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THE WHITE HOUSE

Sept 11, 1991

Dear Richard: (Dorman)

I don't have the full report yet
 but here with The Preface, Findings
 and Recommendations of The
 Waggoner NAS report and The NYT
 article concerning it
 Bert regarded

-7826

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CT 06504

Allan

Assistant to the President for
 Science and Technology
 The White House
 Washington DC 20500

Dear Allan,

You will recall that the Evans committee on Policy
 Implications of Global Warming encompassed a panel on
 Adaptation. I am chairman.

The Adaptation report was released on Friday with subsequent
 notice in the papers typified by the attached story from the
 New York Times.

Also I attach the Preface, Findings and Recommendations of
 the report itself. My reason for attaching the Preface is
 to show my obituary to Roger Revelle.

Should you or your people want to know more, I am at your
 service,

Paul E. Waggoner




DRAFT

THE FY 1991 U.S. GLOBAL CHANGE RESEARCH PROGRAM A Overview

What is driving the U.S. Global Change Research Program ?

World leaders are taking an increased interest in the economics and social implications of global environmental changes, both natural and human-induced. The 1988 midwestern U.S. drought underscored the potential effects of a warm, dry summer, just as the climate of recent decades in the Sahel starkly reveals the human tragedy that can occur in marginal-subsistence zones of a changing planet. Furthermore, the very recent linking of the antarctic ozone "hole" to made-made chlorofluorocarbons (CFC's) and the current debate over humanity's role in the green house effect have placed the environment high on the national and international agenda. In virtually all these issues, the salient feature is the significant scientific uncertainty associated with predicting the behavior of the coupled ocean-atmosphere-land system. The formidable costs associated with addressing environmental changes require policy decisions be based on adequate scientific knowledge. To provide this knowledge, the U.S. Global Change Research Program (US/GCRP) has been developed as the pre-cursor component of U.S. Government's overall approach to global environmental change.

What is the U.S. Strategy for the US/GCRP ?

The US/GCRP has been developed through the Committee on Earth and Environmental Sciences (CEES) of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), chaired by the Director of OSTP. The program is driven by carefully established priorities, and by key scientific questions the must be addressed to establish sound national and international policies that address issues such as the "greenhouse effect" and global climate change, ozone depletions, etc. The Program was developed as a government-wide and integrated research program. It has been established in cooperation with the U.S. and international scientific community, through the National Academy of Sciences (NAS) and internationally through the International Council of Scientific Unions (ICSU). The Program is also linked internationally to a substantial number of other government agencies (though an outgrowth of the White House Conference, the International Group of Funding Agencies for Global Change Research) and to the relevant intergovernmental organizations of the United Nations. The central goal and fundamental objectives of the program are:

Goal: To establish the scientific basis for national and international policy making relating to natural and human-induced changes in the global Earth system.

This goal will be implemented through the following overall objectives:

Objectives:

Establish an integrated, comprehensive long-term program of documenting the Earth system on a global scale.

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.

Develop integrated conceptual and predictive Earth system models.

How will the US/GCRP be implemented ?

The FY 1991 President's Budget requests \$1,034 million for the research program, an increase of about 57% over the FY 1990 program. The US/GCRP is managed through nine agencies (DOC, DOD, DOE, DOI, EPA, NASA, NSF, SMITHSONIAN, AND US/DA), and is conducted in cooperation with a substantial number (over 20) other countries. The U.S. is contributing about 50% of the total international effort, and is provide the leadership in virtually every case.

Climate Change

Current Understanding and Recent Developments

The Climate System:

The Earth's climate is controlled by the input energy from the sun, by the radiative balance of the atmosphere and by internal processes within the climate system. The radiative balance depends upon the input of solar radiation and the atmospheric concentrations of radiatively active trace gases (i.e., greenhouse gases), clouds and aerosols. To predict changes in the climate system requires an understanding of future changes in the atmospheric concentrations of greenhouse gases and aerosols, and the processes that control the response of the climate system to natural and human-influenced changes in the radiation balance.

Contemporary Changes in the Forcing of the Climate System:

Current Understanding: Natural greenhouse gases, primarily water vapor and carbon dioxide, and to a lesser extent, methane, nitrous oxide and ozone, keep the Earth much warmer than it would otherwise be. It is well documented that since the industrial revolution the atmospheric concentrations of carbon dioxide, methane, nitrous oxide and industrially produced chlorofluorocarbons (strong greenhouse gases) have been increasing primarily due to human activities. However, there are many uncertainties concerning the magnitudes of the sources and sinks of these greenhouse gases, hence their residence time in the atmosphere. In particular, the magnitude of the uptake and release of carbon dioxide by the oceans and terrestrial biosphere, and strengths of the individual sources of methane and nitrous oxide are quite uncertain. These uncertainties limit our ability to understand the quantitative consequences of particular emissions control strategies, e.g., it is difficult to relate future emissions of carbon dioxide to growth in its atmospheric concentration. It should be noted, however, that the time taken for atmospheric carbon dioxide to adjust to changes in sources is of order 50-200 years, determined by the slow exchange of carbon between surface waters and deeper layers of the ocean and the response of the terrestrial biosphere. Consequently, carbon dioxide emitted into the atmosphere today will influence the atmospheric abundance of carbon dioxide for centuries into the future, and the atmospheric concentration of carbon dioxide will only respond slowly to changes in emission rates.

Recent Developments: The most significant recent result is the suggestion, based on observational data of atmospheric and oceanic carbon dioxide and theoretical models, that the oceans are only a minor sink for anthropogenic carbon dioxide, and that the most significant sink for anthropogenic carbon dioxide is uptake by extratropical terrestrial ecosystems.

Historic Changes in the Forcing of the Climate System:

Current Understanding: The most reliable information on past atmospheric carbon dioxide and methane concentrations is obtained by the analysis of air trapped in polar ice cores. Analyses of ice cores from Vostock, Antarctica and Greenland have covered a full glacial - interglacial cycle and show a strong correlation between changes in temperature and changes in the atmospheric concentrations of carbon dioxide and methane. However, because of the low (limited by the rate of occlusion) temporal resolution of the ice cores it is

not possible to establish whether changes in temperature initiated changes in carbon dioxide and methane, or vice-versa.

Recent Developments: One time interval of particular interest is that of the Younger-Dryas where rapid changes in atmospheric temperatures and carbon dioxide concentrations were observed. While there is no rigorous model that can explain the observed carbon dioxide and temperature variations, it has recently been speculated that they are linked to large-scale changes in the interplay between biological, chemical and physical processes in the oceans, but the detailed mechanisms are not understood.

Predictions of Climate Change:

Current Understanding: General Circulation Models (GCM's) are currently the best available tools with which to predict changes in the Earth's climate in response to a change in the atmospheric concentrations of trace gases or aerosols, solar activity, or surface albedo. However, it must be recognized that the current GCM's have substantial limitations. In particular, the prediction of global climate change is very sensitive to the treatment of cloud-radiation interactions. Different cloud-radiation parameterizations in GCM models lead to significant differences, up to a factor of three, in the magnitude of the predicted global warming. Prediction of regional climate changes are very uncertain, and are particularly sensitive to the treatment of ocean dynamics and ocean-atmosphere interactions (the exchange of energy and chemicals between the atmosphere and the surface waters, and between the surface waters and the deep oceans controls the rate of predicted warming), and to the terrestrial vegetation-atmosphere interactions (the transfer of energy and moisture between land surfaces and the atmosphere). In addition to our current lack of understanding of several key processes, today's computer capabilities severely limit the spatial resolution of the GCMs. Consequently, while the current GCMs represent the overall climatology of the present climate system quite well and all predict that the Earth's climate will warm in response to an increase in the atmospheric abundance of greenhouse gases, it is clear that the predictions of the magnitude and timing of climate changes, especially at the regional level, are considerably uncertain. In particular, accurate regional predictions of changes in the mean state and variability of climatic parameters needed to assess the impact of climatic change on agriculture, natural ecosystems, coastal regions, and water resources (such as temperature, precipitation, evaporation, soil moisture and the occurrence of severe storms at sub-continental scales) - all of central importance to the modeling of economic impacts of global warming - are not possible at this time. Other potentially important uncertainties concern feedbacks between climate change and biogeochemical cycling, and possible non-linear feedbacks within the climate system itself, i.e., a change in ocean circulation.

A key question is what do the GCM's predict for future climate changes based on trace gas emission, recognizing that there are significant scientific uncertainties, and assuming that there will be no long-term changes in solar irradiance or atmospheric aerosol concentrations. Rather than discuss a number of complex emission scenarios it has been traditional in the scientific community to assume that the atmospheric concentrations of carbon dioxide and the other greenhouse gases will continue to increase at a rate such that there will be a radiative equivalent of a carbon dioxide doubling sometime during the middle of the next century. If this occurs then the GCM's predictions that are considered to be most likely are that: (i) the equilibrium increase in global mean surface temperature should lie between 1.5 and 4.5 degrees centigrade (highly sensitive to modeling the feedback between clouds and climate change; recent models with more sophisticated treatments of clouds have tended to predict temperature changes at the lower end of this range); (ii) between 60 and 80% of the equilibrium warming should be realized at the time

of "equivalent doubling" (sensitive to the treatment of ocean circulation); (iii) global mean precipitation should increase; (iv) sea-ice extent should decrease; and (v) the predicted warming in the northern polar winter should be greater than the global mean.

There are some consistent GCM predictions of climate change at the continental scale (but not sub-continental scale) such as, (i) land areas are predicted to warm more rapidly than oceans, and (ii) mid-latitude land masses in the northern hemisphere will warm more than the global mean and be accompanied by a decrease in summer precipitation. These results carry important implications, but must be stated with lower scientific confidence than those presented above.

Observations of Temperature Changes:

The instrumental record of surface temperatures suggests an increase of between 0.3 and 0.6 degrees centigrade since the mid-nineteenth century, with an undetermined, but probably small (less than 0.05 degrees centigrade) artificial component due to urbanization. The observation of a marked retreat of mountain glaciers in all parts of the world since the end of the nineteenth century tends to support the notion that temperatures have increased globally over the last one hundred years. However, temperatures have not increased smoothly with time, nor uniformly throughout the world. Several points should be noted: (i) the majority of the temperature increase occurred before 1940, prior to most of the anthropogenic increase in the atmospheric concentrations of greenhouse gases; (ii) there is little evidence that the continental U.S. has warmed since 1900; (iii) the northern hemisphere cooled between 1940 and the early 1970s, while the southern hemisphere continued to warm, albeit at a very slow rate; (iv) there have been significant differences in regional changes, especially in the northern hemisphere since 1950; and (v) from 1975 to 1982 a more general warming occurred, followed by little global warming since 1982. It is important to recognize, however, that coupled ocean-atmosphere GCM's predict a highly variable global warming signal, moreover, substantial regional variations are expected.

Detection of the "Anthropogenic Greenhouse" Signal:

The Earth's climate is inherently variable on all timescales, both regionally and globally. Hence, the challenge is to detect an "anthropogenic greenhouse" signal amidst the natural variability of the system. While it can be stated that the observed global mean temperature increase over the past 100 years is broadly consistent with theoretical predictions of climate change, it should be noted that the implied climate sensitivity of the actual system would then be in the lower one-third to one-half of the range predicted by GCM's. In addition, natural variability of the climate system may be as large as the observed changes to date, hence the observed changes could be wholly attributable to natural variability or possibly natural variability could have masked (due to natural variability causing a decrease in temperatures) a larger "anthropogenic greenhouse" signal. Consequently, the current observations cannot confirm the presence or absence of an "anthropogenic greenhouse" signal. Detection of an "anthropogenic greenhouse" signal will require determining trends in both forcing functions and several climatically important parameters, coupled with a quantified understanding of natural variability, and the use of time-dependent coupled ocean-atmosphere GCMs.

Sea Level:

Although the data are difficult to interpret, the best scientific assessment is that over the past 100 years, sea level has risen at an average rate of rise of 1.0-2.0 mm/yr. The uncertainties are large, but the principal causes of this rise are consistent with the expected thermal expansion of the oceans and the melting of mountain glaciers. Regional values differ considerably from global values and predicting future conditions is even more uncertain. If the global mean surface temperature increases, then sea level is predicted to rise, primarily due to the thermal expansion of the oceans and to a melting of some land-ice. The current predicted range of sea level increase associated with an increase in carbon dioxide and the other greenhouse gases, lies between about 10 and 30 cm, at the time of a radiative equivalent of a carbon dioxide doubling (sometime during the middle of the next century). Accurate predictions remain difficult, and somewhat controversial, because of the predicted increased snow accumulation over the Antarctic continent.

Ecological Systems:

Biological Productivity: Where temperature is limiting, warming of soils would increase nutrient availability to plants with potential for increased productivity. Increased temperature will affect respiration more than photosynthesis, possibly reducing carbon stored in terrestrial ecosystems resulting in a positive feedback on atmospheric carbon dioxide concentrations. Higher atmospheric carbon dioxide concentrations can increase photosynthesis with potential increases in net production, but the duration of "carbon dioxide fertilization effects" is unknown. However, while there is some knowledge of the responses of biological production processes to changes in parameters of the physical environment, how these integrate over the life cycle of even one species interacting in a complex of other species is unknown.

Ecosystem Composition: Species will respond differently to changes in temperature, precipitation, and atmospheric carbon dioxide, either singly or in some combination. However, exactly what these responses will be is not known. Also unknown are the changes that will occur among species, including plant-animal and plant-microbe interactions-- both beneficial symbioses as well as insect and fungal pathogens, that affect the structure of ecosystems. GCM's predict that global mean surface temperatures may change much more rapidly in response to an increase in greenhouse gases, an order of magnitude or more, than they did during ice age cycles. If this were to occur, some species will not be able to migrate or otherwise adapt to the changing climate and become extinct. Offsetting this will be the possible genetic differentiation and expansion that might occur as habitat boundaries are altered, with creation of new barriers to reproduction and dissolution of some old barriers. However, extinction is likely to be more frequent than speciation, further decreasing biological diversity.

