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THE WHITE HOUSE AT WORK

Wednesday, October 1, 1997

PRESIDENT CLINTON AND VICE PRESIDENT GORE ADDRESS OVER 100 TELEVISION WEATHER FORECASTERS ON THE ISSUE OF CLIMATE CHANGE

"Clearly, to me, this climate change issue is one of the principal challenges that we face -- a challenge that, if we meet it, will ensure the continued vitality of our small planet and the continued success of the United States throughout another hundred years; a challenge that should we fail to meet it, could imperil the lives of our children and, if not our children, our grandchildren on this planet -- how they live, how they relate to others and whether they are able to continue to pursue their dreams in the way that our generation has."-- President Clinton, October 1, 1997

The President invited over 100 broadcast weather forecasters from across the country to the White House today for a briefing on climate change. The weather forecasters began their day at the National Oceanic and Atmospheric Administration (NOAA) where they received extensive briefings by scientists and independent experts. **The President and Vice President addressed the group at the White House and discussed the four principles guiding the Administration's response to the challenge of global climate change:**

1. The science behind climate change dictates action: The scientific evidence of climate change is solid. While more research is needed, what we already know is more than enough to warrant responsible action. The overwhelming majority of the world's climate scientists have concluded that if we don't cut our emissions of greenhouse gases, temperatures will rise and we will disrupt the global climate. In fact, many believe this process has already begun. Such climate disruption could increase heat-related deaths and lead to the spread of infectious diseases.

2. As a world leader, the United States must commit to realistic and binding limits on our emissions of greenhouse gases. As the nations of the world meet this December in Kyoto, Japan, we must be prepared to commit to realistic and binding limits on our emissions of greenhouse gases. With 4% of the world's population, the United States produces more than 20% of its greenhouse gases. The President believes that we must cut back.

3. The Clinton Administration supports flexible, market-based approaches to our efforts to cut back on greenhouse emissions: The Administration embraces solutions to this problem that will allow us to continue to grow our economy, while at the same time, honoring our global responsibilities. The plan that the United States will bring to Kyoto will emphasize flexible, market-based approaches and technologies that can make energy production much more efficient.

4. Both industrialized and developing countries are part of the solution: We must ask all the nations, both industrialized and developing, to participate in this effort to reduce greenhouse gases. Economic development increases energy demand and greenhouse gas emissions. In fact, emissions from the developing world will likely eclipse those from the developed world by 2035. The industrialized world cannot take on this responsibility alone. In Kyoto, the United States will press for meaningful, equitable commitments from all nations.

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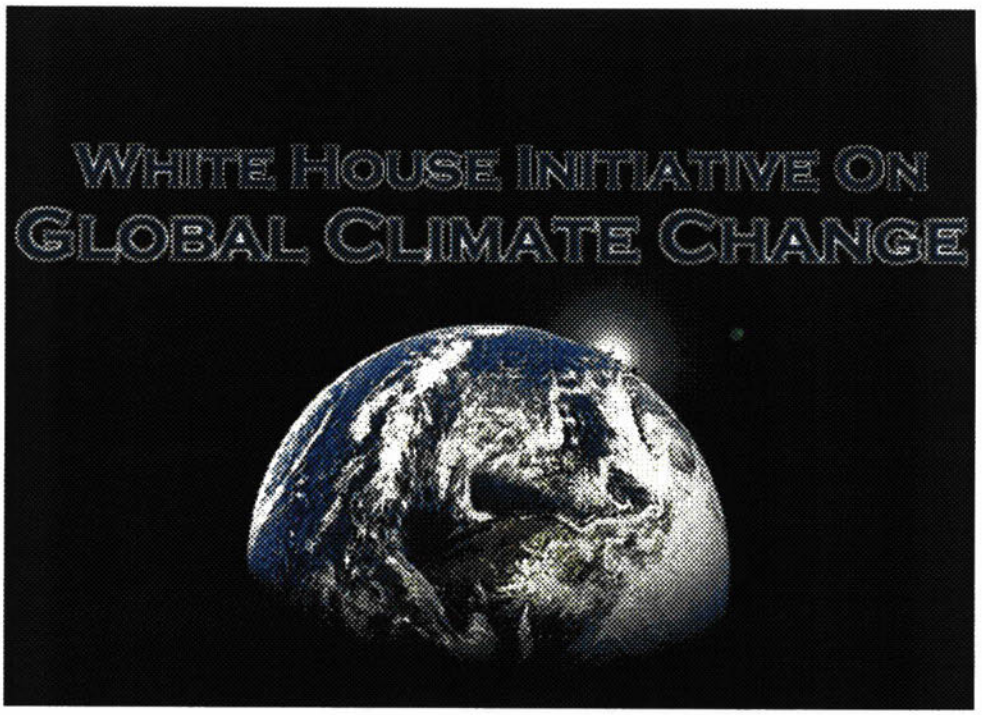
"The science is clear and compelling. We humans are changing the global climate... No nation can escape this danger. None can evade its responsib to confront it... We must all do our part..."

President William Jefferson Clin
United Nations Special Assembl
June 26, 1997


WHITE HOUSE INITIATIVE ON
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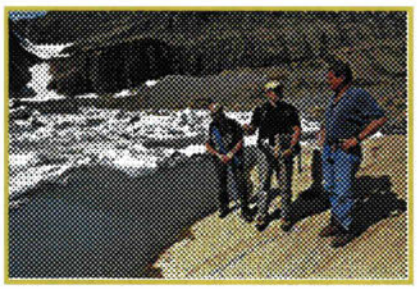
What's New



Vice President Gore Addresses the Glacier National Park community on the effects of climate change

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About the Initiative

The scientific consensus is clear that (1) greenhouse gases are rapidly building up in the atmosphere as a result of human actions; (2) that these increased concentrations will change our climate; and (3) that these changes could have serious adverse and disruptive consequences. Even those who would question whether climate change is already occurring recognize the truth of this fundamental proposition.

President Clinton is committed to taking responsible action to confront the threat that climate change poses. The United States will support international agreements that establish realistic commitments and that require participation by all countries -- industrial and developing. At home, we support flexible, market-based policies based on the principle that vigorous economic growth and environmental protection must go hand in hand. It is up to us not only to prepare our children for the world of the 21st century, but to protect that world for them.

[Text Version]

The Need for Action

Compelling scientific evidence indicates that the human effect on climate is apparent today. The Intergovernmental Panel on Climate Change (IPCC), the authoritative scientific source on the subject, has concluded that, "the balance of evidence suggests a discernible human influence on global climate." More than 2,600 leading scientists have endorsed this conclusion and argued that continued increases in emissions of carbon dioxide and other greenhouse gases "commits the earth irreversibly to further global climatic change and consequent ecological, economic and social disruption."

Scientists agree that global warming and resulting climate disruptions could seriously harm human health (projections include 50 million more cases of malaria per year); increase the incidence and intensity of floods and droughts; raise sea levels enough to inundate up to 7,000 square miles of U.S. coastline; decrease food production in some of the world,s poorest nations; and threaten the survival of many plant and animal species.

In December, more than 160 nations, including the U.S., will meet in Kyoto, Japan in an effort to complete negotiations on a new international climate change agreement. The Kyoto meeting will follow a last formal negotiating session to be held in Bonn, Germany at the end of October.

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Why Climate Change is on the Agenda Now

This December, the world,s nations will convene in Kyoto, Japan to try to conclude an international agreement on greenhouse gas emissions reductions.

The Kyoto meeting -- formally the Third Conference of the Parties to the Framework Convention on Climate Change (FCCC) -- is the latest stage in a process started in Rio in 1992 with the signing of the FCCC. The Convention,s ultimate goal is to stabilize atmospheric concentrations of greenhouse gases at a level that prevents dangerous human interference with the climate system.

