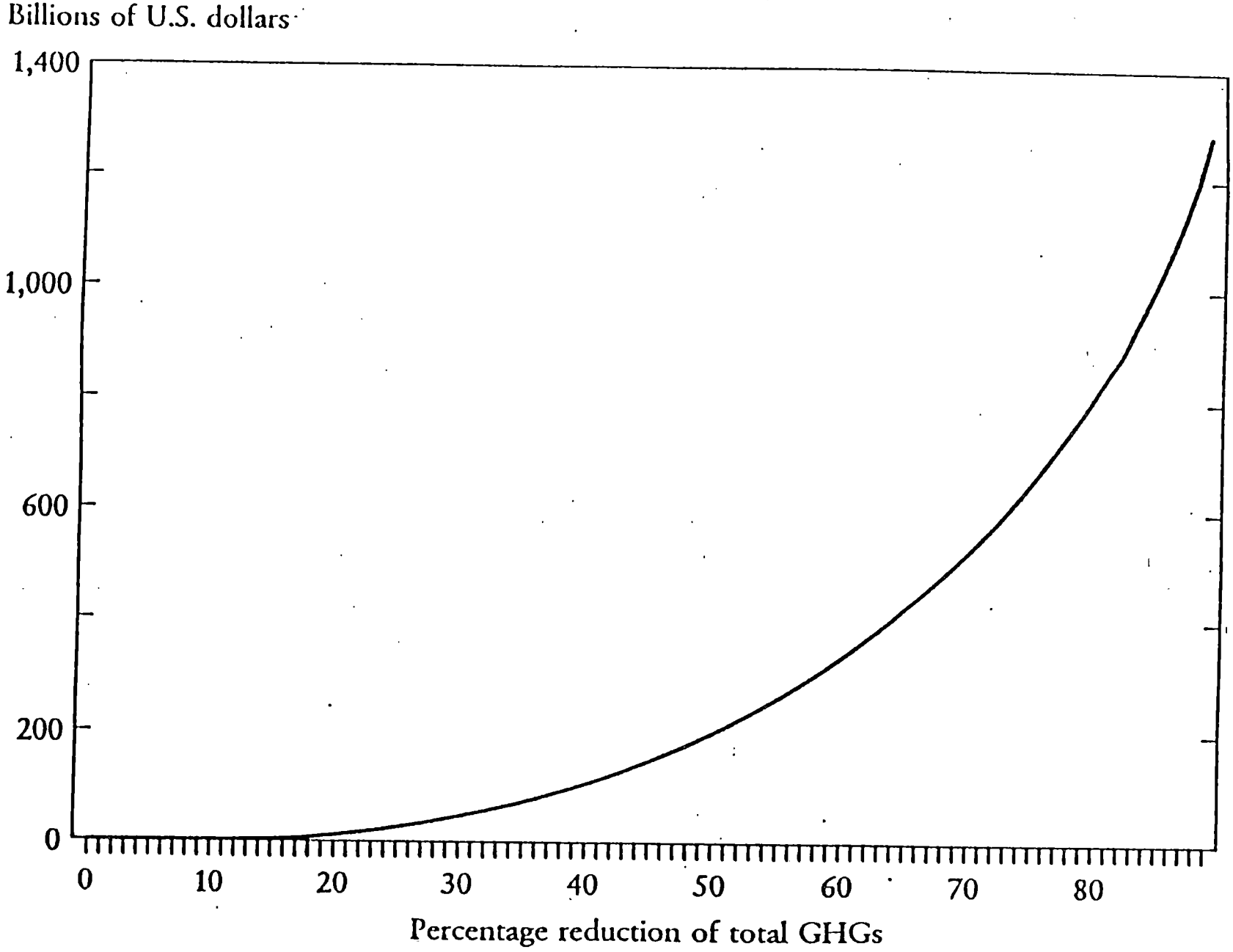
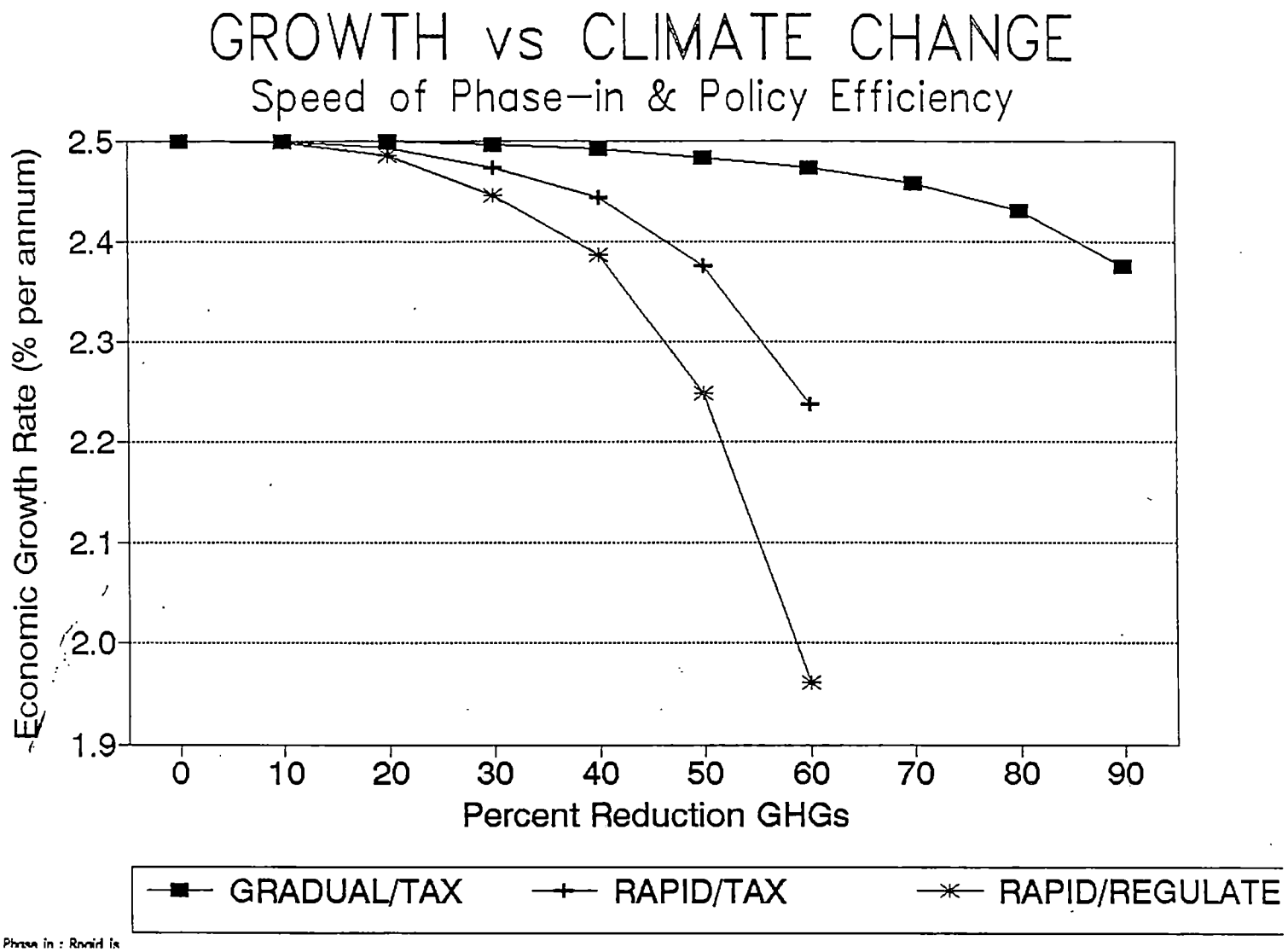


