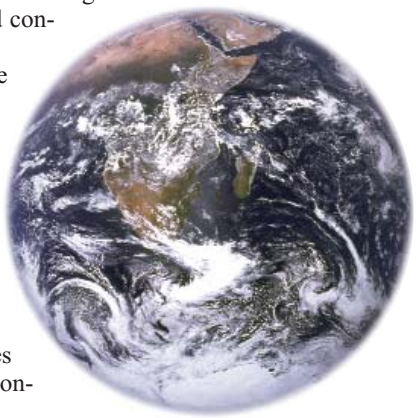
Sustainability and the Commons

Thirty-five years ago, *Science* published a remarkable essay by Garret Hardin entitled "Tragedy of the Commons." I knew Hardin at the time and admired his paper, but had no idea whatsoever of the influence it and its author would have on how we think about population and the environment. That influence has spawned several successor strands. One, evident almost immediately, was an enhanced concern about the impact of population growth on resource utilization. The second was a delayed argument about how to consider population growth in policy terms—an argument to which Hardin later added combustible material with a piece called "Lifeboat Ethics" that struck many as elitist or hard-hearted. The third, much later, is a recent social science literature revising Hardin's hard choice (either a coercive consensus to limit breeding or repressive government controls) by showing that groups often evolve fair social arrangements that limit exploitation and conserve shared resources.



The population/resource collision has only grown more important since Hardin's *Science* essay. Earth's population then was about 3.5 billion; it has since grown by a factor of nearly 2, to 6.3 billion. That growth, amplified by global increases in affluence and the power of technology, has brought escalating pressures on "common-pool" resources such as air, fresh water, and ocean fisheries that are accessible to many potential harvesters who can extract marginal personal benefits at a cost that is low because all other harvesters share it. Decades of depletion of these resources, whose status was explored in the past four issues of *Science*, have led to new concerns and new terms: "sustainability" and "sustainability science." The loss of value compels us to undertake more careful analyses; first, of what values we actually take from nature's resources, and second, of how science can contribute to maintaining such resources sustainably.

We obtain value from our environment in various ways: We may use it for timber or for hunting, we may enjoy it for various nonuse values such as birdwatching, and we may extract pleasure from merely knowing that it's there. In *Man and Nature*, perhaps the first environmental classic, George Perkins Marsh provided a meticulous 19th-century account of what had happened to the world's woods, waters, and fields. In Marsh one finds a kind of outrage over environmental damage, but there is little of the sense of wonder about nature that one finds in modern writers such as Wallace Stegner. Marsh is all about use values, Stegner about nonuse. A modern convergence defines sustainability as requiring that the average welfare of the successor generation, with respect to the total of all these values, be as high or higher than that of the current generation.

That begs some important questions. What about equity? Most, I think, would insist that the condition of the majority of people, if not of everybody, should either stay the same or improve. And what about history? If welfare has been improving for several generations, is there a built-in expectation that historical rates of improvement will continue? Our welfare detectors, after all, are exquisitely sensitive to disparity.

Once we find agreement about what sustainability really means, we can ask what science might contribute. It is surely encouraging that science is focusing increasing attention on resource problems, but the success rate is not high. At small scales, where science is applied in limited societies where property rights can be made clear, there have been some real winners, such as managed preserves that blend conservation objectives with recreational values. But at large scales, ranging from ocean fisheries to global climate, good science often fails the implementation test because the transaction costs are too high or because political and economic factors intervene. A recommended target stock size for managing a marine fishery fails, although its stability makes it desirable, because to harvesters it looks too large to leave alone. Models and climate history tell us that global warming is likely to reach damaging levels, but the cost of controlling carbon emissions is high and there is always the mirage of a hydrogen economy.

The big question in the end is not whether science can help. Plainly it could. Rather, it is whether scientific evidence can successfully overcome social, economic, and political resistance. That was Hardin's big question 35 years ago, and it is now ours.

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