The first step in the process, also agreed in Rio, was for developed nations to reduce greenhouse gas emissions to 1990 levels by 2000 and for all countries to take policies and measures to address climate change. Every developed nation, other than Germany and the United Kingdom, will fall short of the 2000 goal. (Germany and the UK will probably meet the goal but for reasons having nothing to do with climate change -- i.e. absorbing East German emissions and phasing out coal subsidies.)

In 1995, at the First Conference of the Parties, nations commenced the round of negotiations we hope to complete in Kyoto later this year, the goal of which is to develop a new agreement to cover the post-2000 period. Under the so-called Berlin Mandate, parties agreed (i) that they would continue to pursue the Rio Convention,s goals, (ii) that developed nations should take on new quantified emissions reduction objectives, and (iii) that there would be no new commitments for developing countries, though developing countries would be required to advance implementation of commitments they made at Rio.

Over the last two years, nations have met at several formal negotiating sessions to begin to structure an agreement. Some countries, most notably the EU, have proposed specific targets and timetables for emissions reductions. The U.S. has put forward a broad framework, outlining what we feel are the key components of a new agreement. We have not yet proposed a target and timetable.

Our goal is to develop a comprehensive U.S. policy position in time for the final negotiating session in Bonn, Germany at the end of October, and then to conclude an agreement in Kyoto this December. However, it is important to note that many important issues remain unresolved.

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The Administration's Strategy

President Clinton is committed to responsible, balanced action to confront the threat of climate change. The Administration rejects both extremes of the climate change debate: those who support drastic actions that would severely disrupt our economy and those who dismiss the scientific evidence and would do nothing.

President Clinton will only take actions that preserve our vigorous economic growth. The Administration believes -- and has demonstrated -- that environmental protection and economic growth can and should go hand in hand. More than 2,000 economists, including eight Nobel Laureates, have concluded that there are policy options &that would slow climate change without harming American living standards, and these measures may in fact improve U.S. productivity in the longer run.8

The Clinton Administration will emphasize solutions based on flexible, market-based policies, not government regulation. These programs could include, for example, some form of emissions trading within the United States.

The Clinton Administration will invest in research and development to promote technologies that reduce greenhouse gas emissions, save energy, and lessen our dependence on foreign oil. We will work to help American industry increase its role as the world leader in developing environmental technologies.

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Addressing Climate Change Without Hurting the Economy

"I have devoted my passion and the best ideas I could come up with to try to get this country in good shape economically and socially. But I do believe it is folly for us to believe that we can go into the next century without a strategy that says we're going to be responsible and we're going to do our part and lead the world on environmental issues... Let's find a way to preserve the environment, to meet our international responsibilities, to meet our responsibilities to our children, and grow the economy at the same time."

President William Jefferson Clinton
Business Roundtable (6/12/97)

The economists agree. More than 2400 economists, including eight Nobel laureates, have publicly declared that if implemented properly, emission reductions "would slow climate change *without harming American living standards*, and these measures may in fact improve U.S. productivity in the longer run."

Our international policies. The Clinton Administration is committed to pushing for an agreement that is balanced, strong and cost-effective at the December meeting in Kyoto. The United States has proposed a three-part framework for achieving a stronger, more cost-effective and comprehensive treaty:

Binding Emission Targets. To help guarantee the effectiveness of global efforts to reduce greenhouse gas emissions, the U.S. will promote binding targets for developed nations to reduce their emissions. Almost all developed nations, including the United States, will fall well short of the non-binding goals in the 1992 Rio Convention.

Flexibility. To ensure that emission reductions are pursued in the most cost-effective manner, the Administration supports proposals for maximum flexibility, such as allowing the trading of emission permits among developed nations and allowing the so-called "joint implementation," under which developed and developing measures can provide strong incentives to achieve the greatest possible reductions at the lowest possible cost.

Working for a Common Sulution. The United States will only support an agreement that requires all nations to participate in a common solution to the global problem of climate change. Like other industrialized nations, we realize that our responsibility for large proportions of current emissions requires us to agree on binding reduction targets. But any agreement must also require developing nations to commit to appropriate action. [Note: By 2035, scientists estimate that emissions from developing countries will exceed those of developed nations.]

Our domestic policies. The President has not yet endorsed any emissions target or timetable, and specific policies to implement a target and timetable are still being developed. But the Administration's policy work is guided by certain broad principles.

President Clinton is *committed to responsible, balanced action* to confront the threat of climate change. The Administration rejects both extremes of the climate change debate: those who want to take drastic actions that would severely disrupt our economy and those who dismiss the scientific evidence and say we need not act.

President Clinton will *only take actions that preserve our vigorous economic growth.* The Administration believes -- and has demonstrated -- that environmental protection and economic growth can and should go hand in hand.

The Clinton Administration will *emphasize solutions based on flexible, market-based policies,* not government regulation. These programs include emissions trading within the United States.

The Clinton Administration *will invest in research and development to promote technologies* that reduce the emissions that cause climate change, save energy, and reduce our dependence on foreign oil. We will work to help American industry increase its role as the world leader in developing environmental technology.

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Building Towards a Cleaner Future

The cost of reducing greenhouse gas emissions in the short term depends greatly on the ability to accelerate use of existing energy-efficient technologies. Over the longer-term, the solution to the climate change problem depends on developing and deploying new technologies that are even more efficient or are based on non-carbon energy sources.

A range of government programs might help accelerate technological change. Research and development programs generally aim to improve technologies by lowering production and operating costs. Significant R&D opportunities exist in areas such as buildings, transportation, combustion, renewables and sequestration (e.g., fuel cells, advanced industrial turbines, advanced diesel engines, and transportation biofuels). In addition, information dissemination programs assist businesses and consumers in identifying opportunities to reduce the energy intensity of their products or services (e.g., using more energy efficient light bulbs, insulation, appliances, etc.).

Existing Administration initiatives in this area include:

The Climate Change Action Plan (CCAP)

Federal energy consumption

Partnership for a New Generation Vehicle (PNGV)

Partnership for Advancing Technologies in Housing (PATH)

Biomass Energy Initiative

Million Solar Roofs Initiative

The President's Committee of Advisors on Science and Technology (PCAST)

Regional Climate Change Workshops

[Text Version]

The Climate Change Action Plan (CCAP). CCAP began in 1993 with a goal of returning total U.S. greenhouse gas emissions to their 1990 levels by the year 2000. Although the CCAP will fall well short of this goal, CCAP programs will result in emissions reductions of about 76 million metric tons of carbon-equivalent by the year 2000.

The plan includes some 50 initiatives covering major sectors of the U.S. economy. It addresses energy demand, energy supply, forestry. Agency participants include DOE, EPA, and USDA. The CCAP includes measures to reduce all significant greenhouse gases in all sectors of the economy. It is a voluntary program that relies on partnerships and cooperation between the public and private sectors in developing new low-emissions, high efficiency technologies.

Because of lower-than-expected fuel prices and higher-than-expected economic growth and electricity demand, overall emissions growth has outstripped the emissions reductions achieved by CCAP. Additionally, Congress has made significant reductions (about 40% in recent years) in CCAP's funding, thus preventing full implementation of some of CCAP's initiatives.

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Federal energy consumption. The Energy Policy Act of 1992 and Executive Order 12902 challenge Federal building managers to reduce energy consumption by 20% per square foot by 2000, and 30% by 2005, relative to a 1985 baseline. With declining Federal resources available, the Federal Energy Management Program is emphasizing the use of private-sector investment through energy-saving performance contracting and utility financing of energy efficiency to meet these goals. The combination of Federal funding and anticipated private sector funding of up to $4.3 billion through 2005 should make these goals attainable.