EXHIBIT 16



Phase in : Rapid is

EXHIBIT 17

POLICY FRAMEWORK
To Slow Greenhouse Warming

- 1. GATHER INFORMATION
- 2. NEW TECHNOLOGIES
- 3. "ALL WEATHER" POLICIES
- 4. CARBON TAXES OR FEES?

wh2

POLICY INITIATIVES

- 1. GATHER INFORMATION
  - Earth Systems
  - Impact Studies
- 2. NEW TECHNOLOGIES
  - Energy R&D: Non-fossil, nuclear
- 3. "ALL WEATHER" POLICIES
  - Energy Conservation
  - *Draconian* CFC Restraints
  - Market Mechanisms in Environment

wh1

EXHIBIT 19

4. FISCAL STRATEGIES

	GRADUAL	CRASH
CARBON TAX ("Climate Insurance Premium")	$5	$100
EMISSIONS REDUCTION	14%	45%
CFCs	12%	13%
CO2	2%	27%
Trees	0%	5%
US COST (1989 Econ)	$2B/yr	$40B/yr

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EXHIBIT 20

Measures of Effects of Different Carbon Taxes

Dollars unless otherwise specified

Sector of effect	*Level of stringency of GHG reductions*	
	Low	*High*
Tax effect		
Tax on CO_2 equivalent (per metric ton carbon)	5.00	100
Effect on fossil-fuel prices (1989 prices)		
Coal price		
Per metric ton	3.50	70
Percentage increase	10	205
Oil price		
Per barrel	0.58	11.65
Percentage increase	2.8	55
Gasoline price		
Per gallon	0.014	0.28
Percentage increase	1.2	23.3
Overall effects		
Estimated reduction of GHG emissions (CO_2 equivalent)	13	45
Total tax revenues, U.S. (billions)	10	196
Estimated global net economic benefits (+) or costs (−), billions of dollars per year, 1989 global economy	12	−96

EXHIBIT 21

RESEARCH OPTIONS FOR CLIMATE CONFERENCE

I. GATHER INFORMATION

- Natural sciences: monitoring
- Behavioral sciences
    - o Impact and adaptation studies: collaborative study on impact in developing countries
    - o Preventive studies: continue to investigate costs of GHG reductions

II. NEW TECHNOLOGIES

- CFC: critical need for R&D on substitutes
- Forestation:
    - o Alternatives to tropical deforestation; measures to induce countries to behave
- Energy:
    - o Crucial need for perestroika in federal energy R&D
    - o Promising new technologies: biomass, renewables, solar, conservation
    - o International collaborative effort to revive the nuclear option —

III. "ALL WEATHER" MEASURES

- Extreme urgency to tighten CFC accords
- Quasi-market mechanisms in "commons" sectors: pollution, water, coastal regions
- Strengthen energy conservation on fossil fuels (gasoline or fuel taxes and appliance or automobile fuel standards)

[whpol403]

EXHIBIT 22

CONCLUSIONS

- MAJOR FINDINGS:
  - "Very Cheap Lunch" for Modest Reduction
  - Major and Rapid Reduction Extremely Costly
- CURRENT POLICY REASONABLE
- ABOVE ALL:
  - Remember uncertainties about science and society

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THE WHITE HOUSE CONFERENCE
ON SCIENCE AND ECONOMICS RESEARCH
RELATED TO GLOBAL CHANGE

April 17-18, 1990

Washington, D.C.

THE WHITE HOUSE

WASHINGTON

April 5, 1990

Dear Colleague:

On behalf of President Bush, we are honored that you will be coming to the United States April 16-18 to serve as a delegate to the White House Conference on Science and Economics Research Related to Global Change.

By contributing your country's expertise in identifying the critical needs in the fields of science and economics research, you will advance international cooperation and understanding in dealing with the uncertainties of global change.

The United States welcomes a free and open discussion of the science and economics research issues related to global change. As co-chairmen of the Conference, we look forward to joining you in that effort.

Yours Sincerely,

D. Allan Bromley
Assistant to the President
for Science and Technology

Michael J. Boskin
Chairman
Council of Economic Advisers

Michael R. Deland
Chairman
Council on Environmental
Quality

PRE-CONFERENCE MATERIAL FOR DELEGATES

TABLE OF CONTENTS

- Overview of the Conference
- Preliminary Delegation List
- Conference Co-Chairmen Biographies
- U.S. Delegation Biographies
- Hotel/Transportation/Logistics

OVERVIEW OF THE CONFERENCE

GOALS AND OBJECTIVES OF THE CONFERENCE:

President George Bush invited the Heads of State from seventeen nations and the leadership of the E.C. and the OECD to send ministerial-level delegations to the White House Conference on Science and Economics Research Related to Global Change. The Conference is designed to bring together government leaders in science, economics, energy, and the environment concerned with the central research issues of Global Change. The Conference is designed to advance understanding of Global Change phenomena, to enhance international cooperation, and to build the basis for future efforts among nations to integrate more fully science and economics research into the policy process. The Conference adds a new dimension to the international dialogue on Global Change — the proposition that economics, both analysis and research on economic policy and economic consequences, is an essential link between the science of Global Change and policy alternatives. Science and economics research can also serve to identify and develop technologies and policy instruments that relax the tension between growth and Global Change, allowing for greater progress on both fronts. To address these broad goals, the Conference will:

- **Focus on science and economics research** issues relevant to policy on Global Change,
- Address important next steps to substantially **enhance and broaden international understanding** of science and economics research issues that relate to Global Change,
- **Highlight the special role that economics plays** in integrating the science of Global Change with the policy process,
- **Demonstrate linkages between science and economics** research and domestic and international policy processes, and
- Seek to take the initial steps to **implement joint international science and economics research efforts.**

The Conference is conceived as an integral part of the ongoing international process to understand the science of and policy options relating to global environmental issues. The need to improve substantially understanding of both the science and economics of Global Change has been noted by many world leaders. The Conference, therefore, focuses on science and economics research issues as a complement to the ongoing Intergovernmental Panel on Climate Change (IPCC) and other international forums that seek to address the issue of Global Change. It is hoped that the results of the Conference will contribute to the IPCC process and other ongoing international debates and actions.

The Conference focuses on "Global Change," an area of research concerned with understanding the fundamental processes that govern the Earth system functions. Global Change encompasses such diverse and interrelated issues as ozone depletion, greenhouse gases, climate change, food security, water supply, sea level changes, wetlands, deforestation, biodiversity, population change, and energy demand.

The Conference will provide a forum for international leaders to address the complex science and economics research issues central to the policy process, including:

- How well can we predict temperature trends in the decades ahead?
- How "good" are our global scale models, such as models to predict temperature changes?
- How well can we predict the interconnections between global environmental change and the resulting social and economic impacts?
- What are the economic consequences of adapting to or mitigatinGlobal Change?
- How "good" are the models used to assess these economic consequences and their impact on the well-being of humanity?

By addressing such questions, it is hoped that the nations might pledge to enhance joint international research efforts that focus on rapid improvement of both scientific and economic knowledge and development of the necessary infrastructure to implement such efforts.

