

In my prepared statement, I have referred to some of the major ecological changes that are in process now because of human activities. A notable example is the projected increase in atmospheric carbon dioxide due to the consumption of fossil fuels that were deposited millions of years ago. Here we deal as well with the depletion of irreplaceable natural resources.

At our present and projected rate of burning of fossil fuels—coal, oil, and natural gas—during the next 35 years, it seems possible that there will be a buildup of carbon dioxide in the atmosphere sufficient to cause a modest but significant rise in atmospheric temperatures over the whole earth. This is the so-called greenhouse effect.

This modest rise in temperature could cause very large changes in vegetation. It might cause melting of the polar ice caps, with the levels of the oceans rising and unprecedented effects on all living things.

A great deal of research on this is necessary to understand what changes might occur and also how they might be prevented.

It might also be suggested that we avoid the possibility of these changes in the future by the vigorous development of other sources of energy such as nuclear power, solar energy, and the gravitation energy of the tides.

At the same time, over the long term, we would be preserving these precious hydrocarbon resources for what may be their highest use as industrial raw materials.

It is apparent, I believe, that large scale imaginative R. & D. efforts are required and that the total system needs to be examined, not just segments of it. Lately, concern has also been expressed about the stability of the oxygen in our atmosphere. The oxygen in the atmosphere is derived from the photosynthetic processes of green plants, on land and in the oceans. The latter source, which consists of the minute green plants called phytoplankton, contributes a significant amount of the atmospheric oxygen that we breathe, variously estimated as equal to or as much as 10 times as much as that produced by the terrestrial plants.

Concern has recently been expressed that the dumping of poisonous substances into the seas such as insecticides, herbicides, and industrial wastes may diminish plankton population and hence oxygen production. If this were to occur—and I should emphasize that we don't know yet whether this is a real threat—there would occur a gradual decline of oxygen in the atmosphere with drastic effect on all living things. This would be over a time span which is long in terms of man's life but short in terms of geological time.

The oxygen lifetime in the atmosphere is around 2,000 years.

I must emphasize again that the reality of this threat is not known but we must understand its implications. This will require a good deal of investigation, including an understanding of the effects of toxic chemicals on the green plants of the sea, the phytoplankton, and the long-range accurate monitoring of the oxygen in the atmosphere.

While increased expenditures are necessary to apply what we already know to pollution abatement, it is also apparent that we need to develop a great deal of new knowledge. I have indicated some of the areas, only a few of them, where new knowledge is required. This