Marine Ecosystems: The historic record leaves little doubt that global warming will have an impact on marine planktonic organisms. The structure and productivity of marine ecosystems are strongly influenced by ocean circulation and mixing, physical parameters tightly linked with climate. In high latitudes, the distribution of sea ice is especially important, both for plankton and marine mammals and birds. In sub-polar and temperate regions, physical, chemical and biological parameters are highly variable and the system behavior consequently unpredictable. Thus, effects of warming or other changes are similarly uncertain. Warming affects vertical mixing and in turn nutrient supply, a major determinant of ocean productivity. Again, while there is considerable knowledge of specific processes and specific parts of the global oceans, the integration of this knowledge is incomplete and significant gaps in understanding exist.

Scientific Research Needed to Reduce Scientific Uncertainties:

To improve our current understanding of: (i) the natural and human-influenced processes that control the Earth's climate, and (ii) the impacts of climate change at the regional scale, will require an internationally coordinated program of space-based and ground-based research. This research program will need to: (i) establish an integrated long-term program of systematic observations of the Earth's system; (ii) improve our understanding of the physical, chemical, biological, geological, and social processes that influence the Earth's environment and its responses; and (iii) develop integrated predictive models. In particular, we need to document the natural variability of the Earth's climate, and to improve our understanding and modeling of: (i) cloud-radiation feedbacks; (ii) the exchange of energy between the atmosphere and the surface waters of the ocean, and between the surface and deep waters of the ocean; (iii) the cycling of carbon and other key elements between the atmosphere, land and oceans; (iv) the exchange of water and energy between land surfaces and the atmosphere; and (v) the current structure and functioning of ecosystems, and their response to environmental changes.

Summary of Areas of Scientific Uncertainty

- a. *Hydrological cycle:* primarily cloud-radiation and land surface-atmosphere interactions. These uncertainties affect the predicted rate (magnitude at a given time) of "climate change".
- b. *Role of the oceans:* the exchange of energy between the ocean and the atmosphere, and between the upper layers of the ocean and the deep ocean. These uncertainties affect the predicted rate of climate change, especially at the regional scale.
- c. *Trace Gases:* quantification of the uptake and release of carbon dioxide by the oceans and terrestrial biosphere, and quantification of the individual sources of methane and nitrous oxide. These uncertainties affect our understanding of how the climate system will be "forced", hence the rate of predicted climate change. These uncertainties also limit the formation of control strategies.
- d. *Predictions of regional climate change:* limitations in computer resources (spatial resolution and physical sophistication), coupled with an inadequate understanding of several key processes (e.g., the exchange of water and energy between vegetative surface and the atmosphere) limit the accuracy of regional climate change predictions at the scale required for impact assessments to be performed (sub-continental).
- e. *Detection of global change:* trends in a number of climatically important parameters, coupled with a quantified understanding of natural variability, is needed to differentiate between human-induced changes in the environment from those that occur naturally. This will require long-term observations of climatically important parameters and forcing functions, as well as careful development of time-dependent coupled ocean-atmosphere GCM's.

Key Talking Points

1. The Earth's climate is highly variable
2. Human activities are increasing the atmospheric concentrations of greenhouse gases, but uncertainties about their sources and sinks limit the formulation of effective control strategies.
3. General Circulation Models are currently the best available tools to predict future changes in climate. While all GCM's predict the Earth's temperature will increase in response to an increase in the atmospheric concentrations of greenhouse gases, it must be remembered that there are numerous scientific uncertainties concerning the prediction of the magnitude and timing of climate change, especially at the regional scale. These are caused by inadequate spatial resolution in the GCM's and an inadequate understanding of many important processes. The current models necessarily simplify the role of clouds, oceans, and terrestrial vegetation.
4. Observational evidence suggests that the global mean surface temperatures have increased by between 0.3 and 0.6 degrees centigrade within the last one hundred years, but because of natural variability it is not possible to ascertain the cause of the observed increase. The observational record cannot be used to confirm or refute the presence of an "anthropogenic greenhouse" signal.
5. If a global warming were to be caused by increasing atmospheric concentrations of carbon dioxide and other long-lived gases (e.g. CFCs and nitrous oxide) then even with significant reductions in their emissions it would take a very long time, decades to centuries, to reverse the "anthropogenic" warming.
6. Predictions of changes in agriculture and natural ecosystems are not only limited by a lack of reliable regional climate change predictions, but also an inadequate understanding of how biological productivity and ecosystem composition will respond to environmental change.



National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of:

Dear Dr Bromley,

Dr. Berrien Moore and I carefully read the letter from Dr. J.F. Kenney to Governor J.H. Sununu in which Dr. Kenney suggested that the current increase in atmospheric levels of carbon dioxide can be attributed to releases of "juvenile methane. Unfortunately, Dr. Moore and I cannot understand how Dr. Kenney arrived at such an erroneous conclusion given that most of the information presented in his letter was factually correct. The data presented in the letter actually prove that his conclusions are incorrect.

Dr. Moore and I have documented what we believe to be the correct interpretation of the carbon cycle by listing a number of key points concerning both carbon dioxide and methane.

If Dr. Moore or I can be of any further assistance to you with respect to this letter, or any other issue, please call either of us:

R. Watson: telephone # 202-453-1681; fax # 202-755-2552

B. Moore: telephone# 603-862-1766; fax # 603-862-1915

Sincerely Yours

Critique of J.F.Kenney Letter to J.H.Sununu

Although most of the scientific and technical information presented in Dr. J. F. Kenney's letter is correct, the author draws a totally erroneous conclusion about the source of the increase of atmospheric carbon dioxide. Juvenile methane is not the cause of the recent (since pre-industrial times) increase in atmospheric carbon dioxide. All of the information presented in this letter was available, and taken into account, during the IPCC scientific review. This memo will present the correct interpretation of the carbon cycle.

While there is no dispute that the carbon cycle is complex, and the magnitude of many of the reservoirs and gross fluxes between reservoirs are quite uncertain (i.e., by about 20% or more), there is little doubt about the following facts:

CARBON DIOXIDE

- (1) The current (1990) average mixing ratio (often referred to as atmospheric concentration) of carbon dioxide is 353 ppmv ($750 \times 10^{15} \text{g C}$)--known to better than 0.5%. This contrasts to the pre-industrial (1750-1800) atmospheric mixing ratio of carbon dioxide of about 280 ppmv ($594 \times 10^{15} \text{g C}$)--decadal averages for a period of about one thousand years prior to 1750 were constant to within about $\pm 2\%$, i.e., about $\pm 5-6$ ppmv. Therefore, the atmospheric mixing ratio of carbon dioxide has increased by about 25% since the pre-industrial era.
- (2) The atmospheric loading of carbon dioxide is currently increasing at an annual rate of 1.8ppmv ($3.8 \times 10^{15} \text{g C}$). This is three times greater than the annual rate of increase of 0.6 ppmv ($1.3 \times 10^{15} \text{g C}$) in 1958 when precise atmospheric measurements began.
- (3) The interhemispheric gradient of carbon dioxide abundances between the northern and southern hemispheres has increased from about 1 ppmv in 1960 to about 3 ppmv today.
- (4) The annual gross fluxes of carbon dioxide between the atmosphere and the oceans are about $90 \times 10^{15} \text{g C}$, and the annual gross fluxes of carbon dioxide between the atmosphere and the terrestrial biosphere are about $100 \times 10^{15} \text{g C}$. In each case the fluxes are probably only known to about 30%. As stated earlier, the ice core record shows that the atmospheric concentration of carbon dioxide prior to 1750 was constant to within about $\pm 2\%$ ($\pm 5-6$ ppmv) indicating that the gross fluxes of carbon dioxide between the atmosphere and the oceans and between the atmosphere and the terrestrial biosphere were in a quasi-steady state. The contemporary net fluxes are smaller and better known (see next three points) than the gross natural fluxes, hence the uncertainty about the current carbon cycle is less than one might suppose by examination of only the gross fluxes and their associated uncertainties.
- (5) The current annual emissions of carbon dioxide from the combustion of fossil fuel are about $6 \times 10^{15} \text{g C}$ per year (last accurate assessment was $5.7 \pm 0.5 \times 10^{15} \text{g C}$ in 1987). The cumulative release of carbon dioxide from the combustion of fossil fuels is estimated at $200 \pm 20 \times 10^{15} \text{g C}$ between 1850 and 1987.
- (6) The annual emissions of carbon dioxide from "tropical deforestation" were estimated (IPCC) to be between 0.6 and $2.5 \times 10^{15} \text{g C}$ in 1980, i.e., ($1.5 \pm 1.0 \times 10^{15} \text{g C}$). Recent increases in the rate of tropical deforestation suggest that the lower limit is too low, and that the most likely current value is towards the central or upper end of the range. The

cumulative release of carbon dioxide from tropical and extratropical deforestation is estimated at $115 \pm 35 \times 10^{15} \text{ g C}$ between 1850 and 1985.

- (7) The sum of the current annual emissions of carbon dioxide from tropical deforestation and the combustion of fossil fuels is $7.5 \pm 1.2 \times 10^{15} \text{ g C}$, of which only about $3.5 \times 10^{15} \text{ g C}$ remain in the atmosphere. The remaining $4 \pm 1.2 \times 10^{15} \text{ g C}$ is being taken up by the oceans and terrestrial biosphere, but the relative proportions are poorly quantified.
- (8) The net annual uptake of carbon dioxide by the oceans is $(2 \pm 1 \times 10^{15} \text{ g C})$.
- (9) The net annual uptake of carbon dioxide by "non-tropical" terrestrial ecosystems is highly uncertain ($0-3 \times 10^{15} \text{ g C}$), and it has been suggested that it may have increased in recent decades through a number of plausible mechanisms, including enhanced productivity due to a warmer climate, carbon dioxide and/or nitrogen fertilization, and improved forest management.

CARBON 14

- (10) ^{14}C (half-life of 5700 years) is produced in the atmosphere through the partial conversion of ^{14}N by cosmic radiation.
- (11) Because of the rapid exchange of carbon dioxide (about $190 \pm 40 \times 10^{15} \text{ g C}$ per year) between the atmosphere and the terrestrial biosphere and ocean waters, ^{14}C is rapidly equilibrated throughout the atmosphere, terrestrial biosphere and surface waters of the ocean.
- (12) The ^{14}C content of atmospheric carbon dioxide resulting from the combustion of fossil fuels (coal, natural gas, or oil) is zero, because the age of fossil fuels greatly exceeds the half-life of ^{14}C .
- (13) The atmospheric abundance of $^{14}\text{CO}_2$ was approximately constant prior to 1750, then decreased approximately 25% over the 200 year period prior to nuclear bomb testing and nuclear power plant operation. This pattern (known as the Suess effect) is due primarily to emission of ^{14}C -free fossil fuel CO_2 , which diluted the pre-industrial ^{14}C content of the atmosphere. The burning of biomass also contributed to this dilution since vegetation is partly depleted, relative to the atmosphere, in ^{14}C because of fractionation against the heavier isotope at the air-leaf interface. The atmospheric concentration of ^{14}C increased rapidly after 1952, reaching a peak in 1963/4, from which it has decreased to a value about 40% above the 1952 value.

METHANE

- (14) The atmospheric loading of methane is known to about 1%. The current (1990) average mixing ratio of methane is 1.72 ppmv ($3.7 \times 10^{15} \text{ g C}$), compared to a pre-industrial value of about 0.6 to 0.8 ppmv (1.3 to $1.7 \times 10^{15} \text{ g C}$). Note that the corresponding contemporary and pre-industrial values for CO_2 are 750 and $594 \times 10^{15} \text{ g C}$, respectively.

- (15) The atmospheric loading of methane is currently increasing at an annual rate of 0.014 to 0.017 ppmv (0.03 to 0.036×10^{15} g C).
- (16) The current annual emissions of methane from both natural and anthropogenic sources is between 0.3 and 0.5×10^{15} g C, of which about 60 to 70% is believed to be due to anthropogenic activities. The ice core record suggests that the natural sources of methane were relatively stable for several centuries prior to 1850.
- (17) The magnitude of the sources is largely constrained by knowledge of the atmospheric sink, primarily removal by reaction with tropospheric hydroxyl radicals. The atmospheric lifetime is about 10 to 12 years, with an uncertainty of about 20-30%.
- (18) The magnitude of the individual anthropogenic and human-influenced sources of methane are quite poorly quantified, including rice paddies, cattle rearing, biomass burning, landfills, permafrost, natural wetlands, coal mining and venting of natural gas, e.g., the annual flux of methane from rice paddies is estimated to range from 0.019 to 0.13×10^{15} g C.
- (19) Methane from coal mining, and venting of natural gas, as well as "juvenile methane emissions" (if any), would contain no ^{14}C , whereas methane emissions arising from biological sources would contain a modern day ^{14}C signature. The best estimate of the percentage of methane emissions with no ^{14}C signature has recently been determined to be about 20%, although some estimates reach as high as 32%.