To address these complex and interrelated issues, President Bush invited heads of state from a small group of nations to send delegations led by ministerial-level officials. The Conference was conceived with the idea that a representative group of countries would be invited to participate. Their selection was based on the simple criteria that the meeting should include countries or organizations of countries that have substantial populations, large land masses, industrialized economies, heavy future energy needs, major research infrastructures, or have provided international leadership on issues related to climate and Global Change. These countries and organizations were selected:

1. Australia
2. Brazil
3. Canada
4. Federal Republic of Germany
5. France
6. India
7. Indonesia
8. Italy
9. Japan
10. Mexico
11. Netherlands
12. Nigeria
13. Norway
14. Poland
15. Soviet Union
16. United Kingdom
17. Zaire
18. European Community
19. OECD

THE EXPECTED RESULTS OF THE CONFERENCE

The Conference will provide an opportunity to address the science and economics research issues related to Global Change in the context of the policy process. To accomplish these goals, the Conference will focus on and seek to promote:

- A substantially *enhanced understanding* of science, economics, and environmental research agenda central to the needs of future Global Change policy development.
- A *substantive understanding of the uncertainties* in both science and economics knowledge of changes in the global environment of the planet.
- *Increased mutual understanding* of and sensitivity to the substance of science and economics research between both of those research communities.
- *Increased sensitivity* by the two research communities to the policy needs evolving in such areas as environmental and energy policy, and vice versa.
- A *solid* and well implemented science and economics *research effort* as a prerequisite for a complement to evolving efforts by nations to address the international policy questions of global environmental changes.
- A communication *network among national leaders* concerned with, and responsible for, the research and policy agenda related to Global Change. More particularly, this Conference provides a "first-ever" opportunity to forge a partnership between the science and economics research communities and the policy-makers.

To provide a vehicle to focus on these vital issues, the Conference will include two Plenary Sessions and several concurrent Working Groups, which will address the three major themes of the Conference:

- The Science and Economics Research Challenge
- Integrating Science and Economics Research in the Policy Process
- Building a Partnership for Science and Economics Research

The Conference is expected to produce a Co-Chairmen's Report, which will outline the deliberations of the Conference and set forth common actions designed to expand research and cooperation among nations.

As President Bush stated in his invitation letter, "It is my hope that the expertise, experience, and data available in our respective countries can be brought together in a more integrated and coherent fashion. By working together, our nations can enhance international cooperation in these vital areas and contribute to the success of the ongoing IPCC process."

PRELIMINARY DELEGATION LIST

Current as of April 4, 1990; 12:00 Noon

BRAZIL

(tentative)

Name	Title
Jose Lutzenberger	Environment Secretary
Jose Goldemberg	Science Secretary

CANADA

(tentative)

Name	Title
Lucien Bouchard	Federal Environment Minister
Derek Burney	Ambassador to the U.S.
Dr. Ann White	Director, Canadian Global Change Program
Dr. Arthur W. May	President, the Natural Science and Engineering Research Council

FEDERAL REPUBLIC OF GERMANY

(confirmed)

Name	Title
Professor Dr. Klaus Töpfer	Federal Minister for Environment, Nature Protection and Nuclear Safety
Dr. Gebhard Ziller	State Secretary, Ministry for Research and Technology
Dr. Wilhelm Knittel	State Secretary, Ministry for Transportation
Baldur Wagner	Assistant Secretary, Federal Chancellery
Dr. Mario Graf von Matuschka	Assistant Secretary, Foreign Ministry
Dr. Horst Glatzel	Deputy Assistant Secretary, Federal Chancellery
Walter Lötz	Deputy Assistant Secretary, Ministry of Economics
Professor Dr. Ansgar Vogel	Deputy Assistant Secretary, Ministry for Environment, Nature Protection, and Nuclear Safety
Dietrich Kupfer	Director, Office of International Cooperation, Ministry for Environment, Nature Protection and Nuclear Safety
Professor Dr. Hartmut Grossl	Scientist, Max Planck Society, Hamburg

FRANCE

(tentative)

Name	Title
Minister Hubert Curien	Minister of Research and Technology
Minister Brice Lalonde	Secretary of State for the Environment
Jean Audouze	Science Advisor to the President
Claude Alegre	Special Advisor to the Minister of Education
Ambassador Jean Ripert	Ministry of Foreign Affairs (Environment)
Yves Martin	Chairman of the Interministry Committee on Greenhouse
Madame Borione	Ministry of Foreign Affairs
Andre LeBeau	General Director of the Meteorological Center
M. Nasse	Ministry of Economy and Budget
Sylvie Faucheux	Professor of Economy at Paris I

INDIA

(tentative)

Name	Title
Ms. Maneka Gandhi	Minister of State for Environment and Forests
Vasant Gowarikar	Secretary of Department of Science and Technology
Mahesh Prasad	Secretary of Ministry of Environment and Forests
Dr. A.P. Mitra	Director General of Council for Science and Industrial Research

INDONESIA

(confirmed)

Name	Title
Prof. Dr. Ing. B.J. Habibie	Minister of State for Research and Technology; Chairman of the Agency for the Assessment and Application of Technology
Prof. Dr. Samaun Samadikun	Chairman of the Indonesian Institute of Science
Prof. Dr. John A. Katili	Deputy Chairman of the National Research Council
Prof. Dr. Gunawan Satari	Permanent Secretary, Ministry of State for Research and Technology
Mr. Poedji Kuntarso, MA	Director General for Foreign Economic Relations; Ministry of Foreign Affairs
Prof. Dr. Rustam Didong	Deputy Chairman (Economics), National Development Planning Agency
Prof. Dr. Harsono Wiryosumarto	Deputy Chairman (Technology Development); Agency for the Assessment and Application of Technology
Prof. Dr. S.B. Joedono	Assistant Minister (Industry, Energy and Mining), Office of the Coordinating Minister for the Economy, Finance, Industry and Development Supervision
Dr. M. Alwi Dahlan	Assistant Ministery (Population), Office of the Minister of State for Population and the Environment
His Excellency Abdulrachman Ramly	Ambassador of the Republic of Indonesia to the United States of America

ITALY

(tentative)

Name	Title
Hon. Adolfo Battaglia	Minister of Industry, Head of Delegation
Prof. Umberto Colombo	Director of the National Agency for Nuclear and Renewable Energies
Prof. Giuseppe Biorci	Vice President of the National Research Council
Prof. Giuseppe Bianchi	Director General for Energy Sources, Ministry of Industry
Prof. Antonio Praturlon	President of the CNR Committee on Geological Sciences
Prof. Roberto Frassetto	CNR Institute of the Dynamics of Great Masses
Prof. Emilio Gerelli	Economic Counselor to the Minister of Environment
Dr. Corrado Clini	Director General for Pollution Prevention, Ministry of Environment
Prof. Guido Visconti	Department of Physics, University of L'Aquila
Dr. Giovanni Sacco	Vice Director General of Treasury, Ministry of Treasury

MEXICO

(tentative)

Name	Title
Lic. Patricio Chirinos	Secretary of Urban Development and Ecology
Dr. Jose Sarukhan	Rector, National Autonomous University
Dr. Herminio Blanco	Undersecretary for Foreign Commerce, Secretariat of Commerce and Industrial Development
Ing. Alberto Escofet	Undersecretary for Energy, Secretariat of Energy, Mines and Parastatal Industries
Lic. Jose Angel Gurria	Undersecretary for International Financial Affairs, Secretariat of the Treasury
Fis. Sergio Reyes	Undersecretary for Ecology
Amb. Alberto Szekely	Legal Counsel, Secretariat of Foreign Affairs
Dr. Julian Adem	Director, Center for Atmospheric Studies, National Autonomous University
Dr. Manuel Ortega	Director General, National Council for Science and Technology
Hector Santana	Staff Aide to Secretary Chirinos

THE NETHERLANDS

(tentative)