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Partnership for a New Generation Vehicle (PNGV). Although the fuel economy of cars has nearly doubled in the last 25 years, Americans travel more than twice as many miles today as we did in 1970, with a net result of increased fuel consumption and increased greenhouse gas emissions from personal vehicles. While technology has reduced many of the emissions from automobiles, CO2 emissions are the exception.

The PNGV program joins the big three U.S. automakers, Federal agencies and many suppliers of materials and equipment in an effort to develop a more efficient automobile. The program's goal is to triple the fuel efficiency of passenger cars with no decrease in comfort or safety.

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Partnership for Advancing Technologies in Housing (PATH). Energy use in building is responsible for about a third of U.S. greenhouse gas emissions, and rising. Major improvements can be made in the quality of housing, while reducing energy use by 50% or more and lowering costs. The PATH initiative will bring together building suppliers, assemblers, insurance companies, and state and local regulators to explore and demonstrate how innovation in construction markets can achieve environmental goals with an affordable, attractive product. Discussions are underway with jurisdictions in Colorado, Florida and California. HUD, DOE and NIST are playing major roles.

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Biomass Energy Initiative. The biomass energy initiative involves converting agricultural crops to liquid and gaseous fuels. The Departments of Energy and Agriculture are now working with private companies to improve technologies and to demonstrate the potential for such power projects to aid rural development. The initiative has sponsored pilot projects in New York, Minnesota and Iowa.

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Million Solar Roofs Initiative. DOE will lead an effort to place one million solar energy systems on U.S. roofs by the year 2010, by using existing Federal grants, procurement, and other programs, and by working with local communities, businesses, governments, and utilities to increase sales of solar energy systems. By 2010, this initiative could avert carbon dioxide emissions equivalent to those of 850,000 cars and will produce the same electrical generating capacity as several coal-fired power plants.

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The President's Committee of Advisors on Science and Technology (PCAST). The President directed PCAST to conduct a review of national energy R&D policies, which would access their adequacy and Aensure the United States has a program that addresses its energy and environmental needs for the next century.@ PCAST will present its recommendations on publicly supported R&D, incentives for private energy R&D, and commitments to international energy R&D, by October 1, 1997.

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Regional Climate Change Workshops. The White House Office of Science and Technology Policy and the U.S. Global Climate Change Research Program are sponsoring a series of workshops to examine the vulnerabilities of various regions of the United States to climate variability and climate change and to gather information across regions to support national scientific assessment (called for in the Global Change Research Act of 1990). Eighteen workshops with the full involvement of relevant stakeholders are being held in different regions of the country.

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About the Initiative
Global Climate Change

Administration Outreach & Schedule of Upcoming Events

The Clinton Administration is committed to engaging the American people in a substantive dialogue about the issue of climate change and to listening to a range of views about how best to address the problem.

President Clinton and Vice President Gore hosted a meeting including eight Nobel Laureates at the White House in July to explore climate change science. They have also met with key constituencies on the issue, including business and environmental leaders.

Members of the Cabinet are discussing climate change in communities across the nation.

Senior White House officials have met with a variety of constituencies, including organized labor, utilities, auto companies, renewable energy firms, and others to listen to specific concerns and discuss ways of addressing climate change that protect economic growth.

NOAA is sponsoring a briefing on climate change for weather forecasters from across the country on October 1, to provide basic scientific information on the issue. The President and Vice President will also address the group.

The President and Vice President will host the White House Conference on Climate Change: The Challenge of Global Warming on October 6 at Georgetown University.

CLIMATE CHANGE

State of Knowledge

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Introduction and Background

Introduction

Burning coal, oil and natural gas to heat our homes, power our cars, and illuminate our cities produces carbon dioxide (CO_2) and other greenhouse gases as by-products. Deforestation and clearing of land for agriculture also release significant quantities of such gases. Over the last century, we have been emitting greenhouse gases to the atmosphere faster than natural processes can remove them. During this time, atmospheric levels of these gases have climbed steadily and are projected to continue their steep ascent as global economies grow.

Records of past climate going as far back as 160,000 years indicate a close correlation between the concentration of greenhouse gases in the atmosphere and global temperatures. Computer simulations of the climate indicate that global temperatures will ri se as atmospheric concentrations of CO_2 increase. The 1995 report of the Intergovernmental Panel on Climate Change (IPCC), which is the most comprehensive and thoroughly reviewed assessment of climate change science ever produced, concluded that change i s already underway. The IPCC, which represents the work of more than 2,000 of the world's leading climate scientists, concluded that Earth has already warmed about 1° F over the last century, and that the balance of evidence suggests that ther e is a discernible human influence on global climate.

The IPCC estimates that global surface air temperature will increase another 2 - 6.5° F in

the next 100 years. The difference in temperature from the last ice age to now is about 9° F. Their best guess is that we will experience w arming of about 3.5° F by 2100, which would be a faster rate of climate change than any experienced during the last 10,000 years, the period in which modern civilization developed.

Warming of this magnitude will affect many aspects of our lives as it changes temperature and precipitation patterns, induces sea level rise, and alters the distribution of fresh water supplies. The impacts on our health, the vitality of forests and othe r natural areas, and the productivity of agriculture are all likely to be significant. As the risks of global climate change become increasingly apparent, there is a genuine need to focus on actions to reduce our greenhouse gas emissions and minimize the adverse impacts of a changing climate.

Background

During the 1980s, scientific evidence about global climate change and its consequences led to growing concern among scientists, policy makers, and the public. In 1988, the United Nations Environment Programme (UNEP) and the World Meteorological Organizat ion (WMO) jointly established the Intergovernmental Panel on Climate Change (IPCC). Through the IPCC process, scientists representing more than 150 countries have assessed the available information on climate change and its environmental and economic eff ects and have provided the scientific understanding needed to help formulate appropriate responses. A series of IPCC reports, incorporating extensive peer review and a commitment to scientific excellence, have provided the most authoritative and comprehe nsive information available on the science of climate change. In 1996, the IPCC published its Second Assessment Report, which summarizes the most recent information on climate change science and the vulnerability of natural and socioeconomic systems.

IPCC Website:
http://www.ipcc.ch/

In 1990, the United Nations (UN) General Assembly established the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change (FCCC). The FCCC was adopted in 1992, and over 160 signatories have now become parties to the agreement . The agreement was signed by the President of the U.S. and ratified by the U.S. Senate in 1992. The ultimate aim of the FCCC is to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the clima te system. This stabilization should be achieved within a time frame that (1) allows ecosystems to adapt naturally to climate change, (2) ensures that food production is not threatened, and (3) enables sustainable economic development to proceed.

Framework Convention Website:
http://www.unep.ch/iucc.html

In the United States, climate change research is overseen by the U.S. Global Change Research Program (USGCRP), which was established in 1989. Since its inception, the USGCRP has strengthened research on key scientific issues and has fostered improved und erstanding of Earth processes. New directions for the USGCRP include identifying and analyzing regional vulnerabilities to climate variability and climate change. The results of the research it supports have played an important role in the work of the I PCC and other national and international bodies.

GCRP Website:
http://www.usgcrp.gov/

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The Greenhouse Effect and Historical Emmissions

Life as we know it is possible on Earth because of a natural greenhouse effect that keeps our planet about 60û F warmer than it otherwise would be (Figure 1). Water vapor, carbon dioxide (CO_2), and other trace gases, such as me thane and nitrous oxide, trap solar heat and slow its loss by re-radiation back to space. With industrialization and population growth, greenhouse gas emissions from human activities have consistently increased. These steady additions have begun to tip a delicate balance, significantly increasing the amount of greenhouse gases in the atmosphere, and enhancing their insulating effect.

