

COMMENT



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Around 80% of China's electricity generation is coal-fired.

The Kyoto approach has failed

Abandon coal, price carbon consumption and look to new technologies for a lasting solution to global emissions, argues **Dieter Helm**.

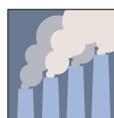
The Kyoto Protocol, agreed in 1997, is the centrepiece of global efforts to address climate change by reducing greenhouse-gas emissions. Its first commitment period expires this year, but despite the political capital invested in it, numerous subsequent Conference of the Parties (COP) meetings and considerable economic costs, it has had no noticeable impact on global carbon emissions. These remain on an upward curve, increasing from almost

2 parts per million (p.p.m.) a year in the early 1990s to almost 3 p.p.m. now, and heading towards the critical threshold of 400 p.p.m..

It will only get worse. At the Durban COP in December 2011, all that could be agreed was that the participant countries would try

to agree by 2015 what they might do after 2020. At current growth rates, by 2020 the economies of China and India will be twice their present size, requiring the addition of 400–600 gigawatts of coal-fired generating capacity to their electricity systems¹.

The reasons for the Kyoto Protocol's ineffectiveness are in its architecture. It is based on carbon production, not carbon consumption. It has a mainly European focus. It does nothing to address ▶



AFTER KYOTO

The legacy of a climate treaty
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► the immediate problem of global coal burning. It is wide open to free-riding, allowing nations to avoid cutting emissions while others do so, and it has few enforcement mechanisms. These are deep flaws that render the protocol incapable of slowing emissions, let alone reversing them. Fortunately, other, better, bottom-up approaches hold hope for progress.

CARBON FOOTPRINT

The idea at the heart of the Kyoto Protocol is that the developed countries accept caps on carbon production from power stations, industrial installations and the like within their borders. Developing countries take measures but need not apply caps. On aggregate, carbon emissions should have been reduced by about 5% below 1990 levels by the end of 2012.

The main problem with the Kyoto approach is that it does not address the carbon footprint — carbon consumption. A country's (and an individual's) carbon footprint is best measured by looking at the carbon embedded in the goods and services that each consumes. Global warming takes no account of national boundaries. If a US consumer buys a car, it matters little whether the steel within it is made in the United States or China.

The difference between carbon production and carbon consumption is not trivial. Take the United Kingdom: from 1990 to 2005, its carbon production fell by around 15%. But carbon consumption went up by around 19% once the carbon embedded in imports is taken into account².

From a Kyoto perspective, this is a triumph; for climate change, it is a disaster. It explains how emissions can apparently fall in Europe but go up globally as rapidly developing countries, such as China and India, export energy-intensive goods to Europe and the United States, which together make up around 50% of the world's gross domestic product.

It is not surprising that Europe has led the way on Kyoto. Carbon-production targets have been comparatively easy to meet, and they make Europe look good. But the real reasons for the fall in carbon production do not give much cause for celebration.

The collapse of the Soviet Union began at the end of the 1980s — nicely timed for the use of 1990 as Kyoto's reference baseline year (see 'Carbon climb'). Before this, Eastern Europe was notorious for inefficient, energy-intensive industrial production, much of which — from a Kyoto perspective — conveniently stopped after the fall of the Berlin Wall. Once the United States had opted out of the Kyoto Protocol, the agreement needed Russia to come on board so that it could come into force; it was a condition that the protocol should be ratified by

at least 55 countries, covering 55% of global emissions in 1990. Russia brought lots more 'hot air' — emissions reductions that were inevitable.

Better still from the perspective of Kyoto compliance, western Europe was de-industrializing too, switching away from energy-intensive production activities towards service industries, in part because Chinese exports were outcompeting industries in Europe.

Most of this would have happened anyway. Europe's green policies have made little difference, and the economic crisis has made reducing its carbon production even easier. The 2008 climate-change package from the European Union (EU) focuses on the short term³. By 2020, it aims to reduce EU carbon emissions by 20%, to increase energy generation from renewables by 20% and to boost energy efficiency by 20%. Aside from the economic illiteracy of assuming that everything adds up to the magic number of 20, the effect has been to focus almost all resources on a small number of current renewable-energy technologies — wind, rooftop solar and biomass.

These measures were intended to reinforce the EU Emissions Trading Scheme (EU ETS)⁴, which has produced a short-term, volatile and low price for carbon when what is required is a medium- to long-term, stable but rising carbon price. The net effect of all these EU measures (especially the renewables) has been to drive up energy prices and reduce European competitiveness, while making almost no contribution towards mitigating global emissions.