Name	Title
Hans Alders	Minister for Housing, Physical Planning and Environment
Dr. B.C.J. Zoeteman	Deputy Director-General for Environment
Dr. Pier Vellinga	Coordinator for National Climate Programs
N.D. Van Egmond	Director for Chemistry and Physics, State Institute for Public Health and Environmental Hygiene
I.G. Roos	Directorate-General for European Cooperation, Ministry of Foreign Affairs
Dr. H.M. Fijnaut	Director of the Royal Dutch Meteorological Institute
Dr. A.P.M. Baede	Head of the Department for Dynamical Meteorology
D.F.W.T. Pietermaat	Environmental Coordinator in the Directorate-General for Energy, Ministry of Economic Affairs
Prof. J.B. Opschoor	Professor of Ecology, Free University, Amsterdam

NORWAY

(confirmed)

Name	Title
Kristin Hille Valla	Minister of Environment
Einar Steensnaes	Minister of Education and Research
Ambassador Kjeld Vibe	Norwegian Ambassador to the United States
Oddmund Graham	Secretary General, Ministry of Environment
Kaare Bryn	Director General, Ministry of Foreign Affairs
Dr. Tore Olsen	Director General, Ministry of Education and Research
Per M. Bakken	Coordinator, Air Pollution, Ministry of Environment
Lorents Lorentsen	Director of Research, Central Bureau of Statistics
Professor Dr. Ivar Isaksen	University of Oslo
Leif Westegaard	Science Officer, Norwegian Embassy in Washington

THE OECD

(tentative)

Name	Title
Robert Cornell	Deputy Secretary-General
William L. Long	Director for Environment
John Ferriter	Deputy Executive Director, International Energy Agency
Andrew Dean	Administrator, Department for Economic Affairs and Statistics
George Kowalski	Head of the Division of Economic Analysis, International Energy Agency

POLAND

(tentative)

Name	Title
Jan Janowski	Deputy Prime Minister; Head of the Office of Scientific and Technological Progress
Andreyewski	Deputy Minister of the Environment
Tadeusz Diem	Deputy Minister of Education
Rybicki	Central Planning Office
Kazimierz Duchowski	Department of Economic Cooperation, Ministry of Foreign Affairs
Wiackowski	Chairman, Parliamentary Commission on Environmental Protection
Stakel	Professor, Polish Academy of Sciences
Sadowski	Institute of Metallurgy and Water Management
Wlodzimierz Bojarski	Senator
Jan Kinast	Polish Ambassador to the United States

SOVIET UNION

(tentative)

Name	Title
Nikolay P. Laverov	Chairman of the USSR State Committee on Science and Technology
Yuriy A. Izrael	Chairman of the State Committee on Hydrometeorology
V.F. Kostin	Deputy Chairman, State Committee for Nature Protection
Aleksander A. Metalnikov	Deputy Chairman, State Committee for Hydrometeorology
A.A. Troitsky	Deputy Chairman, State Planning Committee
V.M. Kotliakov	Director, Institute of Geography, USSR Academy of Sciences
Yu. L. Golubev	Assistant to Chairman, State Committee for Hydrometeorology
Yu. V. Vakajuk	Chief, Division of Global Geophysical Problems, Climate Change and Economic Consequences, State Committee for Hydrometeorology
Yu. V. Pikhanov	State Committee for Hydrometeorology, Department of International Cooperation
Mrs. N. Yu. Vail	State Department Committee for Hydrometeorology, Department of International Cooperation

UNITED KINGDOM

(tentative)

Name	Title
David Trippier RD, JP, MP	Minister for the Environment and Countryside
Sir John Fairclough	Chief Scientific Adviser, the Cabinet Office
Sir Crispin C.C. Tickell, GCMG, KCVO	United Kingdom Permanent Representative to the United Nations
Dr. John T. Houghton CBE	Director-General, Meteorological Office
J.G. Odling-Smee	Deputy Chief Economic Adviser; HM Treasury
Dr. David J. Fisk	Chief Scientist, Department of Environment
Dr. W. David Evans	Chief Scientist, Department of Energy
Dr. Eileen Buttle	Secretary, Natural Environment Research Council

UNITED STATES OF AMERICA

(confirmed)

Name	Title
Nicholas F. Brady	Secretary of the Treasury
Manuel Lujan, Jr.	Secretary of the Interior
Clayton Yeutter	Secretary of Agriculture
Robert A. Mosbacher	Secretary of Commerce
Admiral James D. Watkins (Ret)	Secretary of Energy
William K. Reilly	Administrator, Environmental Protection Agency
Richard H. Truly	Administrator, National Aeronautics and Space Administration
John A. Knauss	Under Secretary of Commerce for Oceans and Atmosphere; and Director, National Oceanic and Atmospheric Administration
Erich Bloch	Director, National Science Foundation
Richard Schmalensee	Member, Council of Economic Advisers

ZAIRE

(tentative)

Name	Title
Citoyen Lobo Kanza Kanza	Secretary of State (Deputy Minister); Ministry of Environment and Conservation of Nature



CONFERENCE CO-CHAIRMEN BIOGRAPHIES

MICHAEL J. BOSKIN

D. ALLAN BROMLEY

MICHAEL R. DELAND



Michael J. Boskin
Chairman
President's Council of Economic Advisers

Michael J. Boskin is the Chairman of the President's Council of Economic Advisers. He was appointed to this post by the President on February 2, 1989, following unanimous confirmation by the Senate. As Chairman, he provides economic analysis and advice directly to the President and assists in formulating national economic policies. Dr. Boskin is on leave from Stanford University, where he is the Burnet C. and Mildred Finley Wohlford Professor of Economics, and was the founder and Director of the Center for Economic Policy Research. He is also on leave as a Research Associate of the National Bureau of Economic Research.

Dr. Boskin is the recipient of numerous professional awards and citations, ranging from the Chancellor's Award and the Department Citation as outstanding undergraduate at the University of California in 1967 and the first National Tax Association Outstanding Doctoral Dissertation Award in 1971 to the Abramson Award for Outstanding Research from the National Association of Business Economists in 1987 and Stanford University's Distinguished Teaching Award in 1988. He is the author of more than 80 books and articles in the areas of government spending, tax theory and policy, public debt, Social Security, retirement patterns and behavior, U.S. saving behavior, capital formation, U.S. economic growth, and the economic status of the elderly.

Dr. Boskin received his B.A. degree with highest honors in 1967 from the University of California at Berkeley, where he received his M.A. in 1968 and his Ph.D. in 1971.

Previously, Dr. Boskin had served as a consultant and adviser to the White House, Department of Health and Human Services, Treasury Department, National Science Foundation, and other government agencies, and various congressional committees.

Dr. Boskin is a member of the Economic Education Committee of the American Economic Association. He and his wife Chris moved to Washington, D.C. from California. They both enjoy skiing and tennis.



D. Allan Bromley
Assistant to the President
Science and Technology

D. Allan Bromley is Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy (OSTP) in the Executive Office of the President. He is on leave from his former position as Henry Ford II Professor of Physics at Yale University, where he was founder and Director of the A.W. Wright Nuclear Structure Laboratory.

One of the world's leading nuclear physicists, he has carried out pioneering studies on both the structure and dynamics of nuclei and is considered the father of modern heavy ion science, one of the major areas of nuclear science. He has also played major roles in the development of accelerators, of detection systems, and in computer-based data acquisition and analysis systems. An outstanding teacher, over the past two decades his laboratory at Yale graduated more Ph.D.'s in experimental nuclear physics than any other institution worldwide. He has published over 450 papers in science and technology as well as edited eighteen books and has received numerous honors and awards, including the National Medal of Science.