A wide variety of activities contribute to greenhouse gas emissions. Burning of coal, oil, and natural gas releases about 6 billion tons of carbon into the atmosphere each year worldwide. Burning and logging of forests contributes another 1-2 billion to ns annually by reducing the storage of carbon by trees (Figures 2 and 3). The result is that the atmospheric level of CO_2, the most important human-derived greenhouse gas, has increased 30 percent, from 280 to 360 parts per million (ppm) since 1860 (Figure 4). Over the same time period, agricultural and industrial practices have also substantially increased the levels of other potent greenhouse gases -- methane concentrations ha ve doubled and nitrous oxide levels have risen by about 15 percent. These gases have atmospheric lifetimes ranging from decades to centuries; today's emissions will be affecting the climate well into the 21st century.

The overall emissions of greenhouse gases are growing at about 1 percent per year. For millennia, there has been a clear correlation between CO_2 levels and the global temperature record. Fluctuations of CO_2 and temperature have roughly mirrored each othe r over the last 160,000 years (Figure 5). The current level of CO_2 is already far higher than it has been at any point during

Figure1

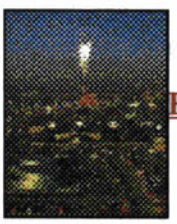

Figure2

Figure3

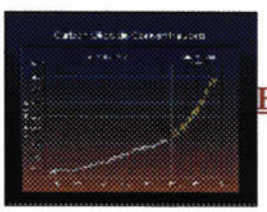

Figure4

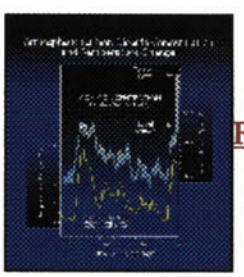

Figure5

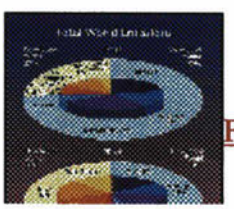

Figure6

this period. If current emissions trends continue over the next century, concentrations will rise to levels not seen on the planet for 50 million years.

Which countries account for the largest proportions of CO2 emissions? In 1995, 73 percent of the total CO2 emissions from human activities came from the developed countries (Figure 6). The United States is the largest si ngle source, accounting for 22 percent of the total, with carbon emissions per person now exceeding 5 tons per year. Over the next few decades, 90 percent of the world's population growth will take place in the developing countries, some of which are als o undergoing rapid economic development. Per capita energy use in the developing countries, which is currently only 1/10 to 1/20 of the U.S. level, will also increase. If current trends continue, the developing countries will account for more than half of total global CO2 emissions by 2035. China, which is currently the second largest source, is expected to have displaced the United States as the largest emitter by 2015.

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Climate Change Over the Next 100 Years

Where is the climate headed? If the world proceeds on a Òbusiness as usualÓ path, atmospheric CO2 concentrations will likely be more than 700 ppm by 2100, and they will still be rising. This is nearly double the current level and much more than double the preindustrial level of 280 ppm (Figure 10). State-of-the-art climate models suggest that this will result in an increase of about 3.5ºF in global temperatures over the next century. This would be a rate of climate change not seen on the planet for at least the last 10,000 years. It is the combined threat of elevated concentrations of greenhouse gases and this unprecedented rate of increase that causes great concern.

What are the projected extent and pattern of warming over the globe? The higher latitude regions will warm relatively more than areas nearer to the equator. The land surface will warm more than the oceans, and there will be less variation in temperature from night to day.

Even if the rate of emissions is slowed enough to limit atmospheric concentrations to about 550 ppm, or roughly double the preindustrial level, the U.S. could experience temperature increases of 5º F to 10º F (Figure 11). These warmer temperatures would lead to soil drying in some regions, with drying estimated at 10 percent to 30 percent for the United States during the summer growing season (Figure 12).

Some modeling experiments have examined the consequences of CO2 levels well beyond 700 ppm, which are likely to occur after 2100 if current emissions trajectories are not altered. If the CO2 concentration were to continue to rise to four times the preindustrial level, or more than 1100 ppm, the estimated temperature increase for the United States would be

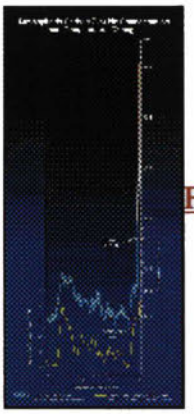

Figure10

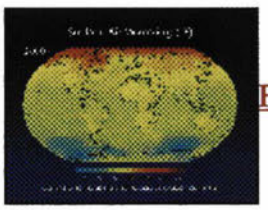

Figure11

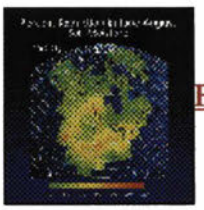

Figure12

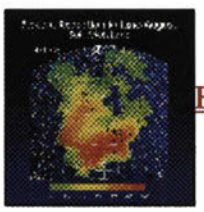

Figure13

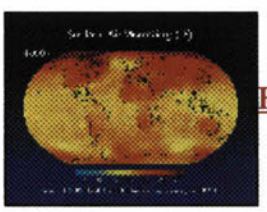

Figure14

15°F to 20°F and soil drying could approach 30 percent to 50 percent during the growing season (Figures 13 and 14).

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Climate Change Over the Last 100 Years

Global surface temperature has been measured since 1880 at a network of ground-based and ocean-based sites. Over the last century, the average surface temperature of the Earth has increased by about 1.0° F. The eleven warmest years this century have all occurred since 1980, with 1995 the warmest on record (Figure 7). The higher latitudes have warmed more than the equatorial regions.

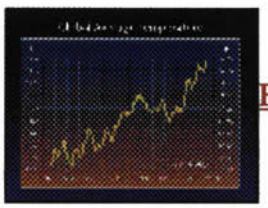
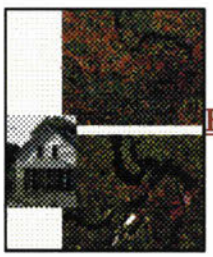


Figure7

Beginning in 1979, satellites have been used to measure the temperature of the atmosphere up to a height of 30,000 feet. The long-term surface record and the recent satellite observations differ, but that fact is not surprising: the two techniques measure the temperature of different parts of the Earth system (the surface, and various layers of the atmosphere). In addition to this, a variety of factors, such as the presence of airborne materials from the 1991 eruption of the volcano Mt. Pinatubo, affect each record in a different way. Satellite observations were initially interpreted as showing a slight cooling, but more recent analyses accounting for natural, short-term fluctuations imply warming, just as the ground-based measurements have indicated over a longer time period. As more data from the satellite record become available, and as the quality of measurements is improved, comparison of these two records should yield additional insights.



Figures8-9

What does warming do? A warmer Earth speeds up the global water cycle: the exchange of water among the oceans, atmosphere, and land. Higher temperatures cause more evaporation, and soils will tend to dry out faster. Increased amounts of water in the atmosphere will mean more rain or snow overall. We may be seeing the first signs of changes in the water cycle. Since the beginning of the century, precipitation in the United States has increased by about 6 percent, while the

frequency of intense precipitation events (heavy downpours of more than two inches per day) has increased by 20 percent. Such events can cause flooding, soil erosion, and even loss of life (Figures 8 and 9). In some midcontinental areas, increased evaporation has led to drought because the heavy rains fell elsewhere.