THE COAL PROBLEM

The real villain of growing global emissions has been ignored: coal. Since the mid-1990s, coal has risen from supplying around 25% of the world's primary energy to almost 30% now, in a context of a rapidly growing underlying energy demand⁵.

Much of this coal burning has been in China, which switched from being an exporter to an importer of coal in the 1990s, and now accounts for a staggering 50% of world coal trade. Its share of global coal production is almost four times that of Saudi Arabia's production of oil⁶. Around 80% of China's electricity generation is coal-fired. China and India together add around three coal-fired power stations a week to their generation portfolios.

China plans to improve its energy efficiency, reducing its energy intensity under its 12th Five Year Plan by 16% between now and 2015. It intends to develop gas and renewables. But the arithmetic of an

economy that doubles in size every decade puts these changes into perspective: a slightly smaller proportion of coal-fired electricity generation in an economy twice the size by 2020 becomes lost in the noise. The world faces a further huge increase in coal burning between now and 2020, and the result will be ever-rising emissions. The Kyoto Protocol has almost nothing to say about this.

The story on coal elsewhere is mixed. In the United States — which remains outside the Kyoto Protocol — carbon emissions have been falling sharply⁷, and faster than in crisis-ridden Europe over the past five years. The United States is shifting from coal to natural gas for electricity generation and industry as the full impact of the shale-gas revolution is played out. Natural gas produces fewer pollutants and half the carbon emissions of coal.

With the price of natural gas in the United States currently around one-quarter of that in Europe, and even lower than that in China, economics is driving a shift towards natural gas without the need for any drastic energy or climate-change policies. So great is the competitive advantage bestowed by shale gas that energy-intensive industries are beginning to migrate from China back to the United States. Ironically, these repatriated industries will push up US carbon production while reducing China's. The net effect is good from a global climate-change perspective — less transport to the United States and more-efficient electricity generation — but it would make the country look bad by Kyoto's emissions-cap approach.

In Europe, the irony is deeper still — many countries are switching from nuclear and gas to coal. Germany stands out. It has prematurely closed some of its existing nuclear-power stations, and is fast-tracking the closure of the rest within the next decade. It is getting out of low-carbon generation in a big way. Germany is increasing the burn in its existing coal power stations, and building new ones that burn lignite, one of the dirtiest forms of coal. The use of natural gas is being squeezed out by low coal prices across Europe, and because the EU ETS carbon price is so low as to be negligible.

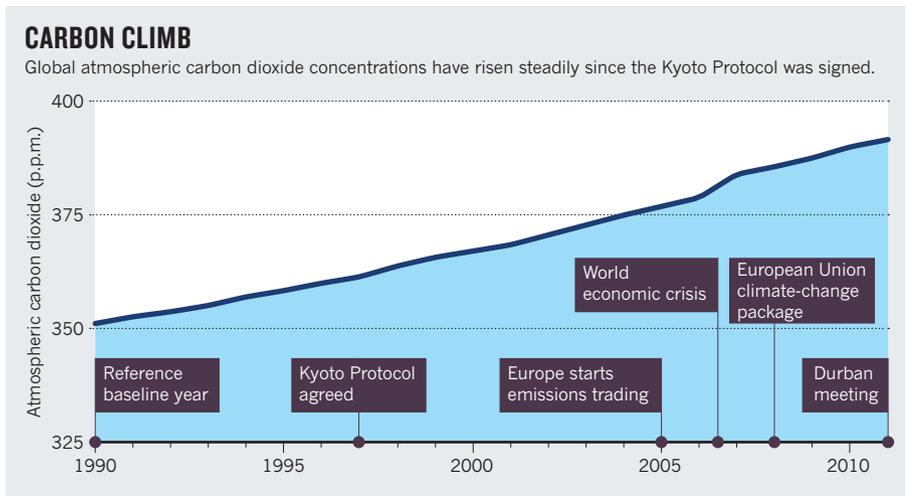
FREE-RIDING

Advocates of the Kyoto approach argue that these problems are temporary. Over time, other countries will join, eventually resulting in a complete set of carbon-production caps. Then the distinction between carbon production and carbon consumption will not matter. Putting aside the facts — that nothing much is going to happen until at least 2020, and that we don't have the luxury of waiting as emissions pile up — why should we have any confidence in the gradual evolution of Kyoto?

The core architecture of the protocol relies

“The real villain of growing global emissions has been ignored: coal.”

