What Matters: An industrial policy for climate change

I believe that the biggest question on the planet today involves sustainable development: is there room enough on the planet for seven billion to ten billion human beings, tens of millions of other species, and economic convergence between rich and poor? As I argue in *Common Wealth*,[1] the answer is no with current technology, and yes if we focus on sustainable technology. The major challenge for our generation is to overhaul several key technology systems on a global scale, including: power production, food supplies, transport services, and infectious-disease control. These steps should be combined with a massive effort in family planning and voluntary fertility reduction, so that we aim for a peak population of eight billion people around 2050, rather than nine billion or ten billion people.

The global economy is literally unsustainable now and cannot absorb further economic and population growth without serious risks of global destabilization—even collapse. The unsustainability shows up in the following areas:

- Carbon dioxide emissions, now running at around 36 billion tons per year, and growing by 1 to 2 percent per year during normal years
- Nitrogen deposition from fertilizer use, creating more than 100 hypoxic zones in the world's estuaries and wreaking even more extensive ecosystem damage
- Water stress from ground-water depletion, glacier melt, reduced snowmelt, diversion of upstream waters through dams, increased evapotranspiration with higher temperatures
- Greatly increased risk of new and reemerging zoonotic diseases
- Greatly increased damage from invasive species
- Greatly increased risk of extreme weather events, including droughts, floods, and tropical cyclones

Even if we did nothing more than continue at current levels of production and resource use, each of these problems would prove to be devastating within decades. Climate change would get completely out of control, reaching serious tipping points in food production, water availability, extreme events, and perhaps sea levels. Epidemic diseases could prove devastating. Food crises would multiply. Biodiversity would be shattered, with likely millions of species facing the threat of extinction.

The implications are rather clear. Either we cut back sharply in living standards in the rich countries, squelch development in the poor countries, or revamp our technological systems world-wide. The costs and benefits of these alternatives are a matter of empirical investigation. I believe the evidence is very strong that the best course of action is technological change, aiming to make possible the convergence of living standards of rich and poor, the continued high living standards of the rich countries, and environmental sustainability. In other words, technological advances, if properly promoted, can turn the answer from no to yes.

It's even fairly clear what needs to be done, but of course less clear on how to do it. Just a few human activities contribute the bulk of the unsustainable resource use. The major areas to focus on are:

- Electricity production, which must become low- or zero-carbon emitting

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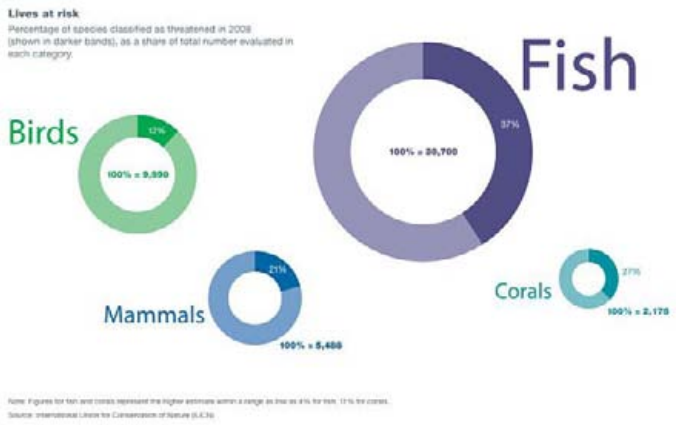
- Automobile transport, which must multiply by four- or fivefold the miles vehicles can travel per gallon of gasoline or eliminate gasoline entirely by moving to electric batteries recharged on a clean grid
- Food production, which must produce a healthier diet with much less destruction of habitats, biodiversity, and water resources; less use of pesticides and antibiotics; and reduced greenhouse gas emissions (methane, nitrous oxide, and CO2 through fossil-fuel use)
- Green buildings that are much more energy efficient and more reliant on electricity than they are on on-site burning of fossil fuels
- Reduced industrial pollution through systematic materials recycling and the redesign of production processes
- Comprehensive introduction of infectious-disease control, including surveillance, monitoring, case management, and appropriate uses of antibiotics

Accomplishing these goals will require bold sector-wide strategies involving the public, private, and academic spheres. The biggest mistake is to believe that technology transformation can and should be left to the marketplace, perhaps after tweaking the markets with some corrective pricing (for example, tradable permits for greenhouse gas emissions). Large-scale technological change requires basic scientific research, extensive spending on product and process development, high-cost demonstration projects, public awareness and education campaigns, revamping of regulations (including environmental assessments, federal land use, liability law, taxation, and zoning), as well as help for the poor to adopt the new technologies. Major industrial sectors in the United States—such as airplanes, automobiles, Internet, public health and medical care, and power generation and the electricity grid—are all examples of extensive public–private partnerships. When the government retreats too much, as it has in the development of carbon capture and sequestration (CCS) technology, precious years are lost.



The Obama administration should revamp and dramatically upgrade the US federal laboratories system by boosting the amount spent on RDD&D (research, development, demonstration, and diffusion) of sustainable technologies from roughly $3 billion per year to $30 billion per year. Moreover, the new administration should rapidly engage with key international counterparts—Brazil, China, the European Union, India, Japan, and Mexico, among others—to cooperate on major new technology classes, such as large-scale solar power, long-mileage automobiles, and global disease control and surveillance. The China–US relationship will of course be especially pivotal. The two countries contribute more than 40 percent of the world's greenhouse gases. Neither can solve the climate or food problems on its own, and both have a tremendous amount at stake. Technological cooperation rather than confrontation and finger-pointing will be essential.

Like McKinsey, I've tried to estimate the costs of these technological transformations. My impression is that they probably sum to 1 to 2 percent of GNP on an annual basis—or, very roughly, $500 billion to $1 trillion per year, a significant sum but modest compared to the incalculable costs and risks of wrecking the planet. Climate change, disease control,

food production, and biodiversity are solvable problems, but only if we cooperatively choose to direct significant resources toward their solution, mobilize the needed scientific and engineering knowledge, and act quickly and consistently for years to come. All of this requires a significant, but manageable change in direction.

[1] Jeffrey D. Sachs, *Common Wealth: Economics for a Crowded Planet*, New York, NY: Penguin, 2008.

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