Conclusions:

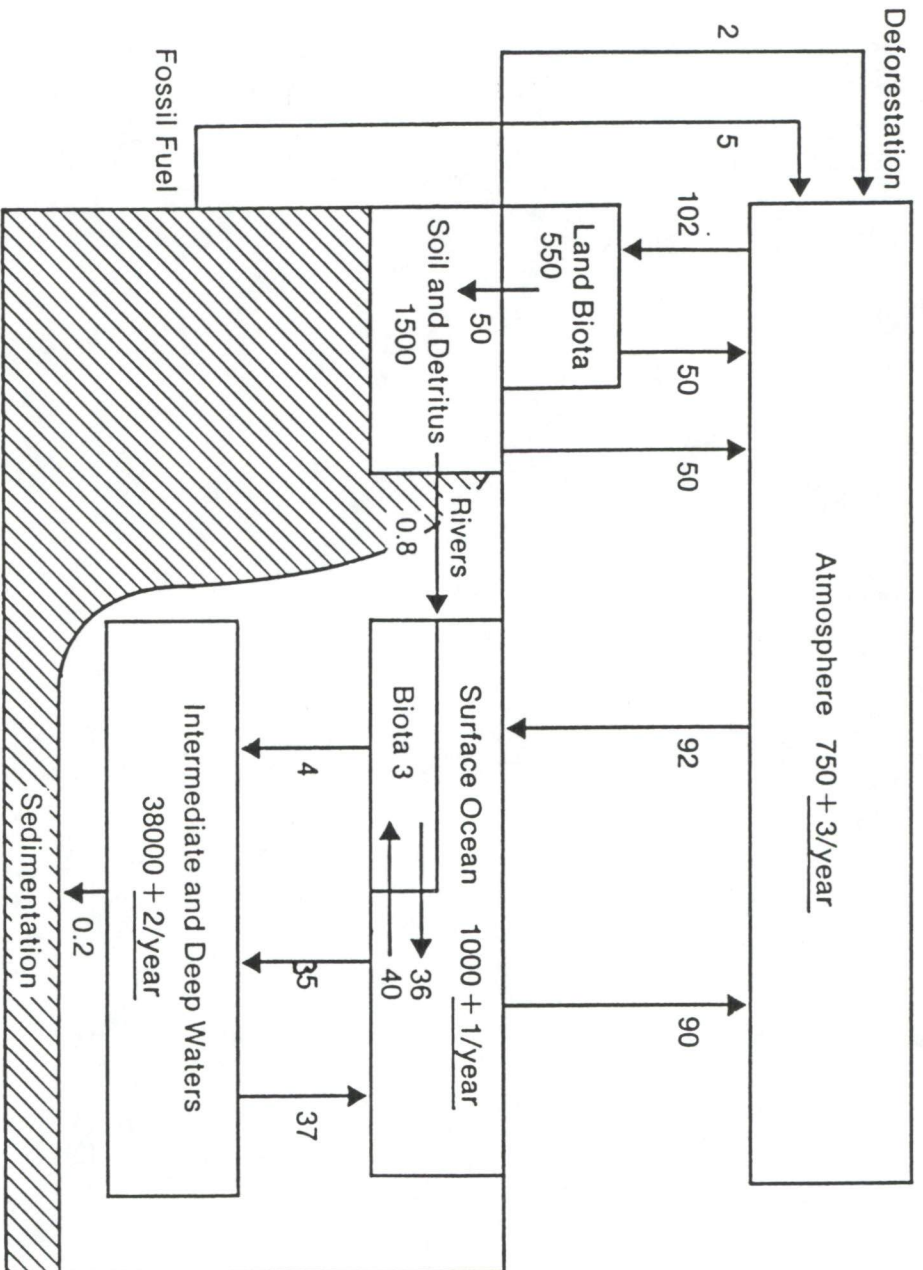
The total annual flux of atmospheric carbon dioxide arising from natural and anthropogenic methane emissions is between 0.3 and 0.5×10^{15} g C, of which about 60 to 70% are thought to arise from the direct influence of human activities, i.e., 0.18 to 0.35×10^{15} g C. It is clear that this annual flux is relatively unimportant, in terms of total carbon, compared to the annual fluxes of carbon dioxide arising from the combustion of fossil fuels ($5.7 \pm 0.5 \times 10^{15}$ g) and tropical deforestation (0.6 and 2.5×10^{15} g C).

The observed decrease, prior to 1952, in the atmospheric abundance of $^{14}\text{CO}_2$, compared to $^{12}\text{CO}_2$, over the last 200 years is consistent with the source of atmospheric carbon dioxide containing no ^{14}C , i.e., from the combustion of fossil fuels (completely depleted of ^{14}C) and the atmospheric oxidation of ^{14}C free CH_4 (the magnitude of this source, $<0.15 \times 10^{15}$ g C per year, is only a few percent of the fossil fuel source).

The observed change in the interhemispheric gradient in carbon dioxide over the past 30 years parallels the increased combustion of fossil fuels in the northern hemisphere.

The anthropogenic fluxes of carbon dioxide are much smaller (factor of about 25) than the natural sources and sinks, but are still large enough to perturb the natural carbon cycle and account for the observed ~25% increase in atmospheric carbon dioxide since pre-industrial times. The ice core record suggests that the atmospheric concentrations of carbon dioxide and methane were in quasi-steady state (natural sources and sinks balanced) prior to the industrial revolution, with rapid increases thereafter.

The sum of the annual emissions of carbon dioxide from tropical deforestation and the combustion of fossil fuels is between 6 and 9×10^{15} g C, of which only about 3.5×10^{15} g C remain in the atmosphere. The remaining 2 to 5.5×10^{15} g C is being taken up by the oceans and terrestrial biosphere, but the relative proportions are poorly quantified. The lack of a quantitative knowledge of the sinks, hence atmospheric lifetime, of carbon dioxide means that there is uncertainty associated with our understanding of the relationship between future emissions and atmospheric concentrations of carbon dioxide.



ⁱⁿ The Role of the Amazon of the Earth System

The Amazon Basin is one of the largest continuous tropical forest and savanna biomes in the world. Approximately 15 percent of the terrestrial biomass is in the Amazon, making it an important reservoir of carbon. It is host to roughly half the species on earth, and roughly 20 percent of world's freshwater flows through the Amazon River and its tributaries. The region is an important natural sink for ozone and has an important role in tropospheric chemistry.

In its undisturbed state, the region plays a significant role in regulating regional water balance and global climate.

The water balance at the earth's surface is a key determinant of its climate, the viability of terrestrial ecosystems and the cycling of carbon nitrogen and phosphorus. The evaporation and condensation of water define this balance. Rainfall and the associated release of latent heat is a principal force defining global circulation patterns in the atmosphere. Two-thirds of the Earth's rainfall occurs within the tropics and subtropics, and precipitation patterns are particularly variable in these areas. Scientists have demonstrated strong correlations between this variability and short-period climate change such as the El Nino Southern Oscillation which occurs once or twice each decade. Billions of people live in the tropics, and such short-term changes have often had disastrous effects associated with severe drought as well as severe flooding. These climatic shifts have also been demonstrated to extend into the mid-latitudes.

The alteration of the Amazon environment by human activities has the potential to effect global and regional climate through the alteration of land cover. The conversion of natural land cover -- forests in particular -- influences climatic conditions in two significant ways:

- 1) the alteration of vegetative cover, such as the conversion of forests to pastures, influences changes in latent sensible heat flux, causing an increase in temperature and a decrease in

evapotranspiration.

2) deforestation results in the release of radiatively important trace gases and carbon dioxide, which influence atmospheric chemistry and radiative transfer properties of the atmosphere.

The Amazonian rainforest lies fully within the tropics, and scientific consensus indicates that regional precipitation is highly dependent on the tropical rainforest itself, which may evaporate as much as 50% of the water vapor that will once again fall as local rainfall. Climate modeling experiments have shown that without the extant vegetation, drier and hotter conditions may prevail. Such changes may not only increase the incidence of fire and hence emission of trace gases, but may preclude the reestablishment of a tropical rainforest. The scientific community realizes that more study is required and that definitive findings will necessarily rely enhanced modeling and monitoring of these coupled climate-biosphere processes. The monitoring must rely on both land-based, airborne and satellite remote sensing systems.

Twenty to thirty percent of the global deforestation occurs in the Amazon. This has resulted in a net release of approximately 0.4 billion metric tonnes of carbon in carbon dioxide, or approximately 20 percent of the global biogenic release, 60 percent of the terrestrial contribution from all of Latin America, and nearly one-third the release from fossil fuel burning in the U.S. Considering the combined contribution of biogenic sources and fossil fuel combustion, deforestation in the Amazon results in approximately 6 percent of the global total carbon dioxide release.

Biomass burning in the Amazon is a significant global change phenomenon, which has been well documented by satellite observations. The emission of radiatively important trace gases is associated with this activity. The exact quantity of trace gas emission from biomass burning is uncertain and further research is required.

file 4-P-2

"Document Control"

TYPE: PRESIDENTIAL PRIORITY DOCUMENT NUMBER: 9200558
ORIGINATOR: 02 STATUS I DIRECTORATE STATUS C

FROM: SUITER, Patricia

TO: PRESIDENT BUSH

DATE OF
CORRESPONDENCE: 01/24/92

SUBJECT: WRITES TWICE-SAME BASIC LETTER - TO EXPRESS CONCERN
OVER THE ADMINISTRATION'S POSITION ON GLOBAL
WARMING.

DIRECTORATE STAFF
ASSIGNED: ENVIRONMENT ASSIGNED: Nancy Maynard

ACTION
REQUIRED: FOR DAB'S SIGNATURE STAFF
ACTION: FOR DAB'S SIGNATURE

SENDER'S DUE DATE: 02/25/92
OSTP DUE DATE: 02/25/92 STAFF DUE DATE
DATE COMPLETED: DATE COMPLETED/DEPT: 03/03/92

COPIES TO: D. Allan Bromley

WHITE HOUSE TRACKING #: CONTACT PERSON:
PHONE: EXT:
REMARKS: DAB Correspondence on File; Incoming in Files in Administrative
Office; Enviro Files X-REF: File 4-P-2

OSTP RECEIVED: 02/21/92 DEPT RECEIVED: 02/24/92
FILE: P-EOP-PRESIDENTIAL PRIORITY

CENTRAL FILES:



OSTP STAFFING SHEET

Letter on Global Warming to the President

ORIGINATOR: Nancy Maynard

PHONE XX6202

DATE ORIGINATED: _____ DATE DUE: _____ COB TRACKING NO. 9200558

EXTERNAL COORDINATION

		COMMENTS	DATE
X	DIRECTOR		
	CHIEF OF STAFF		
	GENERAL COUNSEL		
X	EXEC. ASST.		

ACTION REQUESTED:

Damar:

Please transmit letter to DAB and return signed copies so I can transmit to Sally Kelly

Kara Kelly X6202

CB: For your review, pls.

[illegible]

THE WHITE HOUSE

WASHINGTON

March 3, 1992

Dear Ms. Suiter:

The President has asked that I respond on his behalf to your letters on the the Framework Convention on Climate Change because your concerns are very relevant to the underlying scientific aspects of the issue.

We appreciate your interest in this important subject. It is unfortunate that you have the impression that the Bush Administration is doing less than other countries about global warming and other environmental problems. That impression is entirely mistaken. If we measure progress in terms of concrete actions, we would find that the US is doing more than any other country to understand and address these problems.

President Bush has long been committed to responsible stewardship of the Earth and has established a comprehensive strategy that includes the promotion of sound environmental policies and economic growth. A key component to the President's overall approach to global stewardship is a Presidential Initiative, initially launched in FY 1990, called the US Global Change Research Program (USGCRP). The world's largest program of research and development on global change, the initiative is seeking to provide the best possible scientific and economic understanding of global change so as to produce a sound base of knowledge for policy decisions.

Because of the President's belief in the importance of the USGCRP, the FY 1993 Budget requests \$1.37 billion for the program. The US commitment to the USGCRP has grown dramatically since its inception, doubling over the last three years. A copy of the report describing our research program, "Our Changing Planet: the FY 1993 US Global Change Research Program", is attached for your reference.

In addition, there are many other discrete actions being taken by the Administration which directly address the climate change issue. The US advocates a "comprehensive approach" that encompasses all the relevant anthropogenic factors potentially influencing the climate. This approach is scientifically sound and maximizes both the environmental and economic benefits of any actions. It ensures that all factors - including sources and sinks of all greenhouse gases - are taken into account, so that actions to limit one source of one gas do not inadvertently increase emissions of another. Also, it affords the flexibility to choose the most cost-effective and suitable actions with maximizing environmental benefits for each investment. The

Page 2 - Ms. Suiter

comprehensive approach was described in America's Climate Change Strategy: An Action Agenda (February 1991) and I have attached a copy for your reference.

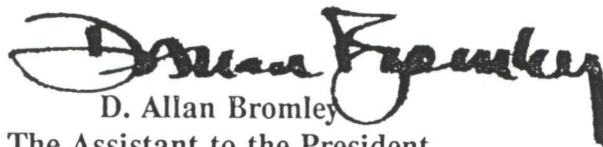
The February 1991 Action Agenda set forth the initial set of concrete actions taken by the Administration which would limit net greenhouse gas emissions. We are now updating the set of actions with new and expanded initiatives. The updated US climate action strategy was most recently summarized by our delegation to the international climate negotiations taking place in New York last week. A copy of the statement by our head negotiator is attached.

Finally, President Bush, on February 11, 1992, announced that the US will unilaterally accelerate the phaseout of substances that deplete the Earth's ozone layer and called upon other nations to agree to an accelerated phaseout schedule. The US has, from the beginning, taken a leadership role in domestic and international efforts to protect the ozone layer. I refer you to the attached summary of the most recent US actions on ozone-depleting substances.

The President and the Administration are committed to help negotiate a successful climate change convention. I believe that the actions described above constitute a thorough and responsible approach to those negotiations and to the very important issue of global change.

Thank you for expressing your interest and concern. We share that concern and we hope to obtain support from you and others as we confront these difficult issues in the coming years.