For more than two decades, Dr. Bromley has been a leader in the national and international science and science policy communities. As Chairman of the National Academy's Physics Survey in the early 1970s, he contributed in a central way to charting the future of that science in the subsequent decade. As President of the American Association for the Advancement of Science, the world's largest scientific society, and the International Union of Pure and Applied Physics, the world coordinating body for that science, he has been one of the leading spokesmen for U.S. science and for international scientific cooperation.

Prior to his present appointment, Dr. Bromley served as a member of the White House Science Council throughout the Reagan Administration and as a member of the National Science Board in 1988-1989. As the U. S. chairman for both the Gandhi-Reagan, Indo/U.S. and the Sarney-Reagan, Brazil/U.S. Science and Technology Initiatives, he led four Presidential missions to conduct negotiations for bilateral cooperation in science and technology.

Born in Westmeath, Ontario, Canada, he received the B.Sc. degree with highest honors in 1948 in the Faculty of Engineering at Queen's University, Ontario, Canada. He received the M.Sc. degree from Queen's University in 1950 and the Ph.D. degree from the University of Rochester in 1952, both degrees in nuclear physics. He subsequently has been awarded ten honorary degrees from universities in Canada, France, Germany, Italy, South Africa, and the United States.

Dr. Bromley is married to the Former Patricia J. Brassor, and they have two children, David John and Karen Lynn.



Michael R. Deland
Chairman
White House Council
on Environmental Quality

Michael R. Deland was appointed by President Bush to be Chairman of the White House Council on Environmental Quality on August 1, 1989, following unanimous confirmation by the United States Senate. In this capacity he serves as environmental adviser to the President as well as Director of the Office of Environmental Quality which oversees the development of environmental policy, interagency coordination of environmental quality programs and environmental data acquisition and assessment. In addition, Mr. Deland is responsible for overseeing implementation of the National Environmental Policy Act.

Prior to Mr. Deland's appointment as CEQ Chairman, he was the New England Regional Administrator for the U.S. Environmental Protection Agency (EPA). In that capacity, from 1983 to 1989, he administered the federal government's programs dealing with air and water pollution control, hazardous waste management, drinking water, toxic substances, radiation, and pesticides.

Mr. Deland was counsel at Environmental Research and Technology, Inc., a national firm headquartered in Concord, Massachusetts from 1976 to 1983. While in the private sector, Mr. Deland published numerous papers and articles, including the Regulatory Focus monthly column in *Environment, Science and Technology*. Between 1971 and 1976, Mr. Deland served in EPA's Office of Regional Counsel in New England (Region I) in several capacities, including Chief of the Agency's Legal Review Section and Chief of the Enforcement Branch.

Mr. Deland received his Bachelor of Arts degree from Harvard College in 1963 and served as an officer in the U.S. Navy before obtaining his law degree from Boston College in 1969. He is a member of the Massachusetts Bar and the American Bar Association and its Natural Resources Committee. Mr. Deland was President of the Business Associates Club (Boston) from 1981 to 1982 and is a former Director of the Environmental Lobby of Massachusetts and the Center for Environmental Intern Programs, a national non-profit organization headquartered in Boston.

Mr. Deland has received numerous awards and citations, including the Massachusetts Audubon Society Award for his leadership in cleaning up Boston Harbor and the New England Environment Leadership Award for the New England Environmental Network. In 1987, he was honored as "Environmentalist of the Year" by the Massachusetts Association of Conservation Commissions. In March of 1989, he was awarded the National Wildlife Federation's Special Achievement Award for his role in prompting the cleanup of Boston Harbor, for his efforts at protecting valuable fishing areas from off-shore oil drilling, and for his early endorsement of environmentally-based growth controls on Cape Cod. Mr. Deland resides in Washington with his wife Jane and three children.

U.S. Delegation Biographies

As part of the Conference handout materials, we are preparing an information/reference booklet which will include:

- one-page narrative biography of each delegate
- an 8" x 10" photograph of each delegate
- the delegate's organization's logo/seal

The biographies, logos and photographs of the U.S. delegation included in this section are representative of the materials we are seeking from each foreign delegation member.

Please provide this information to the White House Conference as soon as possible.



Nicholas F. Brady
Secretary
Department of the Treasury

Nicholas F. Brady became the 68th Secretary of the Treasury on September 15, 1988.

Secretary Brady served in the United States Senate from April 20, 1982 through December 27, 1982. During that time he was a member of The Armed Services Committee and the Banking, Housing and Urban Affairs Committee.

In 1984 President Reagan appointed Secretary Brady Chairman of the President's Commission on Executive, Legislative and Judicial Salaries. He has also served on the President's Commission on Strategic Forces (1983), the National Bipartisan Commission on Central America (1983), the Commission on Security and Economic Assistance (1983), and the Blue Ribbon Commission on Defense Management (1985). Most recently, Secretary Brady chaired the Presidential Task Force on Market Mechanisms (1987).

Secretary Brady's career in the banking industry spans 34 years. He joined Dillon, Read & Co., Inc. in New York in 1954, rising to Chairman of the Board. He has been a Director of the NCR Corporation, the MITRE Corporation, and the H.J. Heinz Company, among others.

He has also served as a trustee of Rockefeller University and a member of the Board of the Economic Club of New York. He is a member of the Council on Foreign Relations, Inc. He is a former trustee of the Boys' Club of Newark.

Mr. Brady was born April 11, 1930 in New York City. He was educated at Yale University (B.A., 1952) and Harvard University (M.B.A., 1954). He and his wife, Katherine, have four children.



Manuel Lujan, Jr.
Secretary
Department of the Interior

POLITICAL
President George Bush selected Manuel Lujan, Jr., who had just completed a 20-year career in the House of Representatives, to be his Secretary of the Interior. He was sworn in on February 3, 1989.

The 46th Secretary of the Interior, Lujan was first elected to the House of Representatives from New Mexico in 1968. When he left the Congress on January 3, 1989, he ranked 15th in seniority among all Republicans and 52nd in seniority among all House members.

A member of the House Interior and Insular Affairs Committee since 1969, Lujan was its second ranking Republican. The Committee has jurisdiction over all activity in the U.S. Department of the Interior as well as the Nuclear Regulatory Commission. Lujan was also the senior Republican on the Energy and Environment Subcommittee.

Lujan was the Vice-Chairman of the House Science, Space and Technology Committee. As senior Republican, Lujan was a member of all subcommittees, including Space Science and Applications which has oversight over NASA.

PERSONAL
Born May 12, 1928 in San Ildefonso, New Mexico. Raised in Santa Fe where Lujan's father, Manuel Lujan, Sr., served three elected terms as Mayor.

A graduate of the College of Santa Fe with a B.A. degree, Lujan also attended St. Mary's College in California.

Prior to entering Congress, the Secretary was a partner in a family insurance and real estate business with three offices in New Mexico. His brother, Edward Lujan, is the managing partner of the business.

Married to the former Jean Couchman of Santa Fe, the Lujans have four children; Terra Everett, Jay, Barbara and Jeff. Secretary and Mrs. Lujan maintain residences in both Washington, D.C. and Albuquerque.

LEGISLATIVE
Economy in Government: Lujan was a Congressional leader in the battle against wasteful government spending. *"The effort to stop inflation boils down to a fight against needless government intervention and spending,"* stated Lujan.

Environmental Protection: Lujan has co-sponsored seven major environmental protection bills including the Clean Air Act of 1970 and the Clean Water Act. More recently, Lujan successfully sponsored legislation setting aside more than 600,000 acres of New Mexico land as wilderness areas, ensuring its beauty and enjoyment for future generations.

