

The Long-Term Outcome of Geo-Engineering (2nd Edition)

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Part A

In 2009, a correspondent asked me whether I thought nuclear weapons were the most dangerous aspect of modern technology. What follows is my reply, heavily rewritten.

The most dangerous aspect of modern technology probably is not nuclear weapons. It could plausibly be argued that the remedies for global warming that are likely to be adopted constitute the most dangerous aspect of modern technology.

Nations have a strong incentive to avoid using nuclear weapons, at least on any large scale, because such use would probably be suicidal. This doesn't mean that nuclear war can never happen. On the contrary, the risk of it is very real. But a major nuclear war at least is not a strong probability for the foreseeable future.

On the other hand, it is virtually certain that nations will fail to reduce their emissions of carbon dioxide sufficiently and in time to prevent global warming from becoming disastrous. Instead, global warming will be kept in check through "geo-engineering." This means that the Earth's climate will be artificially managed to keep it within acceptable limits.¹ Of the many tools that have been proposed for management of the Earth's climate, three examples may be mentioned here: (i) Powdered iron can be dumped into the oceans to stimulate the growth of plankton that will absorb carbon dioxide from the atmosphere.² (ii) Microbes or other organisms may be genetically engineered to consume atmospheric carbon dioxide.³ (iii) Carbon dioxide may be pumped into underground reservoirs for permanent storage there.⁴

Any attempt at geo-engineering will entail a grave risk of immediate catastrophe. "Geo-engineering makes the problem of ballistic-missile defense look easy. It has to work the first time, and just right."⁵ Novel technological solutions usually have to be corrected repeatedly through trial and error; rarely do they work "the first time, and just right," and that's why people "quite rightly see [geo-engineering] as a scary thing."⁶

¹ See, e.g., **Time**, March 24, 2008, p. 50.

² Wood, p. 73, col. 2.

³ Leslie, p. 6, col. 4 (microbes). Wood, p. 73, col. 1 (trees).

⁴ Wood, p. 73, col. 2. Sarewitz & Pielke, p. 59, col. 3. It necessarily remains an open question whether the carbon dioxide will remain underground as long as the proponents of this plan believe. Even if a "demonstration project" (ibid.) keeps the CO₂ underground for as long as, say, ten years, that doesn't guarantee that it will stay there for a hundred or a thousand years. Moreover, any demonstration project will be carried out with special care by highly qualified experts. But once the procedure becomes routine and is widely applied, there **inevitably** will be negligence, incompetence, and dishonesty in its execution. Compare, e.g., the USA Today articles cited in note 67 to Chapter Two, above.

⁵ Wood, p. 76, col. 1, quoting Raymond Pierrehumbert, a geophysicist at the University of Chicago.

⁶ Ibid. See also USA Today, Feb. 16, 2015, p. 7A.

But let's assume that geo-engineering does work the first time and just right. Even so, there is every reason to expect that the longer-term consequences will be catastrophic.

First: Attempts to meddle with the environment almost always have unforeseen, undesirable consequences. In order to correct the undesirable consequences, further meddling with the environment is required. This in turn has other unforeseen consequences... and so forth. In trying to solve our problems by tinkering with the environment we just get ourselves deeper and deeper into trouble.

Second: For hundreds of millions of years, natural processes have kept the Earth's climate and the composition of its atmosphere within limits that have allowed the survival and evolution of complex forms of life. Sometimes during this period the climate has varied enough to cause the extinction of numerous species, but it has not become so extreme as to wipe out all of the most complex organisms.

When human beings have taken over the management of the Earth's climate, the natural processes that have kept the climate within livable limits will lose their capacity to perform that function. The climate will then be entirely dependent on human management. Since the Earth's climate is a worldwide phenomenon, it cannot be managed by independent local groups; its management will have to be organized on a worldwide basis and therefore will require rapid, worldwide communication. For this reason among others, management of the Earth's climate will be dependent on technological civilization. Every past civilization has broken down eventually, and modern technological civilization likewise will break down sooner or later. When that happens, the system of human climate-management necessarily will break down too. Because the natural processes that kept the climate within certain limits will be defunct, the Earth's climate can be expected to go haywire. In all probability the Earth will become too hot or too cold for the survival of complex life-forms, or the percentage of oxygen in the atmosphere will sink too low, or the atmosphere will become contaminated with toxic gasses, or some other atmospheric disaster will occur'.

Third: When the Earth has a managed climate, maintenance of the technological system will be considered essential for survival because, as has just been pointed out, the breakdown of the technological system will probably lead to radical and fatal disruption of the climate. The elimination of the technological system, through revolution or by any other means, would be almost equivalent to suicide. Because the system will be seen as indispensable for survival, it will be virtually immune to challenge.

The elite of our society—the scientists and engineers, the corporation executives, the government officials and the politicians—are afraid of nuclear war because it would lead to their own destruction. But they will be delighted to see the system that gives them their power and their status become indispensable and therefore immune to any serious challenge. Consequently, while they will make every effort to avoid nuclear war, they will be quite pleased to undertake management of the Earth's climate.

Part B

Peter Ward, an astrobiologist with NASA, warns us that natural processes will make our planet uninhabitable, perhaps as soon as a mere 500 million years from the present.¹ Most of us would be content to look forward to just one million more years of an inhabitable planet, but Ward apparently is not satisfied even with 500 million, so he advocates a system of geo-engineering that is supposed to keep our climate livable for the next several billion years.² Ward acknowledges that the level of global cooperation necessary for the creation of an effective system of geo-engineering may be a “utopian pipe-dream,”³ but he evidently believes that it is not entirely impossible, since he advocates it. But what is really astonishing is Ward’s belief that the system of geo-engineering—and therefore necessarily the worldwide civilization on which it will depend—can survive for billions of years.

In Chapter One we remarked on the naivete of scientists in regard to human affairs. Ward has here provided us with an egregious example of it.⁴

¹ Ward, pp. 141-42.

² Ibid., pp. 143, 149.

³ Ibid., p. 143.

⁴ For another egregious example, see K. Brower, pp. 60, 62.

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