SOURCE: US NATL OCEANIC AND ATMOSPHERIC ADMINISTRATION



on countries adopting emissions caps and complying with them in the face of major free-rider incentives, differential impacts and no serious enforcement mechanisms. Kyoto is similar to the classic prisoners' dilemma in game theory. Each country may be better off if all nations cooperate, but each may be tempted to free-ride on the costs and efforts of others.

For instance, emissions from some countries are capped, but those from others are not. The result is that the implicit (or explicit) price of carbon in countries with a cap creates a trade distortion in favour of those uncapped countries that do not have an effective carbon price. Put bluntly, not pricing carbon properly on a comparative basis in China is equivalent to an export subsidy⁸.

The problems for a top-down approach such as Kyoto are made worse by the fact that the impacts of climate change are not all bad, and vary considerably. Arctic countries, such as Russia and Canada, have much to gain from the resources that will become accessible once the ice has melted. For temperate zones, initial rises in temperature might mean that less energy will be needed for winter heating and, in some areas, could result in higher agricultural productivity.

Warming of the planet by more than 2°C will change this cost-benefit equation, but if costs and benefits differ, getting a top-down agreement is made all the harder. For Russia and Canada, for example, the situation is very different from that in poorer tropical nations. No wonder both these Arctic countries were effectively in the 'reluctant camp' at the Durban COP, joining the United States on the outside.

Fortunately, there is a better way forward. Instead of taking a top-down approach that requires global agreement, climate-change policies can be constructed from the bottom up using three key building blocks: putting a tax on carbon consumption; switching from coal to gas as quickly as possible; and boosting spending on new energy technologies.

The first building block is to recognize that carbon consumption is more important than carbon production, and so the carbon price should be based on consumption. This means pricing the consumed carbon irrespective of where it was produced.

TAXING CARBON TRADE

If the exporting and importing countries both have domestic carbon prices, then it does not matter what the base is. But if an exporter of carbon-intensive goods — such as China — does not price carbon at an appropriate level, there needs to be a border tax adjustment on imports. Although there are lots of practical issues, only a small number of carbon-intensive industries make up the bulk of carbon trade, so in practice, a targeted set of border taxes should do the job.

The neat consequence of this approach is that countries can take their own measures to address carbon without reducing their competitiveness, and it encourages the exporter to introduce its own carbon price to avoid the money going to the importer's government.

Proper carbon pricing also helps to encourage the second building block — the coal-to-gas switch. In the short term, this switch is perhaps the only way of slowing down the wall of coal that will come into world energy systems in the next decade.

Pricing carbon and getting out of coal provide the only serious prospects for having some effect on emissions in the short term. Further ahead, what matters is technology. None of the existing technologies is well placed to crack the climate-change problem — especially not the current generation of wind turbines and solar panels. Biomass and energy crops have similar constraints: there is not enough land, water or shallow sea to yield sufficient energy to meet the needs of a global population that is predicted to rise to nine billion by 2050 (ref. 9).

The good news is that there are many new

technologies that might help to crack the problem — from next-generation solar to geothermal and even new nuclear technologies. This is the third and most important building block.

Although politicians have put all their efforts into Kyoto, and Europe has overwhelmingly invested in current renewables partly as a result, the prize has been ignored. It would be better if the focus shifted to what really matters — pricing carbon consumption, getting out of coal as fast as possible and investing heavily in future renewables and new energy technologies.

Little, if any, of this will be achieved through the Kyoto approach. At each COP, the now well-established process of green groups and environmental ministers gathering together to make declarations of intent, without much concrete action, is played out. Copenhagen in 2009 was supposed to demonstrate Europe's world leadership in crafting a new climate agreement. In fact, the United States and China agreed the weak Copenhagen Accord outside the conference framework, and without Europe. At Durban, even the prospect of serious action was put off until after 2020.

There is merit in world leaders meeting, not least because it puts climate change in the media spotlight. Yet the Kyoto conferences allow participants to be seen to be taking climate change seriously while actually doing very little. Climate-change policy cannot wait another decade. The net results of Copenhagen and Durban have been to make Kyoto largely irrelevant. It is probably worth going on with the talking, but the main chance lies in getting on with the bottom-up approach. ■

Dieter Helm is professor of energy policy at the University of Oxford and fellow in economics at New College, University of Oxford, UK. His latest book is *The Carbon Crunch* (Yale Univ. Press, 2012).
e-mail: dieter.helm@new.ox.ac.uk

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