Science and Sustainability

When the World Summit on Sustainable Development convenes in Johannesburg, South Africa, at the end of August, it will serve as a powerful reminder that science and technology are at the core of both the world's greatest problems and its most promising opportunities. The summit also will emphasize that countries lacking a vibrant science and technology enterprise are doomed to lag behind in their evolution and in the quality of life of their citizens. As the rich nations get richer, those with little access to modern science make no progress or, worse, only get poorer. The summit will challenge the developed world to help bring the power of science to bear on bridging the ever-widening gap between rich and poor countries.

Ismail Serageldin, director of the Library of Alexandria (Egypt), eloquently articulated the extent of this disparity at the American Association for the Advancement of Science (AAAS) annual meeting last February (see also *Science*, 5 April 2002, p. 54): One billion people throughout the world have no access to clean water. Two billion people have inadequate sanitation. Almost 1.5 billion people, mostly in cities in the developing world, are breathing air below the standards deemed acceptable by the World Health Organization. Hundreds of millions of poor farmers struggle unsuccessfully to maintain the fertility of their soil.

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Serageldin and other international leaders (see the essay by Raven on p. 954 of this issue) point out that these problems are not simply the result of an absence of scientific or technological solutions. In many cases, the solutions already exist. The problem stems from the failure to develop adequate scientific and technological cooperation and the infrastructure needed to ensure that poorer countries can sustain science- and technology-based progress over time. A striking example is found in the recently published rice genome (*Science*, 5 April 2002, p. 79 and p. 92), with its enormous potential as a basis for enhancing the grain that is the primary source of food for more than a billion people throughout the world. But unless explicit efforts are undertaken to ensure that these advances are translated and transferred to the developing world, and made workable in local contexts, knowledge of the rice genome will principally benefit the rich.

Decreasing the knowledge disparities is not only a humanitarian imperative. Growing contrasts between rich and poor countries, made ever more visible by advances in telecommunications and other technologies, fuel tension, distrust, and danger. And it is by now a truism that what happens in one part of the world can have dramatic environmental, health, economic, social, and political ramifications for the rest of the planet. Using science to address problems in poorer nations can lead to positive returns on the investment for all of humanity. On the eve of the Johannesburg summit, for example, ecologists, economists, and policy-makers are weighing the benefits of habitat conversion for human use versus the conservation of natural habitats and the "ecosystem services" they provide. Balmford *et al.* (p. 950 in this issue) show that conservation generates enormous economic benefits as compared to conversion, and "the benefit:cost ratio of an effective global program for the conservation of remaining wild nature is at least 100:1."

What is the right approach for science and sustainable development? We can learn much from experience with public health issues such as AIDS and malaria. Effective solutions require multidisciplinary, multidimensional strategies. Speaking in February to a group of nongovernmental agencies preparing for the World Summit, Norman Neureiter, science advisor to the U.S. secretary of state, emphasized that modern science and technology are best brought to developing countries through long-term international collaborations involving local scientists. The citizens of poor countries need preparation for the changes that will accompany technological advances, and this will require new and broadened educational programs. There is a payoff: Building indigenous science and technology capacity is essential to maintaining progress.

The strength of our science and technology enterprise provides great opportunity to enrich both international science and global public policy. The AAAS has mounted initiatives, as have other societies and academies, to help tackle the complexities of sustainable development. But to have real impact, we need broader and deeper participation from people across the entire domain of science and technology. Only then can we effectively rise to the challenge the summit will put before us.

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