Sincerely yours,



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

Ms. Patricia Suiter
P.O. Box 557953
Miami, Florida 33255

enclosures

A 0558

THE WHITE HOUSE OFFICE

REFERRAL

RECEIVED

FEBRUARY 21, 1992

02 FEB 21 A10:52

TO: OFFICE OF SCIENCE AND TECHNOLOGY POLICY
ATTN: MAYNARD

OSTP
MAIL ROOM

ACTION REQUESTED:

DRAFT REPLY FOR SIGNATURE OF:
WHITE HOUSE STAFF MEMBER

DESCRIPTION OF INCOMING:

ID: 309486

MEDIA: LETTER, DATED JANUARY 9, 1992

TO: PRESIDENT BUSH

FROM: MS. PATRICIA SUITER
POST OFFICE BOX 557953
MIAMI FL 33255

SUBJECT: WRITES TWICE - SAME BASIC LETTER - TO EXPRESS
CONCERN OVER THE ADMINISTRATION'S POSITION
ON GLOBAL WARMING

PROMPT ACTION IS ESSENTIAL -- IF REQUIRED ACTION HAS NOT BEEN
TAKEN WITHIN 9 WORKING DAYS OF RECEIPT, PLEASE TELEPHONE THE
UNDERSIGNED AT 456-7486.

RETURN CORRESPONDENCE, WORKSHEET AND COPY OF RESPONSE
(OR DRAFT) TO:
AGENCY LIAISON, ROOM 91, THE WHITE HOUSE, 20500

SALLY KELLEY
DIRECTOR OF AGENCY LIAISON
PRESIDENTIAL CORRESPONDENCE

ID # 509486

WHITE HOUSE CORRESPONDENCE TRACKING WORKSHEET

☐ O - OUTGOING☐ H - INTERNAL☒ I - INCOMING

Date Correspondence

Received (YY/MM/DD) 92 / 02 / 19Name of Correspondent: Patricia Suiter☐ MI Mail Report

User Codes: (A) _____ (B) _____ (C) _____

Subject: Writes twice (same basic letter) to express concern over the
Administration's position on global warming.

ROUTE TO:

ACTION

DISPOSITION

Office/Agency (Staff Name):

Action
CodeTracking
Date
YY/MM/DDType
of
ResponseCompletion
Date
YY/MM/DD

DPC

CAHILL

ORIGINATOR

92 / 02 / 1

RL

C

92 / 02 /

RL

Referral Note:

OSTP

Maynard

D

92 / 02 / 1

RL

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Referral Note:

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Referral Note:

ACTION CODES:

A - Appropriate Action
 C - Comment/Recommendation
 D - Draft Response
 F - Furnish Fact Sheet
 to be used as Enclosure

I - Info Copy Only/No Action Necessary
 R - Direct Reply w/Copy
 S - For Signature
 X - Interim Reply

DISPOSITION CODES:

A - Answered
 B - Non-Special Referral
 C - Completed
 S - Suspended

FOR OUTGOING CORRESPONDENCE:

Type of Response = Initials of Signer
 Code = "A"
 Completion Date = Date of Outgoing

Comments: _____

Keep this worksheet attached to the original incoming letter.
 Send all routing updates to Central Reference (Room 75, OEOB).
 Always return completed correspondence record to Central Files.
 Refer questions about the correspondence tracking system to Central Reference, ext. 2590.

#309486

February 9, 1992

President Bush
Domestic Policy Council
Room 231
Old Executive Office Building
Washington, DC 20500

Dear President Bush,

Re: Global Warming Treaty

I am an environmentally concerned citizen deeply concerned about what I consider the Bush Administration stonewalling of the Global Warming Treaty talks. I feel your actions are endangering the entire planet and threatening us with environmental disaster.

World scientific bodies agree that we should act promptly to avert further global warming and as the United States is the world's leading emitter of carbon dioxide I feel we must reduce our dependence on fossil fuels, promote energy efficiency and reduce carbon dioxide emissions starting now. We should support a global warming treaty to cut emissions of carbon dioxide and other ozone-destroying gases.

You say you want to be the "environmental President" yet you appear reluctant to take advantage of opportunities to demonstrate leadership on critical environmental issues. The United States must play a lead role in encouraging environmental protection.

Your delay to commit to attending UNCED next June is but one example of your apparent lack of leadership.

I urge you to support crucial environmental laws before it is too late.

Sincerely,

Pat Suiter

Patricia Suiter
P. O. Box 557953
Miami, FL 33255

January 24, 1992

President Bush
Domestic Policy Council
Room 231
Old Executive Office Building
Washington, DC 20500

Dear President Bush,

Re: Global Warming Treaty

I am an environmentally concerned citizen deeply concerned about what I consider the Bush Administration stonewalling of the Global Warming Treaty talks. I feel your actions are endangering the entire planet and threatening us with environmental disaster.

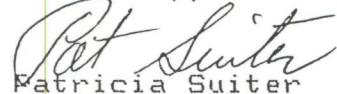
World scientific bodies agree that we should act promptly to avert further global warming and as the United States is the world's leading emitter of carbon dioxide I feel we must reduce our dependence on fossil fuels, promote energy efficiency and reduce carbon dioxide emissions starting now.

You say you want to be the "environmental President" yet you appear reluctant to take advantage of opportunities to demonstrate leadership on critical environmental issues.

Your delay to on the Global Warming Treaty talks is but one example of your apparent lack of leadership.

I urge you to support crucial environmental laws before it is too late.

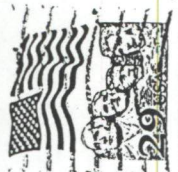
Sincerely,



Patricia Suiter
P. O. Box 557953
Miami, FL 33255



MRS. PAT SUITER
P O BOX 557953
MIAMI, FL. 33255-7953



President Bush
Domestic Policy Council
Room 231
Old Executive Office Bldg.
Washington, DC 20500



MRS. PAT SUITER
P O BOX 557953
MIAMI, FL. 33255-7953



President Bush
Domestic Policy Council
Room 231
Old Executive Office Bldg.
Washington, DC 20500

THE WHITE HOUSE
WASHINGTON

April 13, 1992

Dear Mr. Willardson:

On behalf of President Bush, thank you for your very kind comments on US activities related to the Intergovernmental Negotiating Committee (INC) on a framework convention on climate change. The President appreciates your support and has asked that I respond to your letter of March 25, 1992 regarding this issue.

The President strongly believes that US policies in this area must be based on the most solid scientific and economic information base available. The US Global Change Research Program is the world's largest such program and thus provides much of the scientific foundation for international agreements on climate change and ozone depletion. In fact, the Bush Administration has invested \$2.6 billion in global change research to date, with an additional \$1.3 billion proposed for fiscal 1993. Research on the scientific and economic aspects of global climate change will enable policy makers to make better judgements about potential impacts and policy actions.

Thank you for taking the time to express your interest on this issue and we appreciate your support.

With the President's best wishes,

Sincerely yours,

A handwritten signature in dark ink, appearing to read "D. Allan Bromley", written in a cursive style.

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

Mr. Glen P. Willardson
General Manager
Garkane Power Association, Inc.
P.O. Box 7900
Richfield, Utah 84701

Bromley
cc to Norway

THE WHITE HOUSE

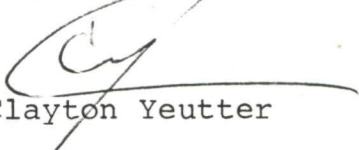
WASHINGTON

5/4/92 7:30pm

The most recent draft from Reinstein. It will be debated tonight until midnight or later. The EC Environment ministers will take it up in Brussels tomorrow morning.

The written comments are by Reinstein. As you can see, he believes most of the changes tilt our way. If you feel otherwise on any of them, please let me know.

Note the substitution of "goal" for "guideline" in paragraph b. That is bracketed by the U.S. (though the brackets are not shown here) pending a response from us. You will remember that we've discussed these two words and "aim" in this context. I'd appreciate your view of "goal" since it apparently translates more attractively to the Germans.


Clayton Yeutter

OUTGOING FAX

U. S. MISSION - ECOSOC SECTION

UNCLASSIFIED ONLY

(212) 415-4141 (DEPT DIAL 44141)

DATE: 5/4

FROM: Bob Reinstein

TO: 1) Clayton Yeutter

OFFICE/TEL# (202) 456-2216 FAX# (202) 456-2878

2) _____

OFFICE/TEL# _____ FAX# _____

SUBJECT: FLYING COMMITMENTS TEXT

ROUTINE _____ PRIORITY ✓ URGENT

COMMENTS: AS DISCUSSED.

2 May 1992
18:00 hours

Possible reformulation of Article 4.3. (a)

3. The developed country Parties listed in Annex ... commit themselves specifically as follows:

- (a) In giving effect to its commitment in para.1 (b) above, each of these Parties shall adopt national^{1/} policies and take corresponding measures that will demonstrate that developed countries are taking the lead in modifying longer-term emission trends consistent with the Objective of this Convention, recognizing that the return by the end of the present decade to earlier levels of emissions of carbon dioxide and other greenhouse gases, resulting from human activity and not ~~covered~~ ^{controlled} by the Montreal Protocol,* would contribute to such modification, and taking into account the differences in these Parties' starting points and approaches, economic structures and resource bases, the need to maintain strong and sustainable economic growth, ^{available technology} and other individual circumstances, as well as the need for equitable and appropriate contributions by each of these Parties to the global effort regarding that Objective. These Parties may implement such policies and measures jointly with other Parties and may assist other Parties in contributing to the achievement of the Objective of the Convention and, in particular, that of this sub-paragraph.

NEW LANG.
(NO LEGAL
SIGNIFICANCE)

POSSIBLE
ADDITION TO
HELP NEW COUNTRIES
IN METHANE
EMISSIONS

ADDED LANGUAGE
TO CLARIFY ALL
FLEXIBILITY ON
JOINT IMPLEMENTA-
TION (EMISSIONS
TRADING)

^{1/} This would include policies and measures adopted by regional economic integration organizations.

* The relationship to the Montreal Protocol and in particular to its reduction schedules needs to be further clarified. [This note is a reminder, to be removed once the text is finalized.]

LINK BACK TO 4(a) TO GIVE
EQUAL WEIGHT TO NATIONAL
ACTIONS AT HOME & IN OTHER
COUNTRIES (TRADING)

- (b) In order to promote progress to this end, each of these Parties shall communicate, within six months of the entry into force of the Convention for it and periodically thereafter, and in accordance with Article 12, detailed information on its policies and measures referred to in sub-paragraph (a) above, as well as on its resulting projected emissions from sources and removals by sinks of greenhouse gases for the period referred to in that sub-paragraph, with the goal of returning individually or jointly to their 1990 levels their emissions of carbon dioxide and other greenhouse gases resulting from human activities and not ~~covered~~ ^{controlled} by the Montreal Protocol. This information will be reviewed by the Conference of the Parties, at its first session and periodically thereafter, in accordance with Article 7.

REQUEST
BY GERMANY
+ OTHERS.
CAN WE
ACCEPT TO
CLOSE THE
DEAL?

- (c) Calculations of emissions from sources and removals by sinks of greenhouse gases should take into account the best available scientific knowledge, including the effective capacity of sinks and the respective global warming potentials of such gases, in accordance with methodologies to be agreed by the Conference of the Parties, where available. The Conference of the Parties shall take decisions regarding such methodologies at its first session and review them regularly thereafter.

MAKES
CLEAR THAT
DEFAULT IS
FLEXIBILITY
ON SINKS +
OTHER GHG

- (d) The Conference of the Parties shall, at its first session, review the adequacy of sub-paragraphs (a) and (b) above. Such review shall be carried out in the light of the best available scientific information and assessment on climate change and its impacts, as well as relevant technical, social and economic information. Based on this information, the Conference of the Parties shall take appropriate action, which may include the adoption of amendments to existing commitments. The Conference of the Parties, at its first session, shall also take decisions regarding criteria for joint implementation as indicated in sub-paragraph (a) above. A second review shall take place not later than 31 December 1998, and thereafter at regular intervals determined by the Conference of the Parties, until the Objective of this Convention is met.

ALLOWS
JOINT
IMPLEMENTATION
(TRADING)
UNLESS
CONF. OF
PARTIES
OVERRULES

- (e) Any Party not listed in Annex .. may, in its instrument of ratification, acceptance, approval, or accession, or at any time thereafter, notify the Depositary that it intends to be bound by sub-paragraphs (a) and (b) above. The Depositary shall inform the other Parties of any such notification. The Conference of the Parties shall review, not later than 31 December 1998, available information with a view to taking decisions regarding such changes in the list in the Annex ... as may be appropriate.

Consequential changes in Article 12:

In para.2 (a), line 2, and in para. 2 (b), line 3, refer to "Article 4.3 (a)."

In para. 4, line 1/2, replace "one year" by "six months".

Dr. Bromley -

This is a memo
I have drafted
fleshing out the
Forests Initiative idea
on which the US
could lead at Rio.

As you know,
Boyden and Bill
Reilly are very
keen on this.

Jonathan
Weiss

Document Originally
Attached to
Following Page

Global Change File

Staff Draft
5/8/92

TOWARD STABILIZING GLOBAL FORESTS

- o At Houston in 1990 the United States, Germany and their G-7 partners announced support for a Global Forests Agreement to assure sound and sustainable use of the world's rich forest resources.
- o The immense ecological and economic importance of forests is under stress around the world. If we wait too long, the forests will be gone. Developing countries have called for an investment to stabilize global forests. We share that vision, and today we offer a first step: a significant and immediate investment toward the goal of stabilizing global forests by early in the next century.
- o This initiative reconfirms and reinvigorates our commitment to successful agreement on Forests Principles and a consensus Global Forests Agreement. We recognize that efforts toward those ends have moved slowly because they have implied that the burden of curbing deforestation would fall disproportionately on poorer countries. Our initiative demonstrates that we envision a Global Forests Agreement in which all countries would share in the investment to conserve forest resources: countries with forests would not bear the entire burden; countries without forests would also benefit and would also share in the investment.