There is also evidence that ecosystems are reacting to warming. Between 1981 and 1991, the length of the growing season in the northern high latitudes (between 45° and 70° N) increased by a total of up to twelve days, as documented by satellite imagery. Greening in spring and summer occurred up to eight days earlier, and vegetation continued to photosynthesize an estimated four days longer.

Global mean sea level has risen 4 to 10 inches over the last 100 years, mainly because water expands when heated. The melting of glaciers, which has occurred worldwide over the last century, also contributes to the rise. Formerly frozen soils (permafrost) in the Alaskan and Siberian arctic have also begun to melt, damaging both ecosystems and infrastructure. Melting and tundra warming will also lead to decay of organic matter and the release of trapped carbon and methane, creating an additional source of greenhouse gases.

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Vulnerabilities and Potential Consequences

The climate changes expected from increased atmospheric concentrations of greenhouse gases are likely to have widespread effects, many of them negative, on ecological systems, human health, and socioeconomic sectors. In general, people in developing countries are more vulnerable to climate change because of limited infrastructure and capital and greater dependence on natural resources. Unless otherwise specified, the impacts and vulnerabilities discussed below are based on scenarios of doubling of current levels of CO2 by 2100 (700 ppm). Beyond such concentrations, impacts appear to worsen, but uncertainty about what will happen increases. In general, uncertainty cuts both ways: outcomes could be less dramatic than expected based on our current understanding, but could just as well be much more severe.

Worsening Health Effects - Climate change will impact human health in a variety of ways. Warmer temperatures increase the risk of mortality from heat stress. For example, in July 1995, 465 deaths in Chicago were attributed to a heat wave with temperatures exceeding 90° F day and night. Today, such events occur about once every 150 years. By 2100, they could become six times more frequent. The potential increases in the heat index, a calculation combining temperature and humidity, illustrate the magnitude of this threat. Washington, D.C. currently has an average July heat index of 85° F, but if CO2 levels reach 550 ppm (double the preindustrial level), this could increase to 95° F, and if concentrations quadrupled to 1100 ppm, it could increase to 110° F. Climate change will also exacerbate air quality problems, such as smog, and increase levels of airborne pollen and spores that aggravate respiratory disease, asthma, and allergic disorders (Figure 15). Because children and the elderly are the most vulnerable

Figure15

Figure16

Figure17

Figure18

Figure19

Figure20

populations, they are likely to suffer disproportionately with both warmer temperatures and poorer air quality.

Diseases that thrive in warmer climates, such as malaria, dengue and yellow fevers, encephalitis, and cholera, are likely to spread due to the expansion of the ranges of mosquitos and other disease-carrying organisms and increased rates of transmission. This could result in 50 million to 80 million additional malaria cases per year worldwide by 2100.

Rising Sea Level - Rising sea level erodes beaches and coastal wetlands, inundates low-lying areas, and increases the vulnerability of coastal areas to flooding from storm surges and intense rainfall. By 2100, sea level is expected to rise by 6 to 37 inches. A 20-inch sea level rise will result in substantial loss of coastal land in the United States, especially along the southern Atlantic and Gulf coasts, which are subsiding and are particularly vulnerable. The oceans will continue to expand for several centuries after temperatures stabilize. Because of this, the sea level rise associated with CO2 levels of 550 ppm (double pre-industrial levels) could eventually exceed 40 inches. A CO2 level of 1100 ppm could produce a sea level rise of 80 inches or even more, depending on the extent to which the Greenland and Antarctic ice sheets melt.

- A 20-inch sea level rise would double the global population at risk from storm surges, from roughly 45 million at present to over 90 million, and this figure does not account for any increases in coastal populations. A 40-inch rise would triple the number.
- South Florida is highly vulnerable to sea level rise (Figure 16). A third of the Everglades has an elevation of less than 12 inches. Salt water intrusion would adversely affect delicate ecological communities and degrade the habitat for many species.

Disruption of the Water Cycle - Among the most fundamental effects of climate change are intensification and disruption of the water cycle.

Droughts and floods - Intensification of the water cycle will produce more severe droughts in some places and floods in others. Such events are costly. Damages from

the Southern Plains drought of 1996 were estimated at $4 billion, the 1993 Mississippi River flood damages at $10 billion to $20 billion, the Pacific Northwest floods in the winter of 1996-1997 at about $3 billion, the 1997 Ohio River flood at about $1 billion, and the 1997 Red River flood in the Northern Plains at about $2 billion.

Water quality and quantity - Areas of greatest vulnerability are those where quality and quantity of water are already problems, such as the arid and semi-arid regions of the United States and the world (Figure 17).

- Climate change would likely increase water supply problems in several U.S. river basins, such as the Missouri, Arkansas, Texas Gulf, Rio Grande, and Lower Colorado.
- Water scarcity in the Middle East and Africa is likely to be aggravated by climate change, which could increase international tension among countries that depend on water supplies originating outside their borders.

Changing Forests and Natural Areas - Climate change could dramatically alter the geographic distributions of vegetation types. The composition of one-third of the Earth's forests would undergo major changes as a result of climate changes associated with a CO2 level of 700 ppm. Over the next 100 years, the ideal range for some North American forest species will shift by as much as 300 miles to the north, far faster than the forests can migrate naturally. Economically important species, such as the sugar maple, could be lost from New England by the end of the next century (Figure 18).

Such changes could have profound effects on the U.S. system of national parks and refuges, leading to reductions in biological diversity and in the benefits provided by ecosystems, such as clean water and recreation. Wetlands are particularly at risk. The wetlands of the prairie pothole region, which support half the waterfowl population of North America, could diminish in area and change dramatically in character in response to climate change. The glaciers of Glacier National Park have receded steadily for decades (Figure 19). Model projections indicate that all the ParkÕs

glaciers will disappear by 2030 unless temperatures begin to cool instead of warm.

Challenges to Agriculture and the Food Supply - Climate strongly affects crop yields. A CO2 concentration of 550 ppm is likely to increase crop yields in some areas by as much as 30 percent to 40 percent, but it will decrease yields in other places by similar amounts, even for the same crop. A warmer climate would reduce flexibility in crop distribution and increase irrigation demands. Expansions of the ranges of pests could also increase vulnerability and result in greater use of pesticides. Despite these effects, total global food production is not expected to be altered substantially by climate change, but there are likely negative regional impacts. Agricultural systems in the developed countries are highly adaptable and can probably cope with the expected range of climate changes without dramatic reductions in yields. It is the poorest countries, already subject to hunger, that are the most likely to suffer significant decreases in agricultural productivity (Figure 20).

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Conclusion

As the world's expanding population burns large quantities of fossil fuels and simultaneously cuts down large expanses of forests worldwide, the concentrations of CO2 and other greenhouse gases are building up in the atmosphere. There is mounting evidenc e that this shift in Earth's atmosphere will lead to global changes and potentially major climatic disruptions.

Human and ecological systems are already vulnerable to a range of environmental pressures, including climate extremes and variability. Global warming is likely to amplify the effects of other pressures and to disrupt our lives in numerous ways. Signific ant impacts on our health, the vitality of forests and other natural areas, the distribution of freshwater supplies, and the productivity of agriculture are among the probable consequences of climate change.

On a business as usual path, the world is headed to concentrations far higher than have been observed during the time of human civilization and to levels not seen on the planet for millions of years--and all in one century, a geologic "blink of an eye." The faster the rate of change in climate, the less time there will be for both ecological and socio-economic systems to adapt and the greater the potential for "surprises" or unanticipated events. Given the long time lags between cause and effect and bet ween effect and remedy, a prudent course of action is to slow the rate of change. Investing now to protect Earth's climate will enable our children and grandchildren to live in a world that is not dramatically altered by an enhanced greenhouse effect.

