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Solar Power and Priorities

A short while ago *Science* published a cartoon of a desert scene with a lone billboard proclaiming, "Invest now! Greenhouse Estates coming soon: the best in ocean front living!" It would indeed be ironic if the cartoonists and the real estate agents were more thoughtful planners than the governments of the world. As serious as the problems of acid rain, toxic waste, and depletion of the ozone layer are, the greenhouse effect looms over all of them because it poses such great potential damage to the environment and is by far the most difficult to solve (see "Issues in atmospheric science," *Science*, 10 February 1989). The consensus prediction for a doubling of the CO₂ concentration, for example, is the year 2050—extremely close for a solution requiring scientific innovation, political courage, and international cooperation.

In developed countries the standard of living has been correlated with energy consumption per capita, with a steady rise in consumption occurring in the countries already consuming the most energy. In developing countries the consumption of energy is much lower, but the rate of increase is high. That mixture is explosive because developed countries argue that there is no point in conserving energy if developing countries keep using up the margin, whereas developing countries argue that they deserve to reach the consumption level of their rich peers. One might argue that we should delay action until the data on the current global warming are conclusive were it not for the fact that the energy industry is so massive. Even after a course of action is agreed upon, years will be required to implement it. Damaging environmental effects may be irreversible by then. A further argument against delay is that the remedies for the energy problem will help solve other environmental and economic problems.

The first and most important decision is the inauguration of a massive effort to use solar power. Solar power is not now cost-effective compared to oil. When the temporary energy crisis in 1973 and 1974 was over, the pressure for immediate alternative sources of energy disappeared. The long-range problems were forgotten. To develop solar energy technology to supply large amounts of power (not just for satellites and specialized missions, important as they are) should be a major priority of our civilization. It will be more and more cost-effective as oil becomes more and more expensive.

The energy crisis requires both technological fixes, such as solar energy, and societal restraint fixes, such as limits on the sizes and number of automobiles. The list of actions could go on to include major conservation efforts, better urban planning, encouragement of mass transit, tax laws to save our high-rise central cities, and zoning to decrease urban sprawl. If those measures, which will take much political courage, are to have a chance, they must be accompanied by some tough dealing on international issues. The developed countries can hardly say to the developing ones that the globe is at its limit of producing greenhouse gases and newcomers must stick to using bicycles. The developing countries, on the other hand, can hardly tell the developed countries that they must subsidize the continuing population explosion. Some international trade-offs can obviously take place: developed countries can concentrate on conservation plans and the funding for technological solutions; developing countries can concentrate on solving the overpopulation problem and preserving their forests and greenlands. The Montreal protocol on phasing out chlorofluorocarbons is a good first step in international cooperation.

Clichés about world peace roll readily off the tongue, but there is perhaps no more dramatic form of aggression of developed countries against developing ones than a gradual global warming. Developed countries are largely in temperate zones and can survive increases in temperature. Many developing nations lie in the tropics, and greenhouse climate changes could make life marginal and desperate. Fortunately, this is not a case of "them against us," for we are all in this environment together. The problem is one that will require politicians to think beyond the next election and citizens to think beyond the next generation. It will require the combined and dedicated attention of physicists, chemists, biologists, engineers, city planners, economists, efficiency experts, and politicians.

There is, of course, an alternative. We could pick an appropriate mountain and build on it a gigantic space vehicle designed to allow a male and a female of each species to be blasted off to live happily ever after on a distant but more livable planet, such as Venus.

—DANIEL E. KOSHLAND, JR.

Science

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