

The Carbon Dioxide Challenge, Simplified

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The world needs more energy. Much more. According to estimates of the International Energy Administration global demand for energy will increase by almost 60% by 2030. Meantime, the world must also dramatically reduce its emissions of carbon dioxide if atmospheric concentrations are to be stabilized at a relatively low level.

But with almost all of the world's energy provided today by fossil fuels that emit carbon dioxide, how can the world produce the vast amounts of new energy that are needed to sustain development and prosperity while at the same time reducing the emissions of carbon dioxide? It is precisely this question that has stymied international negotiations under the United Nations Framework Convention on Climate Change.

At the simplest level there are really only two possible answers to this question. One is that the world needs to replace carbon producing energy supplies with those that are carbon neutral. The second is to continue to rely on carbon dioxide-emitting fossil fuels and figure out some way to remove carbon from the atmosphere, either at the source of energy production or directly out of the air. There are simply no alternatives to these two options.

Virtually all policy debate has focused on the first strategy, but in very indirect and counterproductive ways. One common approach is to try to reduce our individual and collective "carbon footprint" by decreasing our demand for energy, such as by changing light bulbs, driving a hybrid car,

or forgoing that flight overseas. These strategies appeal to environmental values and give people the sense of doing something to help the planet. But the cold, hard reality is that demand-reducing actions simply displace carbon dioxide emissions from one place to another, and do absolutely nothing to address the global emissions challenge.

Simple economics explains why this is so. Any action taken to reduce the demand for carbon producing energy will necessarily have the effect of reducing the costs of that energy from what it would have been with a higher demand. Because the world is seeking to acquire more energy sources as quickly as possible, those who are seeking to reduce their carbon footprint are merely subsidizing those who are seeking to increase their access to energy, for which fossil fuels are the most readily available source. Because carbon stays in the atmosphere for a very long time, what matters is not how much is emitted at one place or time, but the cumulative global emissions over time.

So to the extent that Toyota Prius drivers in the US actually contribute to reduced consumption of gasoline, it simply enables more drivers in rapidly developing countries -- like those driving India's inexpensive new Tata -- to afford to fill their tanks more often with gasoline. China's emissions have been skyrocketing in recent years, as much as three times faster than estimates made only a few years ago. Some amount of this increase has been subsidized by efforts to foster efficiency by governments and consumers in places like Europe and the United States. This economic reality will not be comfortable for many people convinced that their personal actions are making a positive difference. There are of course many very good

reasons for individuals to be more efficient in the use of resources, but having a large effect on global carbon dioxide emissions simply is not one of them. Strategies that reduce local demand for fossil energy in the context of overall increasing demand for energy simply move carbon dioxide emissions from one place to another.

An approach favored by many governments is to place a price on carbon in order to increase the costs of fossil fuels, and thus make more cost competitive the development of energy sources that do not produce carbon. But as with efforts to reduce demand, this strategy is also deeply flawed despite its widely recognized theoretical elegance.

Putting a price on carbon means that the costs of carbon-producing energy sources will increase. That is of course precisely the point. Cost increases will necessarily cause economic discomfort and perhaps some degree of pain among consumers of energy. Such discomfort and pain, the argument continues, will be the necessity that mothers the invention of carbon neutral energy sources which will then displace the carbon producing energy that we rely on today. This sounds wonderful, which is why it is the basis of recommendations found in august reports such as the Stern Review Report from the United Kingdom and those of the Intergovernmental Panel on Climate Change, which last year shared the Nobel Peace Prize with Al Gore.

But as Thomas Henry Huxley once observed, our knowledge is littered with beautiful theories killed by inconvenient facts, and we should add to that list the notion of the emissions-reducing effectiveness of putting a price on carbon. This uncomfortable reality stems from the very fact that putting a price on carbon causes economic pain and

discomfort to energy consumers, who also happen to be citizens and often, also voters. Politicians who want to continue in their jobs spend every waking hour trying to avoid economic discomfort or pain among their constituents, much less cause it intentionally. To think that politicians are going to willingly impose discomfort or pain on their constituents is fanciful at best.

So we see much public posturing over policies like the European carbon emissions trading system and a proposed cap-and-trade bill in the U.S. Congress. Advocates see these as merely first steps toward imposing even greater costs on carbon. Politicians see such policies as acceptable so long as they cause very little pain to consumers, which is to say, so long as they are ineffective at their primary goal.

Consider how in the summer of 2008 the U.S. Congress backed away rapidly from a cap-and-trade bill in the face of a looming recession. Consider also a revolt among various European industries, notably energy and automobiles, to strengthening of the EU trading system. Advocates who support putting a price on carbon don't help their cause when they claim that there will be little or no discomfort as a result of such policies (and maybe even benefits). Politicians take them at their word and thus focus on policies that are little felt by consumers. But if there is no discomfort in the short term, then what in the world will motivate the wholesale action needed to change systems of energy production?

To the extent that policies do result in the substitution of carbon neutral energy for fossil fuels, as is the case with hybrid cars, the local demand for fossil fuels will be a bit reduced, lowering costs and increasing the use of fossil fuels in places with

less enlightened policies. This sort of leakage of emissions through the global economic system is the main reason why advocates for international action to reduce carbon dioxide emissions argue that there must be global participation.

And this brings us full circle to the theoretically elegant but practically impossible. We in the rich world enjoy a very high standard of living because of our ease of access to virtually unlimited supplies of energy. People in the developing world desire that same standard of living, and are doing everything they can to achieve it. Both China and India have stated unequivocally that neither will accept limitations on their ability to acquire more energy so long as their citizens enjoy a standard of living far less than their western counterparts. Anyone who suggests that developing countries will enter into binding global agreement to price carbon once the U.S. signs up are presenting little more than faith-based argumentation, as all available evidence points to the contrary.

If we are to meet the challenge of dramatically reducing global carbon dioxide emissions while at the same time increasing the amount of energy available to people around the world, then we must begin by understanding that the current approaches are simply unworkable despite their conceptual merits. More than 20 years of experience trying to implement such approaches while we watch global emissions accelerate should be plenty evidence enough that it is time to try a different approach.

Policies that will work will necessarily focus on developing revolutionary, new carbon neutral energy sources (including the possibility of fossil fuels with carbon removed and sequestered) that are at lower costs than fossil fuel alternatives. In other words, we

need to skip the step involving pain and discomfort that is a key to current approaches. If the means to reducing carbon emissions necessarily involves enormous technological change, then why not focus on that action centrally, rather than via inefficient and ineffective strategies that seek to motivate that change indirectly through complex yet blunt instruments of social and political incentives?

We can motivate innovation by directly investing in creating a technological revolution. Such a revolution can be jump started by a vigorous program of government investment. Steve Rayner of Oxford and Gwyn Prins of LSE have suggested that such a program should be supported at the level of investment that the U.S. current spends on defense, or about \$80 billion per year. Funds of this level could be raised via a very low carbon tax which would have little impact on consumers or industry,

Whatever the amount is and specific approaches taken, changing the fundamental energy economy of the world will take an enormous effort. Anything else simply won't work. Feel-good actions reflecting the best of intentions and powerful theoretical justifications will not be solutions to the carbon dioxide challenge. A direct approach to innovation can be a solution. The sooner we start the sooner we'll succeed.