

## The Environmental Argument for Alternative Energy Sources and Reforestation

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This presentation first identifies three of the global environmental phenomena in need of most urgent attention, then explains the processes responsible for these phenomena, and finally points out four public policy issues that need urgent attention if large scale social disruption is to be avoided. My principal concern is to identify state of the art scientific findings that support my interpretations of the current situation. These findings will not be explained in detail in my oral presentation; they can be located through use of numbered references in the typed text, copies of which are available for distribution to the press.

### GLOBAL ENVIRONMENTAL PHENOMENA IN NEED OF URGENT ATTENTION

Three global-scale environmental phenomena have become progressively more serious in the last decade and appear to require urgent consideration.

1. During 1988, there has been an enormous amount of media attention to the proposition that the world had become unusually hot during the 1980's, and that 1988 was an extraordinarily hot year. In fact, much of the United States was extraordinarily hot during the summer of 1988. However, imbedding this phenomenon in a global perspective, we see that the phenomenon was local, not global. A typical day in the 1988 summer was July 18. On that day, Oregon, Washington and Northern California were extremely hot, and San Francisco had the highest temperature since records began, 114 years ago.

However, on July 18, 1988, the high temperature for the day in Lisbon was 23 Deg. F below the normal long term high for that day, and the corresponding depressions were 11 for Bonn, 8 for Edmonton, 9 for Martinique, 5 for Monterrey in Mexico, 6 for Sydney, 4 for Tokyo, 3 for Rio, 6 for Nice, 3 for Havana, and 4 for Jerusalem. For 61 sites for which July 18 temperatures were given in the New York Times, it was colder than the long term normal at 35 sites.

This is particularly astonishing, because it has been known since 1953 that cities are warmer than the surrounding countryside, because of the waste heat from buildings and engines, and the low incidence of green plants to lower air temperatures through evaporation off leaf surfaces (1). This urban heat island effect is now known to produce an elevation of city temperatures over those of the surrounding countryside which increases with city population growth (2), and reaches 10 deg. C at the largest city sizes, of about 10 million people (3). Almost all thermometers feeding into national weather service data collection systems are contaminated by this urban effect; in the United States, only 270 of the 11,600 thermometers of the National Weather

Service network are not so contaminated (4). Thus, if the average temperature of all big city thermometers reported in newspapers is only a degree or two above long term normal temperatures for those cities, then the surrounding countryside must be getting a lot colder. In fact, many different studies show that rural stations in the United States have cooled about 2 deg. C. in the period 1938 to 1975 (5). The U. S. Weather Service has identified a set of weather stations they believe to be free of local urban influences (6). Edited annual summaries of the data for these stations are available for the period to the end of December, 1986. Statistical analyses of these data series show declining, not increasing temperature trends since 1941 wherever there was any significant trend at all. Further, the years 1980 to 1986 typically included 1 or two of the coldest years in the period since 1941. At these rural stations, there is no evidence of a warming trend in the 1980's.

This should come as no surprise. We are surrounded by evidence of a cooling trend, not a warming trend. The shuttle Challenger disaster was caused by freezing, not boiling, of booster O-rings, at 28 deg. north of the equator, at sea level, and on the gulf stream; there has been an unusual incidence of freezes of citrus crops in northern Florida in the 1980's (7). The media have widely reported the very high lake levels of the Great Lakes and Great Salt Lake. These elevated lake levels are evidence of sustained long term cold weather, not hot weather. Great Salt Lake is much larger, not smaller in glacial times.

Thus the phenomenon that needs explaining is a gradual increase in city temperatures, coinciding with a decrease over the last five decades in rural temperatures.

(2). The second global phenomenon that raises warning flags is increased mortality rates and decreased growth rates in trees over vast areas.

(3). The third phenomenon which appears to be telling us something very important is the mass deaths of marine life off ocean coasts of Europe, and the east and west coasts of North America. In some cases, the proportion of all life in the sea washing up dead on beaches is very high: perhaps up to 90 per cent. Also, the diversity of causes of death is baffling. In some cases, marine mammals are dieing on the beach with seizures of unknown origin.

The world's oceans are an alarmingly large proportion of the world's environment to become inhospitable to the life normally supported there.

#### INTERPRETATION OF THE DATA

The increased global temperatures about which we hear so much are in fact only an increase in city temperatures, measuring population growth in cities. The question that needs answering is "Why are temperatures declining in rural areas?". The conventional wisdom explanation is that increase in the rate of combustion of fossil fuels year after year produces year-to-year growth in the amount of carbon injected into the atmosphere in the form of carbon dioxide, and that this then shows up as gradual year to year increase in the concentration of carbon dioxide in the global atmosphere. That increased atmospheric concentration of carbon dioxide decreases the likelihood that the earth's atmospheric shield can be penetrated by infrared, or heat radiation.

