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Princeton's Socolow lays out path to address global warming

Staff photo Stephanie Mitchell/Harvard News Office

Energy expert Socolow outlines a plan to break the large reduction in carbon emissions necessary into manageable chunks, or 'wedges,' each of which would take a step toward limiting carbon emissions to today's levels.

Step-by-step to a cleaner energy future

By Alvin Powell
Harvard News Office

A Princeton University energy expert laid out a framework to arrest atmosphere-warming carbon emissions over the next 50 years, saying he was optimistic that significant action could be taken to address global warming.

Princeton Professor Robert Socolow said his optimism stems from his belief that carbon emissions could be arrested at today's rate using technology that is available today — much of it already used by industry.

Socolow added urgency to that optimism, however, saying that changes need to begin today to avoid a tripling of atmospheric carbon dioxide from preindustrial levels by 2055. He outlined a plan to break the large reduction in carbon emissions necessary into manageable chunks, or "wedges," each of which would take a step toward limiting carbon emissions to today's levels.

"What has seemed too hard has become what simply must be done," Socolow said. "The wedge decomposes a heroic challenge into a limited set of monumental tasks."

Socolow, co-principal investigator of Princeton's Carbon Mitigation Initiative, spoke at the Science Center on April 5, delivering the last "Future of Energy" lectures for this academic year. The series, sponsored by the Harvard Center for the Environment, will continue next fall, according to center Director Daniel Schrag, professor of Earth and planetary sciences.

Socolow's talk, "Stabilization Wedges: Mitigation Tools for the Next Half-Century," dealt mainly with two quantities: the tons of carbon released into the atmosphere each year through burning fossil fuels, and the atmospheric levels of the greenhouse gas carbon dioxide, which scientists believe is largely responsible for global warming.

Socolow's "wedge" strategy, developed with fellow Princeton Professor Stephan Pacala, was initially published in a 2004 article in the journal Science and has attracted widespread attention.

Socolow said that if we keep carbon emissions at today's level of 7 billion tons each year, carbon dioxide will continue to increase in the atmosphere but will level out at about 500 parts per million, or less than twice the level before the Industrial Revolution, in about 50 years.

Socolow acknowledged that some people believe that there must be even greater reductions, but he said the goals presented in his plan require no new technology and can be achieved with technology proven and available today.

Further, he said, this action is needed to avoid the far higher carbon dioxide levels in the atmosphere that would otherwise occur, with unknown consequences for the Earth's climate. Projections of "business as usual" that incorporate anticipated global economic growth show annual carbon emissions doubling to 14 billion tons annually over the next 50 years and atmospheric carbon dioxide levels more than tripling from preindustrial levels.

While he contends it is possible to maintain carbon emissions at today's rate of 7 billion tons of carbon per year, Socolow acknowledged it won't be easy. His proposed "stabilization wedges," would each prevent the release of 1 billion tons of carbon into the atmosphere annually by 2055.

Conservation and energy efficiency have the greatest promise among the different wedge strategies, he said. Energy consumption today — and in the U.S. particularly — is very inefficient. Improving efficiency can be responsible for a significant part of future reductions in carbon emissions.

A second wedge could be made up by building power plants whose technology prevents the release of carbon into the atmosphere, Socolow said. The world is faced with a historic opportunity today, since the power plants that will provide much of the future power, particularly in developing nations, haven't been built yet. A lot of attention should be focused on ensuring that those plants, which will likely be in operation for decades to come, use the latest and cleanest technology.

"They haven't been built and can be built right," Socolow said.

Transportation provides another potential "wedge" of 1 billion tons of carbon emissions annually. The number of cars on the road globally is projected to increase dramatically over the next 50 years, but by doubling their fuel efficiency, or by using technology to reduce the number of miles driven each year, their emissions can be kept level.

Other possible "wedges," or ways to cut carbon emissions in the future, include increasing the use of nuclear power, dramatically expanding wind power, allowing the regrowth of forests that consume carbon as trees grow, increasing the use of biofuels, using carbon sequestration technology to separate carbon from fossil fuels and pump it into the Earth for storage, and increasing the use of solar power.

Though Socolow described a path to limit the growth in atmospheric carbon dioxide, he said he is only offering suggestions, not advocating that specific technology make up specific "wedges."

Advocates for each of the different strategies often disagree with advocates for others; for example, proponents of building more nuclear power plants may disagree with wind power advocates. But no one strategy can keep enough carbon out of the atmosphere — or even half the amount — to maintain emissions at today's levels, he said.

Therefore the approach has to be multipronged or else it will likely fail.

"We have to look everywhere in the economy," he said.

Socolow said he does not want to select which technologies and actions should make up the necessary wedges, but hopes rather to get a discussion started.

"I'm trying to promote discussion, get everyone talking and get people in a room and have a free-for-all," he said.

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