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The Management of Weather Resources

"The history of our time is sprinkled with instances of new technologies running ahead of the social, economic, environmental, international, and institutional thinking that should accompany them. Precisely because the science and technology of weather resources management are still at such an early stage, there is an excellent chance in this field to do things right—that is, for policy to be made and institutions to be built in parallel with the scientific discoveries and technological innovations."

The comment above is part of the reply* by the 17 members of the Weather Modification Advisory Board to the question posed by Congress in the National Weather Modification Policy Act of 1976: in effect, What should the federal government be doing about changing the weather?

What can be done? The euphoric predictions of a generation ago, when cloud seeding was first invented, have not been borne out, but significant results have been obtained. The Advisory Board concludes that a more vigorous and better focused research and development effort can yield regional increases in mountain snowpack in the 1980's, increase the rainfall in areas such as the High Plains and the Midwest by late 1980's, reduce hurricane winds and hail damage by the 1990's, and very soon poke holes in the clouds over cities to let the sun shine through. The changes expected would be 10 to 30 percent increases for snow and rain; 10 to 20 percent reductions for some hurricane winds (with much greater reductions in wind damage); and up to 60 percent reduction for hail in some kinds of storms.

Should it be done? The case for managing local weather is very strong. The economic benefits of delivering more water in the right places—for irrigation, hydroelectric power, and municipal and industrial use—far outweigh the costs. Population growth and migration to sunny coastal areas are multiplying the number of people at risk from hurricanes and other severe storms.

To achieve a better grasp of these problems will take 10 to 20 years of concentrated R & D. At present, physicists cannot follow with assurance the chain of cause and effect through a cloud; we are still too heavily dependent on statistical inference. Yet people in 74 countries with interests at stake have bet good money on operational cloud seeding without the kind of semicertainty that would pass muster in a scientific journal. In the United States last year, clouds were seeded in 88 projects in 23 states, covering 260,000 square miles or 7 percent of our land area.

How should it be done? The air and clouds are a public good, belonging to no one. So we must make sure people intervene with prudence in the great envelope around the globe. The Advisory Board feels that we should resist the temptation to place a heavy regulatory hand on an industry still struggling to be born. But it does propose that the federal government license weather modifiers, just as pilots are federally licensed.

Managing the weather to serve human needs is in itself an environmental impact. Those who experiment in the sky need to go beyond guessing the outcome ahead of time; they should monitor during and assess afterward the ecological changes they may provoke. Deliberate changes in the atmosphere should also be designed in open consultation with the people likely to be affected, not all of whom are Americans.

As things stand, no one is in charge of the future of weather resources management. We are still tackling a 20-year problem with 5-year projects staffed by short-term contracts and funded by 1-year appropriations. It is not nearly good enough. The Advisory Board recommends putting the federal government's weather modification R & D in one consolidated action program (not a "lead agency"), and giving it a clear mandate to produce a kit of useful tools with which to make the best of the only environment we have. If we start now, there *is* a chance to do things right, for a change.—HARLAN CLEVELAND, *Aspen Institute for Humanistic Studies, Chairman, Weather Modification Advisory Board, Washington, D.C. 20230*

**The Management of Weather Resources*, vol. 1, *Proposals for a National Policy and Program* (Department of Commerce, Washington, D.C., July 1978).