That, in turn warms the surface of the earth.

There are four problems with this argument. (1) The bulk of the world's surface, that outside cities, is getting colder, not hotter. (2) The most recent theoretical work and computer simulation modelling shows that something needs to be added to the theory. Increased temperatures near the equator, resulting from the increased carbon dioxide concentration of the atmosphere, cause increased evaporation of water from tropical ocean surfaces. This increases the cloud in the atmosphere, and that increase in cloudiness then shows up at high latitudes. This increased high latitude cloudiness, in turn, makes it more difficult for solar radiation to penetrate the earth's planetary shield, and that in turn cools, not warms the earth's surface at high latitudes (8). (3) An even more embarrassing problem is the lack of a statistical relationship between the rate at which carbon is being produced globally by combustion of fossil fuels (9), and the carbon dioxide concentration of the atmosphere (10). There were very large year to year differences in global growth rate in combustion of fossil fuel during the last 15 years, in response to energy price increases. These changes were not reflected in year to year changes in the carbon dioxide concentration of the atmosphere. To illustrate, over the period 1973 to 1982, the greatest growth in global combustion of fossil fuel occurred from 1975 to 1976. But the increase in concentration of carbon dioxide in the atmosphere, as measured at Point Barrow, Alaska, was the smallest from 1975 to 1976 of any pair of years in that interval. Due to a global energy price hike from 1978 to 1982, worldwide combustion of fossil fuels declined from 1979 to 1980, 1980 to 1981, and from 1981 to 1982. The increases in carbon dioxide concentration of the atmosphere were amongst the largest on record from 1979 to 1980, and from 1980 to 1981. Finally, there is hard evidence that a completely different mechanism than fossil fuel combustion seems to affect the concentration of carbon in the global atmosphere. Large-scale changes in the growth of high-latitude forests determines the rate at which carbon dioxide is removed from the atmosphere: years with more tree growth result in an increased rate of removal (11).

Putting these observations together suggests a theory. Years when cold weather decreases the photosynthetic rate in high latitude forests lead to decreased drawdown of carbon dioxide from the atmosphere, which in turn produces more cold weather. Notice that this constitutes a positive feedback loop, in which each variable causes the other to spiral further out of control. The danger is that if this theory is true, there is the possibility of the system slipping into an irreversible pattern of change, towards glacial conditions. This theory seems increasingly plausible when we note that a recent comprehensive U.S. National Research Council study on long run trends in acid rain identified cold weather as a possible contributor to increased tree mortality rates, that are usually attributed to acid rain (12).

The increased mortality rates in marine life argue that we now see early warning of a problem that may arise for humanity also: elevated rates of sickness and death due to interaction between depressed immune response caused by environmental cofactors, such as decreased nutrition and increased pollutant concentrations, with pathogens normally present in the environment.

## INDICATED POLICY RESPONSES

In searching for rational policy responses, we seek strategies that make sense for many different reasons, that are not harmful, and that will be robust even in the face of disagreements amongst scientists about interpretation of the data.

Four policies seem particularly worthwhile.

1. There ought to be a massive worldwide effort to halt the destruction of forests, and begin on a worldwide program of tree planting. Specifically, in high latitude countries, governments should provide farmers with incentives to plant out about a quarter of their land to woodlots, particularly hardwood woodlots. This policy makes sense for a surprising variety of reasons. First, there is a worldwide shortage of hardwood. As evidence of this, from 1984 to 1986, wholesale fuel prices dropped 12 per cent, but hardwood lumber prices only dropped 3 per cent. This presumably explains one of the reasons for the massive tropical deforestation. When farmers keep lots of trees on their property, this has useful effects in smoothing out microclimatic perturbations, as from the evaporation due to hot winds. It also has useful effects in smoothing out runoff during the annual precipitation cycle. There is less flooding and erosion during high rainfall seasons, and less drought during dry seasons. The roots of trees act as giant systems of sponges, holding on to water in the ground. If farmers had more trees on their land, it would increase the diversity of commodities they were selling, and decrease the amplitude of fluctuations in their income brought on by fluctuations of supply and demand in particular markets. Most importantly, it would increase the amount of vegetation available to draw down atmospheric carbon dioxide concentrations.