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NOBEL LAUREATES
GLOBAL CLIMATE CHANGE

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WHITE HOUSE INITIATIVE ON GLOBAL CLIMATE CHANGE

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(Nobel Laureate in Chemistry, 1995, Professor at University of California, Irvine, Foreign Secretary for the National Academy of Sciences, Past President of the American Association for the Advancement of Science)

In 1995, Sherwood Rowland, along with two of his colleagues, won the Nobel Prize in Chemistry for pioneering research in atmospheric chemistry of the destruction of the ozone layer. Since receiving his Ph.D. from the University of Chicago in 1952, he has climbed the academic ranks in chemistry, and is currently the Donald Bren Research Professor of Chemistry and Earth System Science at the University of California at Irvine. Dr. Rowland has received many awards including the Roger Revelle Medal from the A merican Geophysical Union. He also currently serves as the Foreign Secretary of the National Academy of Sciences, and is a former President and Chairman of the Board of the American Association for the Advancement of Science.

Mr. President and Mr. Vice President, global climatic change is underway. Carbon dioxide from the combustion of coal, oil, and natural gas has risen 15 percent in the atmosphere since 1958. Methane, some of which is emitted from cattle and rice paddies, h as increased 16 percent since 1978. The air now holds four times as much chlorofluorocarbons as it did 25 years ago. The amount of ozone in the stratosphere over the United States is 6 to 10 percent lower than it was in the 1960s.

Many other changes are occurring as well. The global average surface temperature has risen about 1 °F during the past century, and sea level has risen from 4 to 10 inches.

Land use patterns have been greatly altered as forests are burned for use as agricultural land. Many of the species formerly in these forests are disappearing. The geographical ranges of tropical diseases are moving northward. Human activities are the chi ef cause of many of these changes. The last century saw tremendous growth in the global population, from about 1H billion in 1900 to 6 billion in the year 2,000 and 8 billion in the year 2025. Much of the world is now moving as fast as possible into a mor e affluent, energy-intensive era.

The combination of a rapidly growing world population with an increase in per capita use of energy carries with it great pressures on the environment and the atmosphere. Because the wind circles the earth within a few weeks, greenhouse gases emitted from each country quickly

become a global problem requiring a global solution. During the 1990s, the world called upon its scientists to evaluate the question of global warming from the accumulation of greenhouse gases. The authoritative IPCC has estimated a probable increase in g lobal surface air temperature of about 3H °F by the year 2100, with a possible range from 2 to 6H °F. They further stated that the balance of the evidence suggests a discernible human influence on global climate, and warned that the average rate of warmin g will probably be greater than any experienced in the past 10,000 years. The variation in estimated outcomes depends upon what the countries of the world do to control the emissions of carbon dioxide and other greenhouse gases in the intervening years. M ore than 2600 scientists have now signed a statement on global climatic disruption in which, as scientists and as concerned citizens, we ask that the United States demonstrate strong leadership in the global effort with a firm proposal for reducing U.S. e missions of greenhouse gases.

(Nobel Laureate in Chemistry, 1995, Professor at Massachusetts Institute of Technology, Member of the President's Committee of Advisors on Science and Technology)

Mario Molina was awarded the Nobel Prize along with Sherwood Rowland for research on the thinning of the ozone layer. Dr. Molina and his colleagues demonstrated experimentally how ozone-destroying chlorine functions in the atmosphere. He is currently the Lee and Geraldine Martin Professor of Environmental Science at Massachusetts Institute of Technology. Since completing his Ph.D. in physical chemistry at the University of California, Berkeley, Dr. Molina has received many honors and awards, including ele ction to the National Academy of Sciences, and selection as a Pew Scholar on Conservation and the Environment. He has also served as an advisor to the National Aeronautics and Space Administration, the National Science Foundation, and the National Institu tes of Health.

I'd be pleased to do that, Mr. Vice President. The "greenhouse effect" is a process that affects the heat patterns of our planet. The earth receives energy from the sun, which passes relatively freely through the atmosphere. But the energy that the earth emits back to outer space is actually trapped by certain gases in the earth's atmosphere, which affects the earth's heat patterns. One of these gases is carbon dioxide, which is the most important greenhouse gas. And what we have in the figure is a repres entation of the amount of carbon dioxide in the atmosphere going back in time 160,000 years. The levels of carbon dioxide range between about 190 and 280 parts per million. We know this from measuring the composition of air bubbles trapped in ice cores fr om Antarctica and Greenland. The lower curve in the figure is a similar record of temperature going from the present back 160,000 years. There is a remarkably large correlation between these two curves. You can see that the preindustrial amounts of CO2 ar e below 300 parts per million. The current concentration of CO2 is roughly 365 parts per million. What is striking is that this is a level that we haven't seen before, certainly not in the past 160,000 years, and we got there very fast.

The next question is where are we heading? What happens in the future depends on what we do. If we continue with the so-called "business-as-usual" scenario, we can predict that we are going to reach levels of about 700 parts per million. And what is rema rkable is how fast this would occur — in only the blink of an eye on the geological or evolutionary time scale. I should point out that the earth has actually seen such high levels of carbon dioxide in the past, but that was some 50 million years ago whe n the earth was a very different place from what it is now. This is the sort of evidence that makes the scientific community consider this to be a serious problem. The magnitude and the pace of change are what make us really worry.

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WHITE HOUSE INITIATIVE ON GLOBAL CLIMATE CHANGE

(Professor at Oregon State University, Past President of both the American Association for the Advancement of Science and the Ecological Society of America)

Jane Lubchenco is currently the Wayne and Gladys Valley Professor of Marine Biology and Distinguished Professor of Zoology at Oregon State University, and has been awarded a litany of honors. She has been selected as a Pew Scholar in Conservation and the Environment, a MacArthur Fellow, a member of the National Academy of Sciences, and a member of the National Science Board. She is also an American Academy of Arts and Sciences Fellow, an American Association for the Advancement of Science Fellow, and has received numerous teaching awards. She has accomplished all of this since receiving her Ph.D. from Harvard University in 1975.

Mr. President, Mr. Vice President, as both of you are aware, the ecological systems of the world — the forests, wetlands, coral reefs — provide the life support systems for all of life on earth. Important ecosystem functions, including flood control, purification of air and water, and the creation of beautiful places for recreation and inspiration can only be provided by intact ecological systems, and when those systems are disrupted or lost, then we lose the goods and services they provide. To provide a few vignettes of the ecological consequences of climate change, in the optimistic scenario of a doubled CO2 world, let me invite you on a brief field trip to different parts of our country:

- Let's begin in the forests of New England, which like probably a third of the forests around the globe, will undergo major changes. For example, we would probably lose sugar maples from the New England forests.
- Let's move to the southern part of our country. Salt marshes in Louisiana are already being submerged. Climatic change would exacerbate this problem as sea level rises between six inches and three feet. The loss of salt marshes would result in the loss of nursery areas, which are the natural hatcheries for important fish and shellfish. We would also lose the system's ability to detoxify pollutants, trap sediments, create a habitat for unique plants and animals, and protect the shores against the battering of waves.
- Now let's move to the Midwest. Drought is no stranger to this region. The heat wave in 1988 resulted in a one–third drop in U.S. agricultural production. While these highly managed agricultural systems are thought to be quite adaptable, climate change is likely to increase demands on available water to ameliorate soil drying, and on pesticide use to combat increased incidences of pests and diseases.
- Flying up to Glacier National Park in Montana, we would be dismayed to find out that fully 73 percent of the glacial areas have already been lost since 1850 because of climate warming. In fact, climate change is predicted to result in loss of all of the glaciers in the park by the year 2030, well within many of our children's lifetimes.