Education: Lujan strongly supported student loan programs in the public and private sectors. His work led to New Mexico adopting a student loan program that is a model for other states.

Technology: Lujan believes strongly that scientific research is the key to our future. *"Science and technology can help us meet the challenges of the 21st century,"* said Lujan.



Clayton Yeutter
Secretary
Department of Agriculture

Clayton Yeutter was sworn in as the 23rd United States Secretary of Agriculture on February 8, 1989.

Yeutter's career includes distinguished public and private-sector service in agricultural policy development, law, economics, marketing and trade.

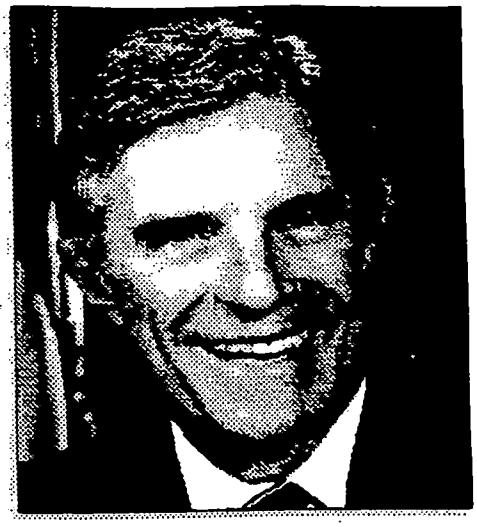
From July 1985 until shortly before his new cabinet appointment, Yeutter served as U.S. Trade Representative. His previous USDA posts include Assistant Secretary for International Affairs and Commodity Programs from March 1974 to June 1975, Assistant Secretary for Marketing and Consumer Service from January 1973 to March 1974 and Administrator of the Consumer and Marketing Service from October 1970 to December 1971.

Yeutter's other career highlights: President and Chief Executive officer, Chicago Mercantile Exchange, July 1978 to June 1985; senior partner, law firm of Nelson, Harding, Yeutter & Leonard, Lincoln, Nebraska, April 1977 to June 1978; Deputy U.S. Special Trade Representative, June 1975 to February 1977; Director, University of Nebraska Mission in Colombia (a large agricultural technical assistance program), September 1968 to October 1970; executive assistant to the governor of Nebraska, January 1966 to September 1968; faculty member, Department of Agricultural Economics, University of Nebraska, January 1960 to January 1966; operator of a 2,500 acre farming-ranching-cattle feeding enterprise in central Nebraska, 1957-1975; and enlistee, later commissioned officer, U.S. Air Force, 1952-1957.

Yeutter was graduated with high distinction from the University of Nebraska in 1952 with a Bachelor of Science degree in animal husbandry. In 1963, he obtained his law degree from the same university, graduating *cum laude* and ranked first in his class. In 1966, he received his Ph.D. in agricultural economics, again from the University of Nebraska, and was named outstanding graduate student in the program.

Yeutter is a former member or chairman of many private and public-sector boards of directors, councils and trusteeships, including: the President's Export Council; the Chicago Association of Commerce and Industry; the Chicago-Tokyo Bank; the U.S. Meat Export Federation; the Chicago Council on Foreign Relations; the Farm Foundation, Oak Brook, Illinois; Tri-Valley Growers, San Francisco, California; and ConAgra, Inc., Omaha, Nebraska.

Yeutter was born in Eustis, Nebraska, December 10, 1931. He and his wife, Jeanne Vierk Yeutter, have four children. He retains ownership of his Nebraska farm, which is currently operated by a tenant. Yeutter's permanent home is in Lincoln, Nebraska, but he currently resides in McLean, Virginia.



Robert A. Mosbacher
Secretary
Department of Commerce

Nominated Secretary of Commerce by President-Elect George Bush on December 6, 1988. He was confirmed 100-0 by the United States Senate on January 31, 1989.

Formerly:

Chief Executive Officer and Chairman of Mosbacher Energy Company
Director of Texas Commerce Bancshares, Houston, Texas
Director, Enron Corporation, Houston, Texas
Director, New York Life Insurance Company, New York
Past Chairman of the National Petroleum Council
Charter member and past Chairman of the All American Wildcatters Association
Member of the Executive Committee and Board of Directors of the American Petroleum Institute
Past Chairman of the Mid-Continent Oil and Gas Association
Twice Past Chairman of the Board of Visitors of the Texas M.D. Anderson Cancer Institute
Former member of Board of Trustees of the Texas Heart Institute
Former National Trustee, Boys Clubs of America Southwest Region
Past Active Trustee of the Aspen Institute for Humanistic Studies
Member of Washington Roundtable and Co-Chair of Houston Roundtable of the Center for Strategic and International Studies
National Finance Chairman for George Bush for President
National Finance Chairman of the Fund for America's Future
Chairman of Victory 88'
Co-Chairman of the Republican National Finance Committee
Member of the Executive Committee for Reagan-Bush
National Finance Chairman for the President Ford Committee in 1976
Won both the North American and World Sailing Championships in the Olympic classes (Dragon and Soling)
Won the Southern Ocean Racing Circuit
Won the Gold Cup twice

Born in White Plains, New York, Mosbacher has lived in Houston, Texas since 1948. He graduated from Washington and Lee University in Lexington, Virginia in 1947.

Mosbacher is married to the former Georgette Paulsin and is the father of four (Diane, Robert Jr., Kathryn and Lisa) and grandfather of five. The Mosbachers reside in Washington, D.C.



James D. Watkins
Secretary
Department of Energy

James David Watkins was nominated by the President to be the sixth Secretary of Energy on January 20, 1989. Admiral Watkins was confirmed by the United States Senate and sworn into office on March 1, 1989.

Admiral Watkins was born in California on March 7, 1927, and claims the city of Pasadena as his home. A 1949 graduate of the U.S. Naval Academy, his tours as flag officer included Chief of Naval Personnel; Commander of the Sixth Fleet; Vice Chief of Naval Operations; and Commander-in-Chief of the Pacific Fleet. Admiral Watkins was selected by President Reagan to become the 22nd Chief of Naval Operations on June 30, 1982. His military decorations include several Distinguished Service and Legion of Merit medals, the Bronze Star with combat "V" and other medals, campaign and service ribbons, and decorations from many foreign nations.

Following his retirement on June 30, 1986, Admiral Watkins devoted his time to issues regarding America's youth, and worked with a number of philanthropic organizations to establish a national program for personal excellence. He also served as a member of advisory boards in both the education and energy fields and has received several honorary doctorates and public service awards.

In October 1987, Admiral Watkins was appointed Chairman of the Presidential Commission on the Human Immunodeficiency Virus (AIDS) Epidemic, submitting the Commission's final report to the President on June 24, 1988.

Admiral Watkins received his master's degree in mechanical engineering in 1958, and is a graduate of the reactor engineering course at the Oak Ridge National Laboratory. He was selected by Admiral Hyman G. Rickover to enter the Navy's nuclear-powered submarine program in 1959, and was qualified as an Engineering Officer of the Watch at one of the Navy's land-based reactor plants. He served for three years in the Atomic Energy Commission as Admiral Rickover's assistant for Naval Nuclear Propulsion and later, in a variety of assignments associated with the management of the nuclear navy. These assignments included Commanding Officer of a nuclear-powered submarine and Executive Officer of the world's first nuclear-powered cruiser.

Admiral Watkins married Sheila Jo McKinney of San Diego, California, in 1950. They have six children: Katherine Watkins Coopersmith, Laura Jo Watkins Kauffmann, Susan, Charles, James Jr., and Edward. Admiral and Mrs. Watkins have eight grandchildren.