2. There should be intensified effort to shift to more efficient use of energy on a worldwide basis. Particularly worthy of major technological innovation is transportation systems within big cities. Most large metropolitan areas in all countries are now plagued with terrible problems of pollution, wasted human time in traffic congestion, and energy wastage due to stop and start driving by hoardes of cars. We need to shift to technologically innovative energy efficient systems of rail transportation. All this will be forced on us within a few decades by worldwide shortages of liquid fossil fuels in any case. The earlier we begin the conversion, the less traumatic it will be. All through society, we need to shift to new methods of doing things which substitute scientific and technological ingenuity for brute force methods based on profligate use of resources. The terrible and growing worldwide problem with pollution is a side-effect of our inefficient and resource-intensive techniques of achieving our social goals.

3. We need to enormously stimulate research on new sources of environmentally benign energy.

4. If the picture I have developed is correct, and high latitude temperatures are declining alarmingly, then we need to give careful attention to points of particular societal vulnerability to system breakdown in the face of extremely cold weather. One type of system that concerns me is major airports which are key hubs for national and international air transport, where weather from

early November to late February can become cold enough to shut air transportation down for days on end if the weather becomes cold enough. Four airports critical to world travel, are Chicago, Montreal, Frankfurt and Moscow. The particular technical vulnerability is that when weather becomes extremely cold, deicing progresses from one end of the plane to the other prior to takeoff, but the front has iced up again by the time the process has extended to the tail. Further, temperatures can drop to the point where maintenance crews can only survive outside for five minutes at a time. There should be careful study of trends in extreme weather conditions at these high vulnerability airports to ascertain the probability of extreme scenarios for the future. It may be prudent to provide facilities so that some proportion of the aircraft leaving the airport under extreme winter conditions could be deiced and serviced within a heated hanger, maintained at temperatures where maintenance workers could survive for much longer periods than five minutes.

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CO/2 BUDGET -- SUGGESTED FORM LETTER FOR A CITY

\_\_\_\_\_  
(organization)

\_\_\_\_\_  
(address)

\_\_\_\_\_  
(date)

Mayor \_\_\_\_\_  
City Hall  
\_\_\_\_\_  
\_\_\_\_\_

Dear Mayor \_\_\_\_\_:

The \_\_\_\_\_ (requesting organization), at its meeting on \_\_\_\_\_, 1989, resolved to ask the City of \_\_\_\_\_ to prepare a CO/2 Budget. This is in line with national and international movements for climate stabilization.

By CO/2 Budget we mean a 12-month budget showing activities that increase CO/2 and those (including soil, tree planting and energy work) which will decrease atmospheric carbon dioxide. A CO/2 Budget is a 12-month jobs, food and environment working plan for a region. Reference to other 'greenhouse' gasses would be optional and only secondary in significance.

\_\_\_\_\_ (name of state) may be one of the first states in the U.S. to undertake the development of a CO/2 Budget. \_\_\_\_\_ (name of city) is capable of providing one of the first such working documents. Others will follow. Timing is key, in the sense that the sooner large scale physical work is undertaken on soil, forest and energy work, the better our chances of survival.

It is becoming clear that protecting the environment and climate stabilization will be among the main problems facing the new Administration and Congress. The world has been very heavily hit by increasing natural disasters relating to climate change for the last 10 to 15 years. Two more years of heat, drought, storms, and all-time record cold spells in the U.S., would mean that our country would have no more surplus food in the five major crops (according to contacts in the Department of Agriculture).

Here is some background.

1. The California Democratic Council put CO/2 reduction and climate stabilization in its platform in 1983.

2. The California Democratic Party put this in its platform in 1984.
3. The AFL-CIO, in its national program from the October 1987 Convention in Miami, included a section on jobs, food and climate (the original resolution came from the Alameda County Central Labor Council, and the Peralta Federation of Teachers, AFT Local 1603).
4. The International Society for General Systems Research now has a Special Interest Group (SIG) on climate. Over the last three years it has held work sessions on the relations between soil, forests, CO/2, cloud and snow formation, intense climate changes and the goal of climate stabilization.
5. Istvan Lang, Secretary-General of the Hungarian Academy of Sciences, announced at Hamburg (World Congress on "Climate and Development," November 9, 1989) that his country will develop a CO/2 budget. It is the first country to do so.
6. The United Nations passed a resolution on 'conservation of climate as part of the common heritage of mankind' on December 6, 1988 (without vote, i.e., the highest form of unanimity).
7. Environmental, business, and various citizen groups have been slowly developing partial pictures of what is happening. It is now time for all-out local, national and international action.

We are requesting that           (name of city)           develop a statement of physical conditions now existing in our city, i.e., include programs and effects on the CO/2 level over the next twelve-month period. It is a basis for a jobs and environment program -- that relates to soil, tree planting, conservation and energy.

Members of           (requesting organization)           will be glad to be of assistance in any way we can in preparation of a CO/2 Budget for           (city)           .

Respectfully yours,

---

President

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For further information:

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