THE CLEAR AND PRESENT NEED

- o Forests provide invaluable goods and services, including timber and fuelwood; soil and watershed protection; carbon sequestration; and habitat for a vast diversity of living things. For example, tropical closed forests currently occupy about 7% of the earth's surface and harbor about 50% of its species. This diversity is of enormous ecological importance, and holds the secret to new medicines and other products of economic value.
- o Yet forests are under serious stress. In the 1980s tropical forests disappeared at the rate of 17 million hectares (42 million acres) per year (FAO 1991), often because of incentives that also lead to economic losses. Temperate and boreal forests, although expanding in some places, are degraded in other places due in part to air pollution and inefficient harvesting (WRI 1992).
- o Forest loss contributes about 20% of net anthropogenic CO₂ emissions, and forests, particularly temperate and boreal forests, constitute a half or more of the global sink for CO₂. Stabilizing global forests by 2000 would abate 70-90 billion tons of projected emissions through 2050.

AN INVESTMENT INITIATIVE

- o As a first step toward stabilizing global forests, we propose an ambitious increase in efforts toward forests conservation: to double current international forests assistance of \$1.3 billion to a global total of \$2.7 billion in 1994 if other countries will join us. Shares of this investment would be allocated among voluntary investors on a fair basis (such as the World Bank formula). This initiative is consistent with calls for a forest conservation strategy, such as the strategy to stabilize forests mapped out by WRI, IUCN, WWF and UNEP starting with a contribution of \$1 billion. Sudden increases in contributions above this level could be of limited use before better capacities and infrastructures are developed to receive such funding.
- o Investor countries would offer funds through existing bilateral and multilateral mechanisms. Recipient countries and organizations would design and propose programs or projects for funding. Examples might include establishing local institutes and methodologies to screen biodiversity resources and attract private investment (e.g. Costa Rica's INBio); debt-for-forest exchanges; research and inventory; creating parks and reserves; education and training; revising tax and subsidy policies; national forest planning; improving agricultural efficiency. Programs would be reviewed regularly and further investment based on progress in achieving results.

Draft

I. THE CHALLENGE

- o Forests are a cherished resource around the world. They provide shelter, fuelwood, timber and countless other products to billions of people. They harbor the treasures of biological diversity nurtured over millennia. They are the lungs of the world, removing carbon dioxide from the atmosphere and replenishing oxygen.

Forests Under Stress

- o Yet forests are disappearing before our eyes. Forests conservation and sustainable use is perhaps the greatest ecological and economic challenge the world faces today.
- o In the 1980s, tropical forests were lost at an average annual rate of 17 million hectares, according to the latest UN Food & Agriculture Organization study (FAO 1991). This rate is 50% faster than estimated in 1980, and appears to be increasing today.
- o At this rate, it will be a matter of years before most of these forests are gone. The result will be an irrevocable loss of biological riches nurtured over millennia -- a resource we will probably never be able to replace. And this loss is occurring now, not 50 years from now. It is directly observable today, not predicted by computer models. If we fail to act today, then by the time climate change is predicted to occur in the middle of the next century, the world will already have lost most if not all tropical forests.
- o Precious resources under stress include the Amazon, the Everglades and Cypress Forest in Florida, the forests of West Africa, Southeast Asia, Madagascar and Central America. The owners and custodians of these resources are working toward conservation and sustainable use -- but additional global investment may be needed. **[add further specifics ?]**
- o Although temperate forests are now growing in industrialized countries, some are now under stress from air pollution. One report is that 50-75% of Europe's forests are being damaged by industrial pollutants, leading to an economic loss of nearly \$30 billion in annual timber harvest revenues (WRI 1992, pp. 198-99).
- o In the words of Harvard's E.O. Wilson, "The worst thing that can happen during the 1980s ... the one process ongoing in the 1980s that will take millions of years to correct is the loss of genetic and species diversity by destruction of natural habitats. This is the folly that our descendants are least likely to forgive us." (Harv. Magazine Jan.-Feb. 1980.)
- o Losing forest resources faster than we can replenish them is also an economic problem. Although there are short-term revenues from clearing and farming the land, over the mid- to longer-term there are significant net economic costs to depleting this natural resource. Better forests conservation can therefore be a net economic plus for the economies of developing and industrialized countries alike.

The Need for an Initiative

- o Given the imminent prospect of serious and irreversible environmental and economic damage, we are proposing this cost-effective precautionary investment as a first step toward a global Agreement.
- o Forests conservation is not a matter of all countries agreeing to stop clearing forest lands. Nor

Draft

does "forests conservation" or "stabilizing forests" indicate that forests could no longer be managed and used as an economic resource; on the contrary, it includes the idea that forests do have economic value that can be sustainably generated by managing land as forest for multiple uses rather than by converting it permanently to non-forest status.

- o In particular, developing countries will not -- and should not -- be told or asked to stop using their forest resources on their own. That strategy is bound to fail. If there are globally shared benefits to forests conservation, then the global beneficiaries should contribute to the investment in those benefits.
- o We therefore propose an investment initiative to create voluntary partnerships between interested countries. Instead of spending years trying to bend the will of forested countries to forego the use of their domestic natural resources, we propose to create the market incentives needed to make forests conservation economically attractive for both investor and recipient countries. And instead of vesting sole authority in a central funding body, we propose to let this market function through diverse, innovative efforts designed by mutually agreed parties.

Benefits of an Initiative

Economic gains for countries with forests

- o Forests produce valuable products, including timber, fuelwood, nuts, and natural chemicals. Forests lost to short-term clearing can no longer provide these products.
- o Forests also provide important ecological services that support economic activity. Forests help protect watersheds and prevent soil erosion. As just one example, the 1991 landslides in the Philippines, which killed thousands, were reportedly seriously worsened because stabilizing forest cover had been cleared. Forests also help microclimates maintain moisture supplies for local agriculture.
- o Rapid forest clearing in many countries is induced by perverse policy incentives, including tax credits for "development" defined as cleared land; timber concessions whose duration is less than the time needed to regenerate a forest; and land rights that arise only upon clearing.
- o Short-term forest clearing can often be economically wasteful as well as ecologically unsound. For example, tax credits supporting land-clearing in Brazil for cattle ranching imposed a net annual national loss of \$1.4 billion (and a federal budget loss of \$2.9 billion) (WRI 1988). If depletion of forest resources were counted in real economic growth rates, Costa Rica's economic growth rate would have to be adjusted downward by 30% from its reported economic growth rate (TSC/WRI 1991). In the U.S., below-cost timber sales cost the federal budget between \$100 million a year (WRI; GAO) and \$365 million a year (Project '88).
- o Hence recognizing and investing in the full economic value of forests can yield positive economic benefits.

Biodiversity

- o Forests are the vital habitats for the enormous biological diversity that sustains the complex web of life on earth. Although tropical closed forests occupy only 7% of the world's land area, they contain 50% or more of the species on earth (WRI 1992).

- o The genetic resources of this biodiversity promise new drugs and other products that will save lives. Taxol, a drug derived from the bark of the Pacific Yew, offers a cure for ovarian cancer. Vinblastine, derived from the rosy periwinkle, has increased the ten-year survival rate for Hodgkins disease from 2% to 60%; vincristine, also from the rosy periwinkle, has increased the ten-year survival rate for childhood lymphomatic leukemia from 20% to 80% (E.O.Wilson 1992).
- o The very diversity of life is itself a natural resource of immense importance. Barely a fraction of the species and genes in this diversity has been identified by humans. Complex food webs and supportive biological interrelationships help undergird the success of ecosystems with long-term implications that are probably not yet recognized.

Carbon storage

- o Forests produce oxygen and store carbon dioxide during photosynthesis. Forest loss is contributing some 15-25% of global CO₂ emissions (IPCC 1992). Forests -- especially Northern Hemisphere forests -- constitute from 1/2 to perhaps 2/3 of the global sink for CO₂ (Quay et al. 1992; Tans et al. 1990).
- o Stabilizing global forests by 2000 could make an impressive contribution to reducing net global CO₂ emissions.

Cumulative Net Anthropogenic Carbon Emissions

Billion tons of Carbon (% reduction from Projected)

Period	(A) Cumulative Projected (no action)	(B) Stabilize OECD Fossil Fuel CO ₂ Emissions by 2000 at 1990 level	(C) Stabilize Forests (no net forest clearing) by 2000	(D) Stabilize Forests by 2000 at 1990 level of cover
1990-2020	278.6	264 (5%)	243.7 (13%)	233.1 (16%)
1990-2050	672.7	630 (6%)	601.1 (11%)	585.5 (13%)

Based on analysis by EPA/OPPE (1992). Scenario (A) is IPCC Scenario IS92a, in which no policy action is taken. In scenario (B), for comparison, all OECD member countries return their fossil fuel CO₂ emissions to 1990 levels by 2000 and keep them at or below that level thereafter (some countries reduce below 1990 levels). In scenario (C), net forest loss declines from 17 million hectares per year in the 1980s to zero by 2000 and thereafter. In scenario (D), net forest loss declines from 17 million hectares per year in the 1980s to zero by 2000 and thereafter, and afforestation returns forest cover to 1990 levels by 2000.

Sensitivity analysis indicated little change in cumulative emissions impact under alternative forests stabilization scenarios: 1990 cover levels achieved in 2000 via higher afforestation rates, coupled with a reduction in forest clearing by only 50% through 2000; afforestation achieved through regrowth of closed tropical forests as opposed to plantations; or net forest clearing reduced to zero as late as 2020 and 1990 cover levels reattained only in 2040.

II. MEETING THE CHALLENGE

- o Funds alone will not solve the local and global problems of forest loss. Specific programs and projects need to be fashioned with care and a coherent vision in order to achieve real results.
- o We do not contemplate the creation of any new central funding mechanism. The variety of existing funding mechanisms offers an adequate set of funding opportunities. These include:
 - o Bilateral assistance agencies and programs
 - o Multilateral development banks
 - o Debt-for-conservation exchanges
 - o Non-governmental organizations
 - o Tropical Forestry Action Plan (TFAP)

Moreover, we welcome the constructive participation and contribution of organizations such as NGOs, TFAP, ITTO, and FAO in the investment initiative and its implementation.

- o We envision each investor country doing its best to identify and fund creative, effective efforts in numerous recipient countries. Every actual investment would be wholly voluntary and based on the mutual interest of the parties involved. In particular, we would look to recipient countries to identify and propose programs that support their own priorities and efforts and match their own investments.

Through this flexible and diversified process, the cost-effectiveness of specific investments can be better ensured. Investors will compete to locate the best opportunities, and potential recipients will compete to offer the best opportunities. This flexibility will also allow countries to find partners that can offer not only funding but expertise, technical abilities, and a shared outlook. In this way programs can be better directed at (and by) the needs of recipient countries and less by the dictates of a central funding body.

- o The investment initiative will aim at achieving the goal of stabilization of global forests by the end of the decade. Investor countries will issue regular reports to the world community on their progress.
- o Specific efforts could include:
 - o Help interested countries establish effective institutes to study and inventory the biological resources of their forests. As Costa Rica's INBio is demonstrating, this capability is the key to attracting private investment in local biodiversity, and thereby making biodiversity a valued and sustainable resource in the face of pressures to convert forest land to other uses. INBio has well-developed expertise and has trained local citizens as "parataxonomists" to help survey the biological resources. In return for the right to examine INBio's inventory, Merck & Co. (US) recently agreed to provide Costa Rica with \$1 million in up-front funding for conservation efforts, as well as a share of future royalties on any drugs Merck develops from the inventory. Similar institutes, designed as appropriate in the context of different countries, could be established through partnerships between investor countries and interested tropical countries.
 - o Invest in additional programs modeled on the imaginative Brazil Pilot Program. Led by Germany, several countries are investing in the Brazil Pilot Program with a view to improving fundamental structural features of forests use in Brazil. Similar efforts could be pursued with other interested countries.

- o Establish or improve national parks systems. The US has one of the world's oldest and most successful parks systems, including both federal and state parks. Federal parks include the Everglades, Yosemite, and Yellowstone.
- o Further engage publicly held debt in debt-for-conservation exchanges that support forests conservation. Under the Enterprise for the Americas Initiative (EAI), the US has already reached agreements with Bolivia, Chile and Jamaica in which \$263 million in official debt is canceled and \$32.4 million in local currency is devoted to local environment and conservation programs.
- o Create a revolving loan fund to help non-governmental organizations finance private debt-for-conservation swaps. A key to these swaps can be finding funding to enable the NGO to purchase debt from the debt market and then negotiate its sale to the national government in return for local conservation funding.
- o Establish a bilateral or multilateral program to finance competitively selected conservation easements, agroforestry, agricultural improvements, studies of policy changes (e.g. taxes, subsidies, land tenure, concessions), and other projects that help recognize the economic value of forests and give land users more complete incentives to conserve that value.
- o Enhance the global forests observation system, in cooperation with the space agencies of OECD countries, Brazil, Asia and Africa.
- o Create a boreal forests study center. The US is pursuing this effort with Canada, CIS republics, and Nordic nations. Negotiations with Russia are almost complete.
- o Assist interested countries in identifying and revising policies that accelerate forests clearing while also imposing economic losses. These may include a variety of tax, subsidy, and property rules. Changing these policies can be analytically and politically difficult, but can bring significant economic as well as environmental rewards.
- o Invest in improving the productivity of non-forest uses of land, such as agricultural productivity. Often the best way of conserving forests is to reduce conversion pressure by improving the yield of non-forest lands. For example, in the US over the past 80 years the total size of our forest area has remained roughly constant. Yet at the same time we have managed to feed a population that has almost tripled, plus significant new exports overseas. We have done so while actually reducing the total amount of land devoted to agriculture - by increasing the productivity of agriculture by about a factor of four. Put another way, if we had to feed today's US population and export markets while relying productivity as it existed in 1910, we would have to farm over 1200 million acres; in fact we farm under 300 million acres. Without the increase in productivity, our agricultural needs could have utterly overwhelmed our forests and wetlands.
- o Engage in partnerships with specific countries and regions. [to come]
- o What we propose today is an offer to invest in the future. We eagerly seek proposals by interested countries for sound, successful programs and projects.