William K. Reilly
Administrator
Environmental Protection Agency

William Kane Reilly was sworn in as Administrator of the U.S. Environmental Protection Agency by President Bush on February 8, 1989. The President announced his appointment on December 22, 1988, and officially nominated him on January 20, 1989. The U.S. Senate unanimously confirmed his nomination on February 2, 1989.

Prior to becoming EPA Administrator, Reilly held five environment-related positions during the previous two decades. He was President of World Wildlife Fund-U.S. (1985-1989) and President of the Conservation Foundation (1973-1989). Those two organizations joined in a formal affiliation in 1985 and Reilly became President of both organizations. He was Executive Director of the Task Force on Land Use and Urban Growth from 1972-1973. From 1970 to 1972, he was on the staff of the President's Council on Environmental Quality and, from 1968 to 1970, was Associate Director, Urban Policy Center and the National Urban Coalition. He also served as Chairman of the Natural Resources Council of America, an association of all major conservation groups, from 1981-1983.

During his presidency of World Wildlife Fund-U.S., Reilly intensified his mission, the protection of the diversity of life on earth. Between 1961 and 1989, the organization supported 1,371 wildlife and endangered habitat projects in 103 countries. At the Conservation Foundation, he continued its long-standing interest in land programs and initiated new programs in environmental dispute resolution, water toxic substances control, and urban conservation and energy. In 1976, Reilly began a program advocating direct cooperation between business leaders and conservationists in resolving polarizing issues in resources and environmental policy, which resulted in several major consensus-building policy dialogues, including the National Groundwater Policy Forum and the National Wetlands Policy Forum.

Reilly has written and lectured extensively on environmental issues, has served on the boards of various private and public sector organizations and received the Horace Albright Medal for his contributions to national parks and the Alfred B. LaGasse Medal for his contributions to environmental progress.

An alumnus of Yale University, Reilly holds a law degree from Harvard University and a master's degree in urban planning from Columbia University. He was born in Decatur, Illinois on January 26, 1940, grew up in Fall River, Massachusetts, and served as a U.S. Army captain (1966 to 1967).

He is married to Elizabeth "Libbie" Bennet Buxton Reilly. They have two daughters, Katherine Buxton Reilly, age 19, and Margaret Mahalah Reilly, age 14. The family resides in Alexandria, Virginia.

NASA



Richard H. Truly
Administrator
National Aeronautics and
Space Administration

Richard H. Truly became the eighth Administrator of NASA on July 1, 1989. One day earlier, he concluded his naval career of more than 30 years, retiring as a Vice Admiral, United States Navy. He is the first astronaut to head the nation's civilian space agency.

Truly became NASA's associate administrator for space flight on February 20, 1986. In this position, he led the painstaking rebuilding of the Space Shuttle program. This was highlighted by NASA's celebrated "return to flight" on September 29, 1988, when Discovery lifted off from Kennedy Space Center, Florida, on the first Shuttle mission in almost three years.

Before returning to NASA, the former Shuttle astronaut served as the first commander of the Naval Space Command, Dahlgren, Virginia, established October 1, 1983. His career in the U.S. Navy began in 1959, when he was commissioned an ensign. This coincided with his graduation from Georgia Institute of Technology, which he attended as a Naval R.O.T.C. midshipman and earned a bachelor's degree in aeronautical engineering.

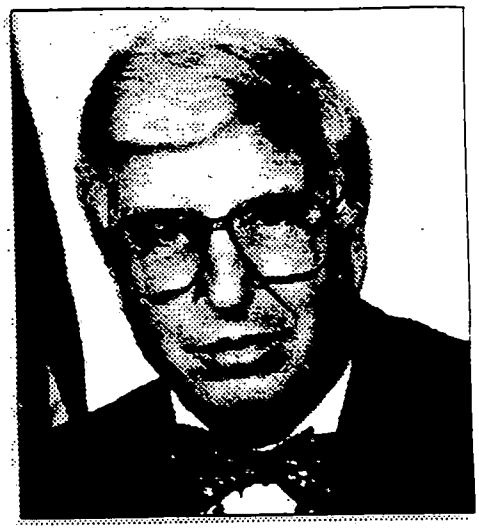
Following flight school, he was designated a naval aviator in 1960. His initial tour of duty, Fighter Squadron 33, was aboard USS Intrepid and USS Enterprise, and he made more than 300 carrier landings. From 1963 to 1965, he was a student and then instructor at the U.S. Air Force Aerospace Research Pilot School, Edwards Air Force Base, California.

In 1965, Truly became one of the first military astronauts selected to the Air Force's Manned Orbiting Laboratory program in Los Angeles, California, and transferred to NASA as an astronaut in August 1969. He served as capsule communicator for all three of the manned Skylab missions in 1973 and the Apollo-Soyuz mission in 1975. As a naval aviator, test pilot, and astronaut, Truly has logged over 7,500 hours in numerous military and civilian jet aircraft.

He was pilot for one of the two-man crews that flew the 747/Space Shuttle Enterprise approach and landing test flights during 1977. He then served as backup pilot for STS-1, the first orbital test of the Shuttle. His first flight in space was November 12-14, 1981, as pilot of Space Shuttle Columbia (STS-2), significant as the first manned spacecraft to be reflown in space. His second flight (STS-9, August 30–September 5, 1983) was as commander of Space Shuttle Challenger, the first night launch and landing in the Shuttle program.

On January 18, 1989, Truly was awarded the Presidential Citizen's Medal by President Reagan. His NASA awards include two NASA Distinguished Service Medals, the NASA Outstanding Leadership Medal, two NASA Exceptional Service Medals, and NASA Space Distinguished Service Medal, the Defense Superior Service Medal, two Legions of Merit, the Navy Distinguished Flying Cross, and the Meritorious Service Medal.

Truly was born in Fayette, Mississippi, on November 12, 1937 and attended school in Fayette and Meridian, Mississippi. He is married to the former Colleen (Cody) Hanner of Milledgeville, Georgia. They have three children: Mike, Dan and Lee, and three grandchildren: Ashley, Courtney and Peter.



John A. Knauss
Under Secretary
Department of Commerce

John A. Knauss, Under Secretary for Oceans and Atmosphere and Administrator of the Department's National Oceanic and Atmospheric Administration (NOAA), took office August 7, 1989.

A noted oceanographer and educator, Knauss was a professor of oceanography at the Graduate School of Oceanography at the University of Rhode Island (URI). He also served as dean of the URI Graduate School of Oceanography from 1962 to 1987, and as the university's provost for marine affairs from 1969 to 1982.

Knauss has been a member of two presidential commissions on marine affairs: the Commission on Marine Science, Resources, and Engineering (the Stratton Commission) in 1967 to 1968 and the National Advisory Committee on Oceans and Atmosphere (NACOA), 1978 to 1985. He served as Chairman of NACOA from 1981 to 1985. He has been President of the Association of Sea Grant Program Institutions, Chairman of the Ocean Science Committee of the National Academy of Sciences/National Research Council, and Chairman of the Marine Division of the National Association of State Universities and Land-Grant Colleges.

He has served as President of the oceanographic section of the American Geophysical Union (AGU), Vice President of the Marine Technology Society (MTS), Vice Chairman of the American Association for the Advancement of Science's (AAAS) Atmospheric and Hydrospheric Sciences Section, and a council member of the American Meteorological Society. He was a co-founder of the Law of the Sea Institute and served on its governing board from 1965 to 1976 and 1981 to 1987. He has been elected a fellow of the AAAS, the AGU, and the MTS.