As an ecologist, I must emphasize that the slower the rate of change in climate, the less catastrophic the results. Species are more likely to be able to migrate, to grow, and evolve if the rate of change is slow.

(Professor at Stanford University, MacArthur Fellowship, the American Association for the Advancement of Science Westinghouse Award for Public Understanding of Science and Technology)

After receiving his Ph.D. in Mechanical Engineering and Plasma Physics from Columbia University in 1971, Stephen Schneider focused on the influence of greenhouse gases and suspended particles on the earth's climate as a postdoctoral researcher at NASA's Goddard Institute for Space Studies, and later at the National Center for Atmospheric Research, where he remained until 1996. In 1992, Dr. Schneider was awarded a MacArthur Fellowship for his ability to integrate and interpret the results of global climate research through public lectures, seminars, media appearances, and research. He was also honored with the American Association for the Advancement of Science Westinghouse Award for Public Understanding of Science and Technology for his ability to express environmental science and its implication for public policy to the general public. Currently he is a Professor in the Department of Biological Sciences and a Senior Fellow at the Institute for International Studies at Stanford University.

Thank you very much, Mr. Vice President, Mr. President. What we're addressing at the moment is, "so what if the climate changes?" This is a question that scientists have spent a long time on, doing literally hundreds of studies, suggesting outcomes ranging from catastrophic to mild. Let's take a look at just two examples — the sea level question and the question of hydrologic extremes, droughts and floods. We all remember the terrible pictures from hurricane Andrew, which resulted in losses on the order of $40 billion in Florida and other areas around the Caribbean. Could we have had something to do with that? If you increase the temperature of the oceans, it increases evaporation, it might make storms stronger. That's very controversial. But one thing we know that isn't controversial is that before 1987 there were no losses larger than $1 billion. And now the insurance industries are very concerned that there have been several in the tens of billions.

What else do we know that's not controversial? Sea levels have gone up and are projected, typically, to go up six inches to maybe three feet, depending upon how things turn out in the next century. And whether storms are augmented in strength by global warming or remain at their natural levels, they'll be causing flooding from a higher sea-level base. As a result of that, the damages would go further inland.

What about the hydrologic extremes? Well, we all saw pictures of the 1988 drought. We know about the seemingly endless stories of floods now. And the question is, "Has nature rolled us a double snake eyes, or have we started to load the dice?" Again, physics says if you increase the heating of something that has water in it, more water will evaporate. So, what that suggests is that more water in the air means that when it does rain, the rainfall can be more intense. When it's dry, you can have more evaporation.

The question is, what's happening? A line that we often use in science is, well, in God we trust, but for the rest of us, please show data. Dr. Tom Karl and his colleagues in North Carolina, for example, have concluded that there has been about a 10 percent increase in precipitation across the United States since 1910. The interesting part, as Tom says, is, "The increase in precipitation is reflected primarily in the heavy and extreme daily events." Translated: Gully washers. The bulk of the rainfall increase has been in those kinds of damaging, extreme events. A pattern is emerging, and the pattern is consistent with the expectations from our models. So, while no one event certainly could be laid to the doorstep of global warming, the increasing frequency and magnitude of severe storms could very well be the first signs of the canary in the cage starting to quiver. The IPCC concluded with a paragraph I know well as a lead IPCC author, and I'll quote what it said in its last paragraph of the summary for policy makers. "When rapidly forced, nonlinear systems are especially subject to unexpected behavior." In my words, that means reducing the pressures humans put on nature is insurance against potential nasty surprises.

(Professor at University of Texas, Director of the Yale Arbovirus Research Unit for 24 years)

Robert Shope has devoted his career to the study of viruses carried by mosquitoes, ticks, and other biting insects. These viruses can cause life-threatening diseases in humans such as malaria, dengue and yellow fevers, and encephalitis. Since receiving his medical degree in 1954 from Cornell University, he has spent many years in Malaysia, Brazil, and other tropical sites studying these insect-borne diseases. He was a Professor of Epidemiology at Yale University's School of Medicine from 1975 to 1995, and served as the Director of the Yale Arbovirus Research Unit. During that period he was awarded many honors, including the Walter Reed Award from the American Society of Tropical Medicine and Hygiene. He is presently a Professor in the Departments of Pathology and Microbiology and Immunology at the University of Texas Medical Branch.

Thank you, Mr. President. Health and the environment are closely linked. If there is a 6 °F warming, the heat alone in North American cities, such as Washington, D.C., will result in an excess of deaths, especially in elderly people who do not adapt well to severe warmth. We had an example in July of 1995 in Chicago, Illinois. There the temperature exceeded 90 °F night and day for a prolonged period, and there were 465 deaths recorded in Chicago related to the heat.

My own personal experience is with diseases transmitted by ticks, mosquitoes, and other biting insects. Let me talk about dengue virus. This causes a disease in people which typically gives them high fever, headache, muscle aches and pains, and sometimes a rash. There is a more severe form of dengue, dengue-hemorrhagic fever, in which the case mortality rate is about 10 percent. This virus is transmitted by a mosquito that lives in and around homes in warm climates. The mosquito is killed by a hard freeze; therefore, it's northern limit is about Memphis, Tennessee, at the present time. In the last decade, we've seen a steady increase in the numbers of cases of dengue in tropical America, including Mexico. This disease is now literally on our southern border. I cannot tell you whether dengue epidemics will occur in the United States, but with climate change and warming, the mosquito will thrive further north.

These same factors apply to the vector of malaria, also a mosquito. Malaria is a disease that, worldwide, kills approximately 2 million people each year. It's a tropical disease, but recently has occurred in small outbreaks in the United States, in New Jersey, New York, and Texas, and with warming we can expect these outbreaks to continue and to enlarge.

The factors that I've talked about argue for controlling the environment while we still have time, and I will say that the best insurance is preparedness. There are many other diseases directly affected by rainfall and warming — St. Louis encephalitis, the tick-borne Lyme disease, and the newly recognized rodent-associated Hantavirus pulmonary syndrome, which broke out in 1993 in the southwestern part of the United States. Each nation in the world has its own set of diseases, some of which affect Americans abroad or can be transported and introduced into the United States. Therefore, the problem of climate change and health is of common interest among nations as are the solutions. Thank you.

(Nobel Laureate in Physics, 1990, Professor at Massachusetts Institute of Technology, Chairman of the Board of the Union of Concerned Scientists)

In 1990, Henry Kendall won the Nobel Prize in Physics, along with two colleagues, for his insightful work in particle physics. Dr. Kendall is currently the J.A. Stratton Professor of Physics at the Massachusetts Institute of Technology. He also serves as the Chairman of the Board of the Union of Concerned Scientists, an organization which he helped found in 1994. Throughout his career, Dr. Kendall has focused on U.S. energy and defense issues such as the nuclear arms race, nuclear power, and renewable energy. He has many other awards and honors including being elected to the National Academy of Sciences.

Mr. President, Mr. Vice President, thank you for this opportunity. Disruption of the climate is linked to, and can aggravate, many other human problems. One link I'd like to talk about is the connection with world food production. Agriculture, as is widely recognized, needs a stable climate in order to be highly productive. But in 1988, in the central North American continent, with combined high temperatures and drought, both Canada and the United States lost one-third of their grain supplies. For the first time in 200 years, food production was not adequate to feed us. In the years since, Australia and Mexico have had somewhat similar events.