Draft

III. COSTS OF THE INITIATIVE

- o Estimating the costs of conserving forests is extremely difficult. Costs may vary depending on local terrain, forest type, competing land uses, local economic circumstances, and pre-existing government policies. Costs may also change over time; most estimates contemplate an initial investment that grows over time.
- o The most prevalent method used to estimate the cost of conservation is to calculate the "opportunity cost of not converting forest land," that is, the difference between the revenue stream to be gained from converting land and the revenue stream to be gained from managing the land as forest. Both are positive, but if the former is larger than the latter there will be a cost to foregoing conversion. Such studies yield a wide of estimates of the marginal opportunity cost of not converting, from \$120 per hectare to \$1150 per hectare.

From p. 8

The total cost estimates derived from these marginal costs begin at around \$0.5-1.5 billion per year and rise to \$15 billion per year or higher. At best these are useful referents for the "ballpark" global cost. The real cost would be defined by the size of the investment countries are willing to make, and not by a particular quantitative goal. Also, the calculated total costs typically are upper bound estimates of preserving every hectare. Meanwhile, observed marginal costs of real forests protection have been substantially lower.

- o Assembling data on real prices in several tropical countries, Panayotou (1992) estimates that for a "hypothetical typical" tropical country, the net present value of converting forest land to non-forest uses is on the order of \$2350 per hectare. The net present value of maintaining the land as a forest for timber production is on the order of \$2000/ha., and for non-timber production (including local ecological services and tourism) is about \$1200/ha. Facing these expected values, the gain from clearing -- the opportunity cost of not clearing -- is about \$350 to \$1150 per hectare.

The opportunity cost of not converting forests vary across countries and types of forests. Panayotou's estimates vary from about \$3000 in Malaysia to \$(-3000) in Peru (where non-timber forest production is apparently more valuable than land clearing).

- o Sedjo (Dec. 1991) reports average net present opportunity costs of not converting (revenues from conversion minus revenues from use as forest) of \$100/ha. in Africa, \$122 in Latin America, \$140 in most of Asia and \$1500 in select forests in Asia.
- o McKinsey (Protecting the Global Environment: Funding Mechanisms, 1989, p. C-2) asserts that the "cost of stopping the deforestation process ... is estimated by various sources at up to \$800 per currently deforested hectare in pure economic terms." "Up to" is ambiguous, and the "various sources" are not identified. The phrase "pure economic terms" suggests an opportunity cost calculation similar to those by Panayotou and Sedjo.
- o The observed marginal cost of protecting forests against degradation (as contrasted to conversion) is often lower.
 - o The cost of debt-for-nature swaps in Latin America has averaged about \$2/ha. (EPA 1992).
 - o On-site management costs to prevent incursion and degradation are reported to be about \$2/ha. in most tropical settings (Dixon et al. 1991).

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- to p. 2
- o Although the royalty stream is not publicly known, the initial \$1 million fee suggests that the Merck/INBio agreement may reflect significantly lower cost per hectare to generate resources for forests conservation, monitoring and investment. Of course this deal is occurring in a country (Costa Rica) with an already well-developed national forests and park system.
 - o These low costs may reflect low-cost measures available to supplement or catalyze local protection efforts at chosen sites by enhancing local property rights, monitoring, or enforcement of the perimeter, or by removing perverse local disincentives to conservation. These protection costs are also dependent on the perimeter:area ratio, which generally falls as contiguous area protected rises.
 - o The total cost of stabilizing global forests is therefore uncertain, dependent as it is on these marginal cost estimates.
 - o WRI/IUCN/UNEP (Global Biodiversity Strategy, 1992, p. 73) reports that stopping deforestation would cost \$52 billion over 10 years, starting at \$1 billion per year and rising to \$8 billion per year in each of the last three years. WRI states that this figure includes costs to manage standing forests and neighboring agricultural activities.

This estimate is based on a table in IUCN/WWF/UNEP (Caring for the Earth, 1991, App. 7) which shows a funding path starting at \$1 billion in 1991 and rising linearly to \$8 billion in 1998, followed by a steady \$8 billion per year in 1999 and 2000. This is the cost to halt deforestation, but not to replant forest cover up to 1990 levels, which costs several billion more. These estimates are then referenced to McKinsey (Protecting the Global Environment: Funding Mechanisms, 1989), which bases its estimate on the \$800/ha. maximum noted above. McKinsey reports (p. C-2) that "Reducing deforestation by 70% of its current level is estimated to cost roughly \$8 billion per year."

- o Sedjo takes his regional opportunity costs and multiplies them by the number of tropical closed forest hectares in each region. From this he calculates that the total cost to dissuade conversion on all closed tropical forests -- the opportunity cost of not converting those lands -- would be a net present value asset of \$264 billion. He states that the annual cost to maintain this asset would be \$13-26 billion (depending on real interest rates of 5% or 10%).

This must be a high upper bound estimate because it multiplies the marginal opportunity cost of not converting the immediately accessible lowland forest hectares by the sum of all tropical forest hectares, upland as well as lowland. The marginal revenue gain to conversion should fall as the land is more inaccessible.

- o Faced with this uncertainty and the pressing need to take cost-effective precautionary measures, it seems reasonable to define an initial investment and observe progress over time. Doubling current international forests assistance to a total of \$2.7 billion would mean an increase of \$1.3 billion, squarely on the path identified by WRI et al. to halt deforestation.
- o Any global investment would be disaggregated into investment shares for each investor country. Ideally these shares should reflect the global benefit being internalized by that investor. A proxy for that benefit may be national income. On the World Bank formula, the US share of the \$2.7 billion would be 18% or about \$485 million. Shares would be ____ % for Japan, ____ % for the EC and ____ % for the countries of the Persian Gulf.

Any more would be too much - overwhelm institutional capacity.

This page not to go to ~~the outside~~ outside USG but should go to w/in USG

Draft

o These costs should be seen in perspective.

o For comparison to an issue that has received more in-depth cost analysis, the costs of stabilizing forests by 2000 may be compared to the costs of stabilizing OECD member countries' fossil fuel CO2 emissions at 1990 levels by 2000.

Stabilizing industrialized country CO2 emissions by 2000 is estimated to cost OECD countries about 0.1-0.6% of GDP in 2000, based on a survey of economic models performed by the OECD Secretariat. As this stabilization is maintained, estimated costs rise to 0.3-1.5% of GDP by 2020, and 0.4-2.1% of GDP by 2050. See OECD, "Costs of Reducing CO2 Emissions: Evidence from Six Global Models," Restricted (13 March 1992), Chart 6 and revision from Andrew Dean, OECD, 17 April 1992; EMF 12, "Executive Summary" draft 2/12/92; CBO, "Carbon Charges as a Response to Global Warming: the Effects of Taxing Fossil Fuels" (Aug. 1990), Tables 3. 5 and 6. Cost to a particular OECD member country would vary from the cost to the OECD group as a whole. A best estimate of the cost to all OECD countries may be a drop in GDP of 0.4% below baseline in 2000 and 1% below baseline in 2020.

Total OECD country GDP in 1990 was about \$16 trillion, and will grow to about \$30 trillion by 2020 (assuming a real growth rate of just over 2% per year). In that context, an \$5-15 billion per year investment cost (the high end of the WRI et al. path) would cost under 0.04% of total GDP in 2000, or less than 10% of the GDP loss in 2000 from stabilizing OECD country fossil fuel CO2 emissions. (Note that the forests policy would bear this lower cost while achieving net CO2 reductions between ²three and ⁴six times greater, as shown in the table above).

o The global benefits of forests conservation may justify an investment to overcome the local incentives favoring forest clearing. As noted above, Panayotou found the opportunity cost of not converting to lie between \$350 and \$1150 per hectare. He estimated the global external benefits of conserving the forest (benefits not paid to the local land user and thus not incorporated in his opportunity cost calculation) to exceed the private opportunity cost. He calculates a value for biodiversity of \$220/ha. (based on current "existence value" (chiefly tourism) and not including future discoveries of genetic resource uses or ecological services), and a value for carbon storage of \$1250/ha. (assuming a tropical forest stores 125 tons of carbon/ha., and assuming that carbon abatement costs \$10 per ton in the industrialized world). The total global gain would thus be \$1470/ha., exceeding the local opportunity cost. These calculations are necessarily highly approximate and only illustrative; nevertheless they suggest that there can be net gains to global beneficiaries who invest in tropical forest conservation.

express it as per ton of Carbon - tropical forests compared to US fossil fuel - 10-20 x cheaper

less than 0.1%



THE WHITE HOUSE
WASHINGTON

DATE: 5/12/92

TO: OSTP

FROM: PHILLIP D. BRADY
Assistant to the President and
Staff Secretary

Please forward your comments
directly to this office
by 10:00 a.m., WED. 5/13/92.
Thank you.

THE WHITE HOUSE
Office of the Press Secretary

For Immediate Release

May 13, 1992

The President today announced that the United States has joined eight other countries of the Americas in signing an agreement that will formally establish an Inter-American Institute for Global Change Research. The Institute will bring together the critical resources and capabilities needed to address important issues of global change in the Western Hemisphere.

The agreement was signed today by D. Allan Bromley, Assistant to the President for Science and Technology at a meeting hosted by President LaCalle of Uruguay in Montevideo.

The President first announced the concept of a network of regional institutes to study global change in his closing remarks to the White House Conference on Science and Economics Research Related to Global Change, which was convened by the President in April, 1990. Since then, the United States has actively developed this concept and has promoted the establishment of the first of these institutes which will be located in the Western Hemisphere. The United States will continue to work with senior representatives in the areas involved to establish institutes in the European/African region and in the Western Pacific region.

This signing affirms the President's commitment to global stewardship and his desire to further promote responsible environmental policies and reiterates that protecting the environment and encouraging economic growth can be mutually beneficial.

#

THE WHITE HOUSE
WASHINGTON

May 18, 1992

MEMORANDUM FOR KATHY SUPER

FROM:

D. ALLAN BROMLEY

Alan

SUBJECT:

A POSSIBLE PRESIDENTIAL ACTIVITY

Enclosed herewith is a letter from William T. Golden, the Chairman of the Board of the American Museum of Natural History.

Depending upon how things go in Rio it might well be that the President might wish to stop by to see their global warming exhibit later in the summer.

I promised Bill that I would pass on his request but I would certainly not advise that the President respond positively until we see how the Rio conference goes and can then make a much better judgment as to whether this would be a profitable expenditure of Presidential time. For the moment this is just a heads up and I will get back to you after Rio.

Enclosure

1565 I

AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET
NEW YORK, N.Y. 10024-5192
769-5752

OFFICE OF THE CHAIRMAN

April 29, 1992

40 Wall St., 4201
New York, NY 10005

MAIL ROOM

92 MAY 4 PM 4:00

Dear Allan:

It was a joy to see Lynn (and you!) again at the AAAS dinner on Friday night and to learn of Lynn's romantic and happy marriage (how pleased Pat would be) and to learn of the "dinosaur" book that Lynn's writing.

Now I revert to our brief conversation about the global warming exhibit that will open at the American Museum of Natural History in mid-May. It will be a pioneering presentation, done jointly with the Environmental Defense Fund. It will be highly informative, stimulating, and noncontroversial. It has been two years in preparation under fine scientific oversight.

As you know, the Museum is one of the three great institutions of its kind in the world. It is visited by some three million people a year, including some half million school children, has a distinguished scientific staff, and important educational programs. And we have an outstanding board of trustees, greatly strengthened in the past two years under the leadership of the new management. It would be splendid and attract much attention if President Bush, on some occasion when he is in New York, would seize the opportunity to visit the Museum and specifically to see this exhibit. President Langdon, the trustees, and I would be honored to welcome him. If you think well enough of this idea to broach it to President Bush and the appropriate staff members, I would be grateful.

With warm regards,

Sincerely,

W T

William T. Golden

Dr. D. Allan Bromley
Assistant to the President
for Science and Technology
Old Executive Office Building
Suite 358
17th St. & Pennsylvania Ave., NW
Washington, DC 20506

THE WHITE HOUSE
WASHINGTON

May 19, 1992

MEMORANDUM FOR THE PRESIDENT

FROM: D. ALLAN BROMLEY *Amor*

SUBJECT: U.S. Signs Agreement Establishing the
Inter-American Institute for Global Change Research

I am pleased to report to you that an unprecedented international agreement for research on global change was signed last week in Montevideo, Uruguay, at a high-level meeting of governments of the inter-American region. The United States was joined by ten other countries of the region in signing the agreement which establishes the Inter-American Institute for Global Change Research. This number represents only the charter group and it is anticipated that the remaining eleven countries that have participated actively in the discussion leading to the formation of the Institute will also sign in the near future. President LaCalle of Uruguay hosted and addressed the meeting. I signed the agreement on your behalf in Montevideo.

The Inter-American Institute for Global Change Research is a major U.S.-led initiative which you can be proud to carry into UNCED. You introduced the concept of the Institute during your closing remarks at the 1990 White House Conference on Science and Economics Research Related to Global Change. I believe that it is the most successful product of that conference thus far.

Following are some background notes on the establishment of the Institute which may prove useful to you in your preparations for UNCED and in your discussions with Prime Minister Brian Mulroney, whom I understand will wish to raise this issue with you in his visit later this week.