Knauss graduated from Massachusetts Institute of Technology (B.S., 1946), the University of Michigan (M.S., 1949), and the University of California, Scripps Institution of Oceanography (Ph.D., 1959).



Erich Bloch
Director
National Science Foundation

Erich Bloch was confirmed by the Senate to be Director of the National Science Foundation on August 6, 1984. As Director, he is responsible for an agency charged with strengthening the national scientific and engineering research potential and with improving science and engineering education at all levels. The Foundation has an annual budget exceeding $1.7 billion and the annual award of 12,000 to 14,000 grants for research in all fields of natural, social sciences, and engineering.

Before joining NSF, Mr. Bloch was a corporate Vice President for Technical Personnel Development at IBM Corporation, which he joined in 1952 as an electrical engineer. During his career at IBM, Mr. Bloch was the engineering manager of IBM's STRETCH supercomputer system in the late 1950's and early 1960's. In 1962, he headed development of the Solid Logic Technology program, which provided IBM with microelectronic technology for its System/360 computer. Subsequently, Mr. Bloch was appointed a vice president of the company's Data Systems Division and general manager of the East Fishkill facility, which is responsible for the development and manufacture of semiconductor components used in IBM's product line. He was elected an IBM vice president in 1981.

From 1981 to 1984, Mr. Bloch served as Chairman of the Semi-conductor Research Cooperative, a group of leading computer and electronics firms that fund advanced research in universities and shares in the results, and was the IBM representative on the board of the Semiconductor Industry Association.

In February 1985, Mr. Bloch was awarded the National Medal of Technology by President Reagan. The award was made for his part in pioneering developments related to the IBM/360 computer that revolutionized the computer industry. In 1989, Mr. Bloch was the recipient of the IEEE United States Activities Board Award for Distinguished Public Service and the IEEE 1990 Founders Medal. He also received honorary Doctorate of Engineering degrees from the Colorado School of Mines, the University of Notre Dame, and Rensselaer Polytechnic Institute; honorary Doctorate of Science degrees from the University of Massachusetts at Amherst, George Washington University, State University of New York at Buffalo, the University of Rochester, Oberlin College, and Washington College; and an honorary Doctorate of Science and Engineering degree from the Ohio State University.

He is a member of the National Academy of Engineering and is a Fellow of the American Association for the Advancement of Science and of the Institute of Electrical and Electronics Engineers and a member of its Computer Society. He received his education in electrical engineering at the Federal Polytechnic Institute of Zurich, Switzerland, and a Bachelor of Science degree in electrical engineering from the University of Buffalo in 1952.



Richard Schmalensee
Council of Economic Advisers
Office of the President

Richard Schmalensee is a Member of the Council of Economic Advisers. He has primary responsibility for the analysis of microeconomic and regulatory policy. Dr. Schmalensee is on leave from the Massachusetts Institute of Technology (MIT), where he is the Gordon Y. Billard Professor of Economics and Management.

Dr. Schmalensee's research and teaching have focused on industrial organization and on anti-trust and regulatory policy. He has written numerous articles in professional journals and is the author of three books and co-author of three others. He has extensive consulting experience on anti-trust and regulatory matters. He has served on the editorial boards of several economics journals, is co-editor of the *Handbook of Industrial Organization*, and is founding editor of the MIT Press *Regulation of Economic Activity* monograph series. Dr. Schmalensee has also served on various committees of the American Economic Association and the Econometric Society, of which he is a Fellow.

Dr. Schmalensee attended the public schools of Belleville, Illinois and received his B.S. (Economics, Politics and Science; 1965) and Ph.D. (Economics; 1970) degrees from MIT. Prior to joining the MIT faculty in 1977, he taught at the University of California, San Diego. He is married to the former Diane Hawk; they have two sons.



HOTEL/TRANSPORTATION/LOGISTICS

Dr. Franmarie Keel

White House Conference on Global Change
Suite 615
1019 19th Street, N.W.
Washington, D.C. 20036

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Fax: (202) 653-2034
Telex: 249118SDAVISUR
Telemail (OMNET): GLOBAL.CHANGE

HOTEL

The White House Conference is being held at:

The J.W. Marriott Hotel
1331 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Telephone: 202-393-2000

- The White House Conference has reserved rooms for each official delegation member. **Charges for the hotel room April 16th and 17th, 1990 and for Conference meals served April 17 and 18, 1990, will be paid for by the White House Conference.**

- Hotel room check-in is 3:00 p.m. Conference registration begins at 12:00 noon, Sunday, April 15, for delegates arriving in Washington early. Registration will continue Monday all day and until 12:00 noon on Tuesday, April 17. Special arrangements should be made with White House Conference coordinators for early or late arrivals/departures and check-in.

- To cover any personal incidental expenditures (such as telephone calls, charges at the hotel restaurants and gift shops, and additional room service), each delegation member must present *one* of the following upon registration at the hotel to guarantee incidentals:

    - credit card (American Express, VISA, Master Card, Diners Club, JCV)
    - a letter received by April 14th, 1990 from the delegation's embassy stating embassy will cover its delegation's incidentals prior to delegation's departure from the hotel

TRANSPORTATION

- Delegations will be met by White House Conference personnel at Washington National Airport, Washington Dulles Airport, Baltimore-Washington International Airport, and Andrews Air Force Base and will be escorted to the hotel beginning Sunday, April 15.

- White House Conference personnel meeting flights can be identified by a White House Conference sign. Delegations arriving in Washington domestically will be met at the gate. International arrivals will be met at the exit of the mobil lounge at the entrance to U.S. Immigration and Customs.

- Procedures have been established by the Conference to assist in the facilitation of U.S. Customs.

- Transportation will be provided for delegations' return to those designated airports after the close of the Conference Wednesday, April 18, through Thursday evening, April 19.

- All transportation for official Conference events held outside of the J.W. Marriott Hotel will be provided by the White House Conference.

- All airline arrival and departure times must be confirmed as soon as possible with the White House Conference at 202/653-5980.

- Please inform the White House Conference immediately if flight plans change at departure (i.e. cancelled flight, family emergency, etc.)

SPECIAL REQUIREMENTS

- Any special room, bed, dietary, or medical requirements should be forwarded to White House Conference coordinators as soon as possible.

MISCELLANEOUS

- Simultaneous interpretation in Russian, Spanish, and French will be provided during the Conference meetings.

- Please note the dinner at the State Department, on Tuesday, April 17, is business attire.

WHITE HOUSE CONFERENCE ON SCIENCE AND ECONOMICS RESEARCH RELATED TO GLOBAL CHANGE

Delegate Travel Accommodation Registration

PLEASE PRINT OR TYPE

Name: _____

Title: _____

Country Delegation: _____

HOTEL ACCOMMODATIONS:

In order to facilitate your registration upon arrival at the Conference site at the J.W. Marriott Hotel, it will be necessary to provide the information requested in this form. The White House Conference provides each delegate with a hotel room from check-in April 16th to check-out on April 18th. The J.W. Marriott Hotel requires guarantee of payment for incidentals, such as telephone, room service, gift shop, laundry, restaurants, etc., with cash, a credit card or a Letter of Guarantee from your Embassy. A Letter of Guarantee should include delegate's name, check-in date, Embassy Financial Officer, and any stipulations, and must be received by April 14, 1990.

Credit Card # _____ Expiration Date: _____

Type (*American Express, Visa, Master Card, Diners Club, JCV*): _____

Name as it appears on card: _____

Signature: _____ Date: _____

This should be completed and sent by fax (202-653-2034) to Susan Thoren at the White House Conference in Washington, D.C., or delivered by April 12th to 1019 19th Street NW, Suite 615, Washington D.C. 20036