Food demand is expected to double in the next 30 years, which is almost no time at all. Fresh water, which is vital for irrigation, is already short. The human race uses nearly one half of the available fresh water, and 40 percent of the world's population lives in areas that are water short. Expansion into new arable land is highly constrained, and the last thing we need are climatic changes and disruptions putting additional pressures on a system that is already becoming considerably stressed. Of course, it's the bottom tier of the developing nations that will get hit directly by shortages. This has already started to generate increasing numbers of hungry migrants, environmental refugees, streaming across national borders. The result is that no nation will be sheltered from the effects of dislocations in food supplies, altered trade balances, and fresh water difficulties. The flow of migrants may increase into the hundreds of millions of people. And even though the wealthy nations will remain able to feed themselves, and remain well fed into the future, no nation will escape troubles from pressures on the food supply. Mr. President, it is ot the case that one end of the boat can sink, so let me say that this is a developing problem in national security, and we have to deal with it. The best way to deal with problems of this sort is to stop them at the outset and not wait until the results are presented to us and the great troubles have developed. Thank you.

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(Professor at Harvard University, member of the President's Committee of Advisors on Science and Technology)

John Holdren is a world-renowned expert on energy and environmental science. In 1995, he delivered the Nobel Peace Prize acceptance lecture on behalf of the Pugwash Conferences, on the occasion of that organization's sharing of the 1995 prize. He is currently the Teresa and John Heinz Professor of Environmental Policy and Director of the Program on Science, Technology, and Public Policy in the John F. Kennedy School of Government, and Professor of Environmental Science and Public Policy in the Department of Earth and Planetary Sciences at Harvard University. From 1973 to 1996, he was a Professor of Energy and Resources at the University of California at Berkeley. He has been elected ..a Fellow of the National Academy of Sciences, the American Physical Society, the American Association for the Advancement of Sciences, the California Academy of Sciences, and the American Academy of Arts and Sciences. He was also awarded the MacArthur Foundation Prize. Dr. Holdren received his Ph.D. from Stanford University in aeronautics, astronautics and theoretical plasma physics in 1970.

I think, Mr. President, Mr. Vice President, there are at least six reasons why most people underrate the seriousness of the climate disruption problem. I think the first reason that people tend to underrate this problem is that human well-being is a lot more dependent on climate than most people think. As you heard today, we're talking about the productivity of farms and forests and fisheries. We're talking about the frequency and intensity of floods and droughts and heat waves. We're

talking about the geographic pattern of disease. We're talking about sea level rise and associated destruction of coastal property. And we're talking about the potential for political tension and conflict over the consequences and over who's responsible and who should pay.

The second reason people tend to underrate this problem is that climate disruption is a lot further along than most people think. As we've seen, atmospheric carbon dioxide is already higher than it's been in the last 160,000 years. The global surface temperature, which is expected to lag behind increasing carbon dioxide concentration, is higher than it's been in the last thousand years.

The third reason that many people are more complacent than they should be is that the climate implications of future growth in population and future growth in energy consumption are a lot bigger than most people think. We're going to have in the year 2050, barring near disaster, something like 9 billion people compared to less than 6 billion today. We're going to have energy use under "business as usual" that will be three times higher than today's and CO2 emissions that are 2 to 2H times today's worldwide.

The fourth point is that scientific uncertainties are not grounds for complacency, in spite of what many people may think. There are uncertainties about many of the details of timing and magnitude and regional variation in the consequences of climate change, but there is no uncertainty at all that humans have significantly altered the global atmospheric concentrations of gases we know to be critical in controlling climate. And there's a solid consensus among the scientists who have studied these matters seriously that the chances of significant impacts on human well being from climate change over the next few decades are substantial.

The fifth reason that people underrate the problem is that the time lags between cause and effect and between effect and remedy are longer than most people think. Those time lags and above all the several decades that it will take to substantially successfully transform the world's fossil fuel-dependent energy supply system mean that doing nothing is a very dangerous course of action. The world's energy-economic system is a lot like a supertanker, very hard to steer and with very bad brakes, and we know from the science that has been reviewed here today that that supertanker is heading for a reef. Even though we can't say exactly when we're going to get to the point where that reef rips the bottom out of the supertanker, it's a bad idea in these circumstances to keep on a course of full speed ahead.

The last reason that people tend to underrate this problem is because the fate of industrialized and less developed countries is a lot more interconnected than most people think. We all live on this planet under one atmosphere. We all live on the shores of one global ocean. Our countries are linked by flows of people, money, goods, ideas, images, drugs, and weapons. If we in the industrialized countries are to enjoy a stable and sustainable prosperity, we are only going to be able to manage that if we can achieve for the rest of the world now less fortunate a stable and sustainable prosperity as well. And the only way to do that is going to include addressing the danger of global climate disruption in a cooperative way.

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EVENTS AND REMARKS
GLOBAL CLIMATE CHANGE

September 2, 1997	Vice President Gore Addresses the Glacier National Park community on the effects of climate change
August 4, 1997	Remarks by the President to CEO Global Climate Change Meeting
July 26, 1997	Opening Remarks by the President and the Vice President at the Lake Tahoe Forum
July 24, 1997	Opening Remarks by the President and Vice President at the Discussion on Climate Change
June 26, 1997	Address to the United Nations Special Session on Environment and Development

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Environmental Protection Agency Global Warming Page
Global Change Data and Information Systems

Framework Convention on Climate Change:
Department of State, Bureau of Oceans, Environment and Science
Framework Convention on Climate Change Secretariat
Information Unit of the FCCC (IUCC)
Information from the Meetings of the Main and Subsidiary Bodies (Linkages)

Science:
Carbon Dioxide Information Analysis Center
Global Change Master Directory (GCMD)
Intergovernmental Panel and Climate Change
International Energy Agency (IEA) Greenhouse Gas Research and Development Programme
National Climatic Data Center (weather data)
National Oceanic and Atmospheric Administration (NOAA):

- Office of Oceanic and Atmospheric Research
- Office of Global Programs
- Climate Monitoring and Diagnostics Lab
- National Weather Service
- Satellite Active Archive

U.S. Global Change Research Program
Regional Climate Change Workshops
Regional Climate Change Workshops
White House Office of Science and Technology Policy
World Meterological Organization

Technologies:
Department of Energy, Office of Energy Efficiency and Renewable Energy
Center for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET)
National Renewable Energy Laboratory

Programs:
Department of Energy, Energy Patrnerships for a Strong Economy
Department of Energy, Photovoltaics Program
Environmental Protection Agency
Environmental Protection Agency, Office of Policy, Planning, and Evaluation
International Council for Local Environmental Initiatives (ICLEI)
Joint Implementation
U.S. Country Studies Program

Public Health:
Harvard
Johns Hopkins, Center for a Liveable Future

Documents:
Department of Energy, Energy Information Administration

To comment on this service,
send feedback to the Web Development Team.

Web Page

September 24, 1997

MEMORANDUM TO ANN LEWIS AND TODD STERN

FROM: **KEVIN MORAN**

SUBJECT: **REQUIREMENTS FOR BROADCASTING WEATHER FORECASTERS EVENT ON THE WHITE HOUSE HOME PAGE**

According to the Web Team, we can broadcast the Weather Forecasters event from the White House Home Page if we can get the following by the end of the week:

Real Video Server Software	$7,000
High Performance Windows NT PC Hardware	$4,000
SGI live audio/video server	$5,000
WHCA line	????
	$ 16,000

With these requirements, we will be able to provide live, professional quality video and audio coverage of the event -- accessible to as many as 1,000 locations. It will also create an archive copy of the event that can be retrieved by up to 100 users at a time, any time after the event.

Climate Change Web Site