I would welcome an opportunity to meet with you, at your convenience, to discuss further the development of this Institute, how you might include it as part of the U.S. message at UNCED, and the plans for completing your envisioned global system through the establishment of similar regionally-focused institutes in the Euro-African and Western Pacific areas.

Background

Your proposal to establish several north-south regional research institutes to bring together the critical mass of resources and capabilities needed to address global change research was first presented by the United States during the White House Conference on Science and Economics Research Related to Global Change in April 1990 and was highlighted in your closing remarks. More recently, this concept has been further endorsed by the United States during negotiations on a framework convention on climate change.

The United States has participated actively in promoting the establishment of the first of these institutes -- in the Western Hemisphere -- by: hosting (and chairing) the first developmental workshop in San Juan, Puerto Rico, in July 1991; providing funding and sending personnel to the international Interim Working Group; and chairing the second workshop for the development of the Institute, held in Mar del Plata, Argentina, in March 1992.

The United States has also participated in and supported meetings of scientific and legal experts to negotiate the legal agreement and scientific agenda for the Institute. From the beginning, however, we have emphasized that we were developing a cooperative activity among equals. The cooperation among the participating countries has been unprecedented and remarkably effective.

International Involvement

To date, twenty-two different countries from the Americas have participated -- at senior policy levels -- in the development of the Institute. They are the following:

<u>Argentina</u>	<u>Colombia</u>	<u>Guyana</u>	<u>Paraguay</u>
<u>Bahamas</u>	<u>Costa Rica</u>	<u>Jamaica</u>	<u>Peru</u>
<u>Bolivia</u>	<u>Dominican Republic</u>	<u>Mexico</u>	<u>Suriname</u>
<u>Brazil</u>	<u>El Salvador</u>	<u>Nicaragua</u>	<u>U.S.</u>
<u>Canada</u>	<u>Guatemala</u>	<u>Panama</u>	<u>Uruguay</u>
<u>Chile</u>			<u>Venezuela</u>

Eleven of these countries (underlined) became founding charter members of the Institute by signing the agreement in Montevideo last week. Others are expected to join in the near future as they complete the necessary domestic procedures and approvals.

In addition to the countries of the region, the European Community, Germany, Italy, Japan, The Netherlands, Spain, and international organizations including the International Council of Scientific Unions (ICSU) and the Organization of American States (OAS) have actively supported the development of the Institute and have participated in the meetings. The Japanese have indicated their willingness to play a leading role in establishing the Pacific Institute -- as have the Indonesians.

THE WHITE HOUSE

May 19, 1992

Dear Phil:

Since the attached memo is purely informational and since it is important that the President have this information prior to his meeting with Russian leadership, I hope that you would be able to

get them to the President without
the necessity of waiting.
My thanks.

Alex

Global Change file

DOMESTIC REGULATION OF METHYL BROMIDE

- * Section 602 of CAA unambiguously states that the Administrator shall list "all substances with an ozone depletion potential of 0.2 or greater."
 - the Act does not allow us to consider costs, benefits, substitutes etc.
- * A major international scientific assessment under the Montreal Protocol was just completed in July and concluded the "best estimate" of the ozone depletion potential of methyl bromide was 0.7.
 - assessment co-chaired by NASA and NOAA
 - reviewed all available data and involved world's top scientists
 - Sec 606 of the CAA explicitly cites Protocol science assessment as basis for regulatory decisions
 - delaying action based on need for assessment would simply not be credible
- * Meeting held by Bromely with NASA and NOAA and USDA in August concluded that adequate basis existed for regulating now.
- * While scientific uncertainties exist,
 - they could increase or decrease ozone depletion potential
 - extremely unlikely number would fall below 0.2
- * Montreal Protocol Parties will regulate methyl bromide this month
 - widespread support among developed nations for freezing production with a reduction of 25% by 2000 also likely
 - next Protocol assessment due in 1994 and will likely lead to further reductions/phase-out by 2000 (and achieve consistency with CAA position)
- * Substitutes for methyl bromide in soil fumigation (its major use) are highly likely by 2000.
 - dazamid has been tested in strawberries, tree nurseries, and tobacco which are the major uses of methyl bromide. It appears to be as effective.

-- it has been approved for non-food uses in U.S. and its producer has already been in to EPA to begin process of approval for food use (field trials could begin this year with approval likely to take 1-2 years)

-- EPA's proposed rule freezes production at current levels, allows production to be maintained at that level through 2000 and then calls for a phase-out

-- allows maximum legally allowable flexibility to reduce costs

-- gives maximum time for substitutes to be developed and approved.

* Bottom line: Science cannot legitimately used as an excuse for inaction. Protocol negotiations reinforce scientific basis for action, will begin regulation of methyl bromide this month, and will likely end up at or close to a 2000 phase-out in 1994. CAA does not give us luxury of regulating methyl bromide in this two-step process, but end result is likely to be similar domestically and internationally.

Land Monitoring and Remediation Workshop

- Hosted by the Bechtel Corporation in San Francisco, California, September 1991, with BHP-Minerals International as a contributing sponsor
- Two working groups reviewed areas of potential government / industry interest in GCRP
 - Resource / site characterization and monitoring
 - Reclamation and remediation
- Both groups developed recommended areas of interest and pilot projects, with these considerations
 - Need to validate remote sensing observations with ground truth data
 - Specifics on ground truth data validation part of pilot project planning

Global Change Effects Workshop

- Held in conjunction with the International Aeronautical Federation Conference in Montreal, Canada, October 1991, with the Canadian Advisory Council on Remote Sensing as a contributing sponsor
- Two working groups reviewed areas of potential government/industry interest in GCRP
 - Atmospheric and climate modeling
 - Land / ocean
- Both Groups developed recommended areas of interest and pilot projects with these general considerations
 - Begin with small projects in well-defined research areas
 - Select projects based on pre-existing capabilities and expertise found within the Geosat Committee member companies

Global Change Effects Workshop

Pilot Project 5: Optimizing Utilization of In Situ data

Goals

- Provide vehicle for researchers in government, academia and industry to participate in a joint project with both scientific research and data management value
- Demonstrate potential for leveraged value through utilization of combined government / industry in situ sensors and data holdings
- Explore potential for coordination of government and industry in situ data gathering campaigns in areas of mutual value

Global Change Effects Workshop

Pilot Project 5: Optimizing Utilization of In Situ Data

Objectives

- Collaborate on research in area of mutual interest, utilizing in situ data from government and industry sensors and archives
- Emphasize use of data from industry provided sensors: ocean platform, aircraft, ship, ground
- Develop an inventory of in situ data bases for access by government, industry and academia
- Explore benefits of stronger industry role in forums defining standards for catalogs and data exchange

Global Change Effects Workshop

Pilot Project 5: Optimizing Utilization of In Situ Data

Implementation

- Joint government / industry planning group defines specific application research objectives:
 - Research of interest to GCRP
 - Application in which industry has relevant in situ data
- Project team implements the project
 - Refine research objectives
 - Defines data requirements, identify and obtain commitment of data source
 - Carry out the research project, utilizing data obtained from industry and government sources
- Issue reports describing successes, lessons learned, and recommendations for future steps

Global Change Effects Workshop

Pilot Project 6: Establishing Universal Definitions and Protocols in Global Environmental Change Related Measurements

Goals

- Facilitate understanding among government, industry and academia in definition of key environmental parameters
- Improve parameter definition and measurement techniques in general as a basis for added value to the GCRP

Global Change Effects Workshop

Pilot Project 6: Establishing Universal Definitions and Protocols in Global Environmental Change Related Measurements

Objectives

- Collaborate to develop standard definition and measurement protocols in specific areas of common interest
- Emphasize applicability of industry provided source data and measurement techniques that add value to the GCRP in these areas
- Explore benefits of stronger industry role in forums defining standards for data measurements and data interchange

Global Change Effects Workshop

Pilot Project 6: Establishing Universal Definitions and Protocols in Global Environmental Change Related Measurements

Implementation

- Joint government / industry planning group defines specific focus of the project, choosing from such issues as
 - Land based measurement and reporting of atmospheric gas emission data for acid precipitation precursors and greenhouse gases
 - Standard definition for wetlands
- Project team implements the project based on the planning group's recommendations
 - Identifies specific problem areas in measurement and parameter definition standards
 - Recommends standard measurement and parameter definitions in these specific areas
- Issues reports describing recommendations and proposed follow-on actions

Land Monitoring and Remediation Workshop

Pilot Project 1: Plant Stress

Goals

- Yield a better understanding of various sources of vegetation stress
- Provide opportunities to measure and monitor stress with remote sensing techniques

Land Monitoring and Remediation Workshop

Pilot Project 1: Plant Stress

Implementation

- Review resource industry in situ data and previous interdisciplinary research in remote sensing of plant stress
- Select several categories of sites known to show vegetation stress
 - Mines
 - Industrial facilities
 - Landfill sites
 - Disease or insect-infested forests
- Identify the sensors and spectral and spatial resolution required at each type of site

Land Monitoring and Remediation Workshop

Pilot Project 2: Coastline Processes

Goals

- Promote better management of delta and coastal areas
- Support global sea level measurements for studying the effects of global warming

Land Monitoring and Remediation Workshop

Pilot Project 2: Coastline Processes

Objectives

- Establish techniques and procedures for monitoring natural or human - induced modification of the coastline
- Support studies on plant stress, especially as it relates to coastal vegetation

Executive Summary

- U.S. resource industry not in "Mission to Planet Earth"
- Need sound industry-government-academic partnership to mutually understand natural and man-made environmental change in order to mitigate, adapt and respond to need for improved environmental management throughout society
- International planning by IPCC, IGBP, IPECA

The Geosat Committee 1991 Environmental Workshops

- Identify resource industry research and priorities relevant to U.S. GCRP
- Identify areas for enhanced industry - government cooperation
- Propose simple pilot projects to start cooperative research efforts

Objectives Of This Meeting

- Review Geosat committee environmental workshops and proposal for government / industry cooperation in global change study, environmental management and earth observations
- Discuss linkages to ongoing government research and relative priorities of suggested pilot projects
- Discuss plan for follow up action

The Geosat Committee 1991 Environmental Workshops

- Identify resource industry research and priorities relevant to U.S. GCRP
- Identify areas for enhanced industry - government cooperation
- Propose simple pilot projects to start cooperative research efforts

Resource Industry Background

- Escalation of global environmental concern
- Resource industries provide for society's energy, mineral, food and fiber needs
- Conduct research relevant to government global change research program but...
- Resource industry not involved in government environmental programs

Benefits of Industry-Government Cooperation

- Leverage resources, costs, facilities, personal and technology transfer
- Example: Industry provides in-situ data to help government validate remote sensing for global environmental issues
- Proactive industry opportunity to understand relevant new government Earth observing technology for imposing government policy, legislation and regulation on industry.

The Geosat Committee Environmental Initiative

- 15 years of geological, oceanographic, and engineering cooperative remote sensing applications research
- Now focusing on environmental remote sensing applications research to enhance business opportunities and minimize negative impact on business
- Geosat environmental workshop report is a response to CEES/OSTP question of what industry is doing in global change research issues

Government Research Initiatives under FCCSET

- NASA EOS (Earth Observing System) \$30 Billion
- High Performance Computer and Communications Program
- National Technology Initiative (NTI)
- U.S. Global Change Research Program (GCRP) \$1.5 Billion / year

Benefits of Cooperative Research to Resource Industries

- Participation in defining global change phenomena leading to government environmental policies and regulations impacting business
- Help define Industry-Government research program potential for leveraging government research assets
- Demonstrate industry willingness to cooperate in environmental research to help assure sound government policy legislation effecting industry

Benefits to Global Change Research Program

- Access to industry assets such as expertise, ground truth data and specialized data collection facilities
- Demonstrate relevance of GCRP to U.S. economic growth through enhanced technology transfer
- Increase public support of GCRP through unified program based on government, industry and academic participation

Executive Summary

- U.S. resource industry not in "Mission to Planet Earth"
- Need sound industry-government-academic partnership to mutually understand natural and man-made environmental change in order to mitigate, adapt and respond to need for improved environmental management throughout society
- International planning by IPCC, IGBP, IPECA

Executive Summary (Continued)

- U.S. GCRP: "Establish scientific basis for national and international policy related to natural and human induced changes to global earth systems
- Industry-government cooperative research will depend on mutual access to data and scientific information

Industry - Government Interfaces

- CEES/GCRP part of White House FCCSET without industry participation
- CEES/OSTP with help of GEOSAT, EPRI, and Global Climate Coalition formed the private enterprise - government interface (PEGI) in 1991
- Encourage Industry-government synergism to reduce duplication and leverage assets
- Facilitate sharing of data, information and resources
- Catalyst for cooperative research projects

The Geosat Committee 1991 Environmental Workshops

- Land Monitoring and Remediation, San Francisco: Bechtel, BHP Minerals sponsors
- Global Change Effects, Montreal: CACRES sponsor
- Oil Seeps and Spills, Houston: AMOCO sponsors
- Attendance: representatives of 35 resource industry, 6 government and 5 academic organizations

The Geosat Committee 1991 Environmental Workshops

- Identify resource industry research and priorities relevant to U.S. GCRP
- Identify areas for enhanced industry - government cooperation
- Propose simple pilot projects to start cooperative research efforts

Pilot Project Elements

- Base line data
- Technology
- Global change effects observed
- Site specific interaction
- Leverage research assets

The Next Step for Pilot Project Cooperation

- PEGI response for agency priorities for GEOSAT pilot projects
- Propose industry - government project planning panel co-chairs
- Identify linkages to on-going related projects

Geosat Committee Goals

"Industry serves at the will of the people"

Ian Parker, Chairman, Newmont

U.S. GCRP: 1992 Issues

- Integrating climate modeling and prediction
- Global water and energy cycles
- Ecological systems
- Population dynamics
- Sea level changes

