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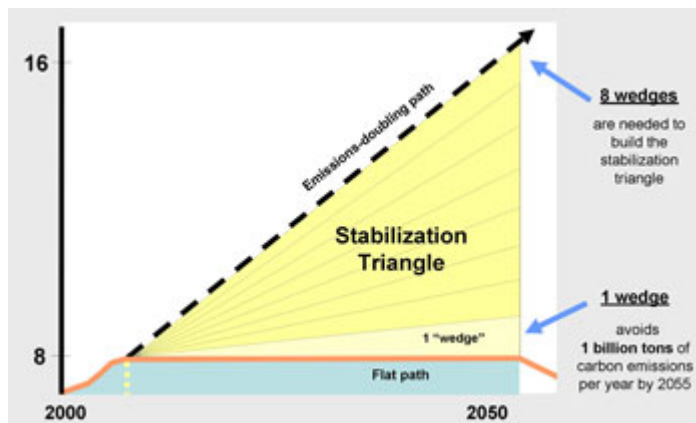


The Crux

November 18, 2011

7 Billion People, 30 Gigatons of CO₂, 1 Warming Planet: Population & Climate in the 21st Century

The world is now home to 7 billion people, each of whom contributes to the carbon emissions that are slowly cooking the globe. To find out how growing population affects our plans to deal with climate change, we talked with Princeton's Robert Socolow, co-creator of one of the best models for thinking about how to prevent climate



The “stabilization wedge” idea is a modular way of reducing carbon emissions.

Many of my students are “green” consumers. They are proud of riding bicycles, they turn off lights when they leave the room, and they eat little or no meat. But they are usually surprised when I tell them that the most important decision they will make, as far as its impact on natural resources is concerned, is how many children to have.

Most sources of carbon emissions—heating and lighting homes and stores, making steel, providing food—grow in proportion to population. We’ve just hit 7 billion people, and there’s no way any single approach, or just two or three approaches, can effectively deal with the environmental pressures that this many people exert.

To foster a way of thinking about the problem of climate change that involves using many different approaches in tandem, Steve Pacala and I introduced the “stabilization wedge” in 2004. A wedge is a campaign or strategy that reduces carbon dioxide emissions to the atmosphere over the next 50 years by a specific amount, relative to some baseline future where nothing is done to slow down climate change.

Examples of wedge strategies are driving more efficient cars, driving cars less far because cities are laid out differently, building lots of wind power, and growing many more trees.

Each wedge is an immense amount of activity in lots of countries. A wedge of wind power, for example, requires installing a million large (two-megawatt) windmills by mid-century and not producing an equivalent amount of coal-based power. We worked out that a world that implements seven wedges over the next 50 years, and then lowers emissions further over the following fifty years, would substantially reduce the damage from climate change. Our paper carried a message of hope: each wedge we considered involves scaling up and improving an activity or a technology that is already familiar. Humanity doesn't need to wait for some miracle technology.

There are far more than seven ways to get a wedge. We listed 15 ways in our paper, and we indicated that there were others. As David Hawkins of the Natural Resources Defense Council put it, our paper was the iPod of climate change: each person fills it with his favorite things. And since every person fills his or her iPod differently, our paper implicitly requires negotiation across countries and interest groups so that societies can pursue a specific set of wedges coherently.

The wedge model was influential beyond Steve's and my wildest dreams. The message that societies could build on what they already understood and that many strategies could be pursued in parallel was widely welcomed. The paper helped build the case for early action and ambitious goals—in the relevant United Nations organizations, in national governments, in many environmental organizations, and in a wide variety of businesses.

Building a case and winning a case aren't the same, of course. The world is emitting greenhouse gases today about 25 percent faster than seven years ago. If we were writing the wedges paper today, it would call for nine wedges to keep emissions constant for the next fifty years, and more carbon dioxide would be in the atmosphere in spite of these efforts. To have no more carbon dioxide in the atmosphere at midcentury than our 2004 paper allowed, about twelve wedges would be required. Procrastination is costly.

In our 2004 paper we didn't include a "population wedge," but we have done so in later papers. A wedge reduces baseline emissions by about 7 percent. Therefore, to the extent that emissions are proportional to population, a set of policies and actions driven by environmental concerns that results in about seven percent fewer people at midcentury than assumed in some baseline projection, would produce a wedge. For example, if the mid-century world population would be nine billion people if no one cares about the sustainability agenda, then a mid-century population of eight and a half billion people, resulting from environment-inspired policies, is a "population wedge."

In detail, of course, it depends on where the kids would have been born. A person born into a family living in poverty will emit far fewer greenhouse gases over his or her lifetime than someone born into a prosperous family. An average American emits at least ten times more greenhouse gases per year than an average Indian. So, reduction of population growth, from the perspective of climate change, is especially important in wealthy countries. Right now, women in some wealthy countries—including Japan, Italy, and Russia—are on average having fewer than two children, which over time will lead to falling populations. Some of these countries' governments are paying couples to have more children: so-called "pro-natalist" policies. The environment would be better served if there were no such bribes.

Not bribing women in prosperous countries to have more babies than they would choose on their own is especially important, because the next two or so generations of babies will count the most from the perspective of climate change. On average, a child born at mid-century, if the world has taken climate change seriously, will emit fewer greenhouse gases than a child born today. To be sure, the reverse is true for a baby born into poverty: assuming that global poverty is substantially alleviated over the next few decades,

a child born at midcentury in one of today's developing countries may well emit more greenhouse gases over his or her lifetime than a child born in that same country today. Thus, assuring that every woman living in poverty today has only the children she wishes is the complementary task. A global population smaller by the end of the century than today is plausible—and a desirable objective if it can be achieved without coercion, pestilence, or war.

In the 1960s, when I was deciding to have two children, my friends and I actually did make the connection between the environment and the number of children we would try to have. Since then, there have been deliberate efforts to delink population and the environment; I am glad to see the recent efforts to restore the linkage in public discussion. But it is critical to link the environment to parents' choices in both rich and poor families, not just in poor families.

[Robert Socolow](#) is a professor of Mechanical and Aerospace Engineering at Princeton University, where he focuses on global carbon management. He is the co-principal investigator of Princeton University's [Carbon Mitigation Initiative](#) (CMI). Under CMI, Princeton has launched new, coordinated research in environmental science, energy technology, geological engineering, and public policy.