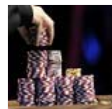


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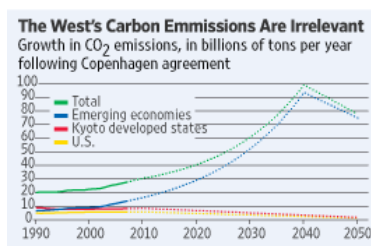
## Naked Copenhagen

*Temperature is increasingly at the mercy of the developing world.*

By RICHARD MULLER

Imagine a "dream" agreement emerging from Copenhagen next week: The U.S. agrees to cut greenhouse emissions 80% by 2050, as President Barack Obama has been promising. The other developed countries promise to cut emissions by 60%. China promises to reduce its CO<sub>2</sub> intensity by 70% in 2040. Emerging economies promise that in 2040, when their wealth per capita has grown to half that of the U.S., they will cut emissions by 80% over the following 40 years. And all parties make good on their pledges.

Environmental success, right? Wrong. Even if the goals are all met, emissions will continue rising to nearly four times the current level. Total atmospheric CO<sub>2</sub> will rise to near 700 parts per million by 2080 (the current level is 385), and—if the U.N. Intergovernmental Panel on Climate Change (IPCC) models are right—global temperature will rise about six degrees Fahrenheit at mid latitudes.



The reason is that most future carbon emissions will not come from the currently industrialized world, but from the emerging economies, especially China. And China, which currently emits 30% more CO<sub>2</sub> per year than the U.S., has not promised to cut actual emissions. It and other developing nations have promised only to cut their carbon "intensity," a technical term meaning emissions per unit of GDP.

China claims it is already cutting CO<sub>2</sub> intensity by 4% a year as part of its five-year plan. President Hu Jintao has hinted that at Copenhagen China will offer to continue such reductions. By 2040, that will add up to a 70% reduction in intensity.

Sounds good, but here's the catch: With 10% annual growth in China's economy, a 4% cut in intensity is actually a 6% annual increase in emissions. India and other developing countries have similar CO<sub>2</sub> growth.

That 6% yearly increase is what is shown in the nearby chart.

True, China's CO<sub>2</sub> per capita is only a quarter of the U.S. emissions rate. But warming doesn't come from emissions per capita, it comes from total emissions.

China's carbon intensity is now five times that of the U.S.; it is extremely carbon inefficient. By the time the Chinese cut emissions intensity by 45%, its yearly total will be over twice that of the U.S. And in the proposed Copenhagen dream scenario, by 2025 China's emissions will actually surpass those of the U.S. per capita.

If the issue is rising emissions in the next several decades, the bottom line is simple: The developed world is rapidly becoming irrelevant.

Every 10% cut in the U.S. is negated by one year of China's growth. By 2040 China could be the most economically dominant nation on earth. The West might be able to cajole it, but won't be able to impose sanctions on China. Temperature will be at the mercy of the newly powerful economies.

Moreover, an expensive effort to reduce Western emissions sets a worthless example. Only emissions cuts that provide measurable economic benefit to the developing nations will be adopted by them. If the 80% U.S. emissions cut winds up hurting the U.S. economy, it guarantees China will never follow our example.

Cheap green energy is not going to be easy. Coal is dirt cheap, and China has been installing a new gigawatt coal plant each week—enough to supply five completely new cities the size of New York every year.

Technological change can help a great deal. For now carbon capture and sequestration (CCS) from coal combustion is unproven, but so is cheap solar. I expect we can make CCS work. Perhaps the West can subsidize CCS in China or pay to make its plants CCS ready. A dollar spent in China can reduce CO<sub>2</sub> much more than a dollar spent in the U.S.

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There is another alternative: luck. Here's how it could help. Scientists are aware of a phenomenon that would counter the greenhouse effect: warmth evaporates water; water creates clouds; clouds reflect sunlight. A small cloud increase would significantly reduce predicted warming. The IPCC gives such cloud feedback only a 10% chance. My estimate is 30%. Clouds may already be kicking in, responsible for the negligible global warming of the past 12 years. Maybe, but we don't know. That's why we need luck.

Perhaps we could geoengineer a solution: Squirt a few million tons of sulfur dioxide into the stratosphere to

reflect sunlight, emulating the 1991 Mt. Pinatubo eruption. We'll certainly get pretty sunsets. Or we could foam up the oceans to increase reflectivity. Many people find such ideas scarier than warming because of the threat of unintended consequences.

Another option is that we could learn to live with global warming. Despite claims to the contrary, storms aren't increasing. The rate of hurricanes hitting the U.S. coast has been constant for a century, and the number of damaging tornadoes has been going down. Will Happer, a former director of research for the Department of Energy, argues that additional CO<sub>2</sub> may have helped the agricultural revolution. And chilly Berkeley might be nicer with a few degrees warming.

But the bottom line is that 80% cuts in U.S. emissions will have only a tiny benefit. The bulk of our effort is best directed at helping the emerging economies conserve energy and move rapidly toward efficient solar, wind and nuclear power. Developing cheap carbon capture and sequestration is also a priority. Above all, we need to recognize that make-the-West-bear-the-burden Copenhagen proposals are meaningless.

**Mr. Muller is professor of physics at the University of California, Berkeley, and author of "Physics for Future Presidents" (Norton, 2008). References and a spreadsheet with the numbers for the chart are at [www.mullerandassociates.com](http://www.mullerandassociates.com).**

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