Geosat Environmental Workshops

- Responses to CEES/OSTP query to inventory industry interests in global change research
- Focus industry interest on earth observations applications for: Resource Development, Global Environment Change Study, Improved Environmental Management
- Crosscut industry interests with GCRP agency research programs
- Industry - government cooperation in critical environmental research essential to U.S. sustained resource development commensurate with acceptable environmental stewardship

Cooperative Research Mechanisms

- Parallel research Programs:
 - Self Funding, communication and exchange
- Joint Programs (e.g., CRADAs):
 - Shelf funding, Joint planning of shared goals, Information and Data
- Contract Research:
 - Government contracting for specific research with industry asset support

US Global Change Research Interdisciplinary Science Elements

- Climate and hydrologic systems
- Biogeochemical dynamics
- Ecological systems and dynamics
- Earth system history
- Human interactions
- Solid earth processes
- Solar influences

U.S. Global Change: Research Program FY93

Candidate Opportunities for Private Enterprise/Government Interactions on Global Change Research

- Greenhouse Gases, global warming potential and emissions trading
- Advanced computers for climate modeling
- Biological mechanisms of CO₂ - enhanced growth of plants
- Identify, estimate and analyze sources of greenhouse gas emissions
- Land characterization and land use
- Economic methods for assessing cost of climate change
- New instrumentation for measuring global change
- Biotechnology and genetic engineering to mitigate greenhouse gases and to adapt to climate change

The Geosat Committee, Inc. 1991 Environmental Workshops

- Land Monitoring and Remediation
 - Resources/site characterization and monitoring,
 - Reclamation and remediation
- Global change Effects
 - Atmospheric / climate modeling,
 - Land / ocean
- Oil Seeps and Spills
 - Characterization and detection,
 - Technology and monitoring,
 - Remediation

Land Monitoring and Remediation Workshop Resource / Site Characterization and Monitoring Panel

- Common Themes
 - Data quality control
 - Data standardization
 - Baseline data
 - In situ Ground truth for remote sensing system
- Priority Research Areas
 - Gas monitoring
 - Plant stress
- Sensor technology
 - Data base management
 - Hydrologic process
 - Image processing

Land Monitoring and Remediation Workshop Reclamation and Remediation Panel

- Common themes:
 - Baseline Data
 - Global change effects
 - Human interactions
 - Ecological interactions
 - Site specific interactions
 - In situ ground truth for remote sensing systems

Global Change Effects Workshop Atmospheric and Climate Modeling Panel

- Common Themes:
 - Atmospheric emissions
 - Climate modeling and prediction

Global Change Effects Workshop Land and Oceans Panel

- Common Themes: Observable with remote sensing
 - Ocean productivity
 - Sea level
 - Sea ice
 - Land / water cycles
 - Soil characteristics
 - Vegetation and ecological boundaries
 - Land ice / snow

Oil Seeps and Spills Workshop

- Common Themes: Exploration and Environmental Applications
 - 75+% oil slicks are natural
 - Mean ocean flow remote sensing
 - Sensor technology
 - Radar
 - Airborne laser fluoroscope
 - CZCS

Pilot Project 3: Baseline Data

Goals

- Solve environmental problems in an effective and cost - efficient manner
- Make better resource and environmental decisions at reduced costs

Pilot Project 3: Baseline Data

Objectives

- Make remote sensing data more readily accessible and known
- Demonstrate effectiveness of using remote sensing data to solve environmental problems

Pilot Project 3: Baseline Data

Implementation I

- Survey available data sets from industry, government and academia
- Develop mechanisms to make data sets accessible in a user - friendly manner
 - Publications
 - Software
 - Seminars, workshops...

Pilot Project 3: Baseline Data Implementation II

- Select a specific example of environmental concern
 - Industrial contamination
 - Water pollution
 - Reduced agricultural productivity
 - Stressed natural vegetation
 - Mine closure
- Use several types of remote sensing data
 - Upgrade and standardize data
 - Determine cause and extent of problem
 - Develop plan for remediation

Pilot Project 3: Baseline Data

Examples Presented at Workshop

- Urban water use efficiency
- Soil differences
- Vegetation growth
- Vegetation stress
- Irrigation efficiency and distribution
- Leaks in water aqueduct
- Remedial site investigations
- Sanitary landfill siting

Pilot Project 4: Site Specific Interactions

Goals

- Develop more effective cost - efficient procedures to prioritize and clean-up Superfund sites
- Develop criteria to determine optimum level of clean-up at Superfund sites

Pilot Project 4: Site Specific Interactions

Objectives

- Use remote sensing to assist in effective and cost-efficient clean-up of Superfund sites
- Use remote sensing to assist in developing optimum clean-up levels at each site based on human and environmental conditions

Pilot Project 4: Site Specific Interactions

Implementation

- Select Superfund sites
- Obtain remote sensing data for the sites
- Explore ways to improve effectiveness of assessment and clean-up process
- Site characterization (historic development)
- Risk assessment
- Targeted field sampling
- Assist in development of criteria to determine optimum clean-up level at each site
- Environmental features
- Human considerations

Recommendations for Cooperative Research

- Enhance economic growth through technology transfer from GCRP
- Facilitate growth and development by;
- Resolving intellectual property issues mutual access to remote sensing and ground truth data
- Develop environmental data standards and cooperative data bases
- Develop joint research mechanisms (i.e. CRADASSs)
- Consider industry in GCRP planning
- Joint programs more cost effective and mutually beneficial than parallel or contract programs
- Encourage academic involvement
- Establish criteria level verifiability remote sensing technology for industry compliance
- Take next steps to identify industry - government pilot project priority, linkages to existing programs, and initiate joint planning

Concluding Remarks I

- Global environmental change effects all nations, all economies, all life
- Effective industry - government partnership is critical
- Environmental policies must be based on sound analyses of scientific research

Concluding Remarks II

- Organizations working globally to develop predictive understanding of earth systems
- Observing systems and long term baseline data critical to science leading to informed government policies
- US GCRP should adopt spirit of national technology initiative NTI and CRADAs to leverage industry - government research access

Concluding Remarks III

- Cooperative synergistic industry - government role is critical in developing and evaluating remote sensing technology for studying global environmental change, environmental management and policy implementation and compliance.

"We need the collective money expertise people and time of government, universities and industry in a strong and common commitment to provide timely, cost effective research. We then need to report and communicate the best predictive models of what is happening to our environment and what the solutions and impacts of these actions will be."

Dr. Kenneth Ciriacks
V.P., AMOCO Production Company
Director, the Geosat Committee

Applying Resource Industry Research to the U.S. Global Change Research Program

A Proposal for Industry / Government
Cooperation in Global Change Study,
Environmental Management and Earth
Observation Applications from the GEOSAT
Committee 1991 Environmental Workshops

A Report by the GEOSAT Committee, Inc.

Robert F. Brammer and
Frederick B. Henderson III
Co-chairmen and Editors

An Assessments of Resource Industry
Issues and Research Priorities
Industry Research Compared with
Government Plans for Global Change
Study, Mitigation Adoption and
Research Strategies
Recommendations for Industry /
Government Cooperative Research and
Suggested Pilot Projects

Summary

- An assessment of resource industry issues and research priorities
- Industry research compared with government plans for global change, study, mitigation, adaption and research strategies
- Recommendations for Industry / Government cooperative research and suggested pilot projects

1992 Geosat Membership as of May 1992

AMOCO	Japex
ARCO	Loral Aero Systems Division
ASARCO	MacDonald-Dettwiller Assoc.
Barringer Patents Inc.	Marathon
Barringer Laboratories Inc.	Marine Spills Response Corp.
Bechtel Corporation	Mobil
BHP Minerals Int.	Noranda Exploration Co. LTD.
BHP Petroleum Int.	Petroscan
British Petroleum	Placer Dome Inc.
CCRS	Radarsat International Inc.
Chevron	RESTEC
CRA Exploration	Sedona Scientific
DE Gasparis/Hawthorn	Shell
Desert Research Institute	SI Corporation
Earthsat	Spot Image
EOSAT (GE, Hughes/SBRC) TASC	
ERIM	Terra-MAR, Inc.
ERSDAC	Texaco
GER	Unocal
Hunt Oil Company	

THE GEOSAT COMMITTEE

1991 ENVIRONMENTAL WORKSHOP:

OIL SEEPS AND SPILLS

CHAired BY:

DR. R.N. BAKER

AMOCO PRODUCTION COMPANY

HOUSTON, TX

OIL SEEPS AND SPILLS WORKSHOP

GOALS

- IDENTIFY INDUSTRY CONCERNS, INTERESTS AND RESEARCH DIRECTIONS.
- PROPOSE PILOT PROJECTS FOR INDUSTRY/GOVERNMENT COLLABORATIVE RESEARCH PROGRAMS.
- DISCUSS METHODS OF DETECTION, MONITORING AND REMEDIATION OF OIL SEEPS AND SPILLS, AND RELEVANT APPLICATIONS TO GLOBAL CHANGE RESEARCH.

OIL SEEPS AND SPILLS WORKSHOP

PARTICIPANTS

NOVEMBER 1991

AMOCO PRODUCTION COMPANY

ERIM

SHELL OIL COMPANY

TEXACO

PECTEN INTERNATIONAL

TEXAS A & M UNIVERSITY

MARATHON

UNIVERSITY OF OKLAHOMA

BRITISH PETROLEUM

INTERA

MOBIL OIL

TERRAMAR

TASC

BATTELLE LABS

MPB CORP., QUEBEC

EARTHSAT CORP.

MARINE SPILLS RESPONSE CORP.

OIL SEEPS AND SPILLS WORKSHOP

WORKING GROUPS

- OIL SPILL CHARACTERIZATION AND DETECTION
- TECHNOLOGY AND MONITORING
- REMEDIATION

OIL SEEPS AND SPILLS WORKSHOP PILOT PROJECT 7:

CHARACTERIZATION AND DETECTION PROTOTYPES

PURPOSE

- DETERMINE MOST IMPORTANT PARAMETERS FOR DETECTION AND MONITORING OIL SEEPS AND SPILLS
- IMPROVE OUR ABILITY TO PROTECT THE ENVIRONMENT AND DISTINGUISH BETWEEN MAN MADE AND NATURAL SEEPS
- IDENTIFY INDUSTRY NEEDS FOR SEEP/SPILL DETECTION:
 - TYPES OF MEASUREMENTS
 - MONITORING REPETITION RATE
 - G R O U N D / S E A T R U T H REQUIREMENTS
- ANALYZE KNOWN OIL SEEPS TO:
 - DETERMINE PARAMETERS SUCH AS CHEMICAL, PHYSICAL AND BIOLOGICAL PROPERTIES OF OIL
 - OCEANOGRAPHIC AND WEATHER INFLUENCES
 - REMOTE SENSING AND IMAGE PROCESSING TECHNIQUES

OIL SEEPS AND SPILLS WORKSHOP

CHARACTERIZATION AND DETECTION PROTOTYPES

IMPLEMENTATION

- PANEL OF INDUSTRY AND GOVERNMENT EXPERTS
- ORGANIZE JOINT TASK GROUP TO STUDY KNOWN SEEP/SPILLS, POSSIBLE CONTROLLED SPILL EXPERIMENT
- TEAM MEMBERS ANALYZE DATA AND PROCESSING TECHNIQUES, COMPARE RESULTS AND DETERMINE MOST EFFECTIVE (BOTH COST AND TECHNICAL) APPROACH

**OIL SEEPS AND SPILLS WORKSHOP
PILOT PROJECT 8:**

REMEDICATION STUDIES OF THE PAST AND PRESENT

PURPOSE

- STUDY THE EFFECTS OF OIL IN THE ENVIRONMENT USING HISTORICAL (TIME LAPSE) DATA FOR AN OIL CONTAMINATED SITE.
- MODEL AND EVALUATE RESULTS.
- IMPROVE OUR UNDERSTANDING OF THE ELEMENTS INVOLVED IN OIL SEEPS/SPILLS, E.G.:
 - GROUNDWATER
 - TEMPERATURE
 - SOIL CHEMISTRY
 - TYPES OF POLLUTANTS
 - VEGETATION

OIL SEEPS AND SPILLS WORKSHOP

REMEDATION STUDIES OF THE PAST AND PRESENT

IMPLEMENTATION

- FORM A GROUP OF REPRESENTATIVES FROM INDUSTRY AND GOVERNMENT TO SELECT A CONTAMINATED STUDY SITE. ESTABLISH MEASURABLE PARAMETERS AND REMEDIATION STANDARDS.
- REVIEW HISTORICAL REMOTE SENSING AND GROUND DATA FROM THE SITE.
- PERIODICALLY SAMPLE SITE TO MONITOR PROGRESSIVE DEGRADATION OR REMEDIATION.
- IDENTIFY KEY FACTORS INVOLVED IN ABOVE.
- DOCUMENT RESULTS AND ENCOURAGE INDUSTRY TO CONDUCT "PROOF OF METHOD" JOINT PROJECT.

OIL SEEPS AND SPILLS WORKSHOP

COOPERATING ORGANIZATIONS

THE GEOSAT COMMITTEE

MAJOR PETROCHEMICAL COMPANIES

AMOCO CHEVRON
EXXON TEXACO
SHELL CONOCO

GOVERNMENT LABS

ONR/NRL
BATTELLE
U.S. NAVY

PRIVATE COMPANIES

EARTHSAT ERIM
INTERA MSRC

UNIVERSITIES

TEXAS A & M
UNIVERSITY OF TEXAS
LSU
RICE

OCEANOGRAPHIC INSTITUTES

LAMONT - DOHERTY
WOODS HOLE
SCRIPPS

FEDERAL AGENCIES

NOAA
DOD
US COAST GUARD