

Sustainable Development

When scientists and public policy specialists gathered at the Earth Institute at Columbia University, New York, to assess the State of the Planet in 2004 (www.earth.columbia.edu/sop2004), their overriding concern centered on global-scale interactions between the growing human population and Earth processes under increasing strain. The fourfold increase of the human population during the past century, coupled with a roughly 4.5-fold increase of economic activity per person, has led to adverse anthropogenic effects on species extinction, ecosystem functions and biodiversity, climate change, groundwater depletion, soil nutrient losses, and zoonotic disease emergence and transmission, with far too little societal effort invested in mitigating these consequences. The world's poorest people suffer the most because of their narrow margin of survival, lack of access to technologies, vulnerability to natural hazards, and fragility of the ecosystems in which they are concentrated.

These pressures will intensify in the coming decades—the critical period that Harvard University biologist E. O. Wilson has termed “the bottleneck.” By the year 2100, we might plausibly have a stabilized or gradually declining global population equipped with new technological systems that are compatible with long-term environmental stewardship. But will we pass through the bottleneck safely? The conferees underscored the precariousness of the complex social processes linking scientific advance, technological development and adoption, geopolitics, and economics, which will have to function effectively for our safe passage through the bottleneck.

Global society is caught between competing visions of the future: one of fear and one of hope. Both acknowledge a world under stress but draw wholly different conclusions. The vision of fear holds that globalization, rising populations, resource depletion, and environmental stress auger an intensified struggle over scarce resources and across clashing cultures, a world increasingly divided between “us” and “them.” The United States, alas, seems to be betting that way, allocating an astounding \$450 billion per year to the military, which is half of the world's total military spending. The State of the Planet conference offered a very different perspective. The scientists attending showed that science and technology offer a suite of options for combining economic well-being and environmental sustainability. Carbon from fossil fuels can be captured and stored, food productivity can be bolstered through improved soil management and agrobiotechnology, water can be made safe for drinking and produced in sufficient quantity for agriculture, millions of lives per year can be saved through existing highly effective health technologies, and threatened species and ecosystems can be saved with advances in conservation biology.

Yet there was certainly no technological utopianism at the conference. Developing and mobilizing the needed science and technology will require long lead times, public funding for research and development, and improved systems of global governance. In short, passing through the bottleneck will require a level of collective action that is nowhere yet in sight. Budget funding for the future technologies that could underpin sustainable development is a small fraction of military spending, and only a slight part of that spending is directed at the health, energy, and environmental needs of the world's poorest people.

The requisite level of public understanding also does not yet exist. Our political leaders choose military rather than scientific options, in part because the public lacks the knowledge of the real risks and real options facing global society. For this reason, scientists themselves, through academic institutions, national academies, and international associations, have a key role to play in public leadership. There is a public hunger today for information that is not spin or sound bites. The global scientific consensus on the challenges of sustainable development is much greater than the public is aware and could form the basis for meaningful plans of action. Scientists can serve the public interest well by finding more opportunities for systematic dialogue with the public, including leading corporations and civil society groups. Bringing together diverse stakeholders in a science-based process of consensus building has been dubbed “analytic deliberation” (*Science*, 12 December 2003, p. 1907). New high-level forums for analytic deliberation on climate, biodiversity preservation, and global poverty reduction can provide a critical mechanism for consensus building on strategies for sustainable development.

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