

CLIMATE CHANGE



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Michael Wara's scholarly research focuses on the study of climate policy and regulation, with an emphasis on the emerging global market for greenhouse gases and the post-Kyoto regime for reducing their emissions. Professor Wara holds a doctorate in ocean sciences from UC Santa Cruz and has published work on the history of the El Niño/La Niña system and its response to changing climates. His scholarship has been published in premier scientific journals, including *Science* and *Nature*. He joined Stanford in 2007 as a research fellow and lecturer in law at Stanford Law, teaching International Environmental Law, and as a research fellow at the Program on Energy and Sustainable Development in Stanford's Freeman Spogli Institute for International Studies. Previously, Professor Wara was an associate in Holland & Knight's government practice group, where he focused on climate change, land use, and environmental law.

The following is Professor Wara's commentary "Is the global carbon market working?" (*Nature*, February 2007).

IS THE GLOBAL CARBON MARKET WORKING?

A perennial problem in international climate politics is how to engage developing nations in controlling greenhouse-gas emissions. These countries have more immediate priorities than climate change. Yet they must be part of any effective solution to global warming, for their emissions are high and rising (although not nearly as high, on a per capita basis, as those of the industrialized world). To encourage developing-country participation, the Kyoto Protocol established a global market for emissions reductions in 2003 called the Clean Development Mechanism (CDM). This market is now mature enough for analysis of its successes and shortcomings.

The CDM works by paying developing countries to adopt lower-polluting technologies than they otherwise would. For example, rather than building an inefficient but cheap coal-fired power plant, a Chinese utility might choose instead to build a more efficient gas-fired plant that emits less carbon dioxide. The difference in potential carbon emissions between the coal and gas plants can, after monitoring and certification, be converted into CDM credits that can be sold to an industrialized nation party to the Kyoto Protocol. The revenue from the credits enables the utility to afford the more expensive gas plant. The purchase of low-cost credits by industrialized nations to offset their own emissions reduces the cost of complying with Kyoto. The mechanism works because it is cheaper to construct low-carbon energy infrastructure from scratch in developing nations than to modify or replace existing technology in industrialized nations.

The CDM has become an important component of how European governments intend to comply with their Kyoto commitments because it reduces the cost of compliance. It is also essential to energy companies and others involved in the European cap-and-trade programme for CO₂, called the Emissions Trading Scheme (ETS). Last year, the United Kingdom proposed that ETS emitters with CO₂ caps should be allowed to use CDM credits to meet up to two-thirds of their ETS effort. Together, the CDM and ETS are the keystones of an emerging global regime of linked but distinct markets for greenhouse-gas emission controls.

But is the CDM working? The answer depends strongly on the criteria against which its success is evaluated. There is near unanimous agreement that the CDM has succeeded in engaging many buyers

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and sellers and substantially reducing emissions of the six Kyoto Protocol gases (CO₂, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride). So far in the CDM scheme, the projected reductions for all these gases combined add up to more than 1.75 billion tonnes of CO₂-equivalent emissions. This equates to annual reductions of 278 million tonnes, a very small fraction of the annual global CO₂ emissions (26 billion tonnes in 2003).

Active primary and secondary (resale) markets in CDM credits have emerged, along with sophisticated systems for verification and delivery. Developing nations that were initially sceptical of the CDM—notably China and India—have entered the market with great enthusiasm and now sell the most credits. The regulatory regime administered by the United Nations has overcome both funding and logistical hurdles to emerge as a relatively successful arbiter of the global marketplace. These political accomplishments are outstanding, but they are not sufficient to judge the effort a success.

In other, and perhaps more important, ways the CDM is failing to deliver results. Initially, the market was expected to create strong incentives to invest in infrastructure for low-carbon energy in developing countries. Although many gases cause global warming, CO₂ matters most because it is emitted in prodigious quantities and has a long atmospheric lifetime. The energy sector is generally the largest emitter of CO₂ in any country. Yet a detailed look at CDM projects producing and selling credits reveals that nearly two-thirds of emissions reductions involve neither CO₂ nor energy production (see chart in original publication).

CASHING IN

The largest volume of credits, almost 30% of the entire market, come from capturing and destroying trifluoromethane (HFC-23), a potent greenhouse gas that is a by-product of the manufacture of refrigerant gases. At current carbon market prices (~€10 (~US\$13) per tonne of CO₂) and neglecting taxes, these HFC-23 credits amount to €4.7 billion up to 2012 (the end of the first compliance period of the Kyoto Protocol). In fact, HFC-23 emitters can earn almost twice as much from CDM credits as they can from selling refrigerant gases—by any measure a major distortion of the market. The distortion exists because it is extremely cheap to cut HFC-23 emissions from these facilities. Indeed, in the industrialized world similar manufacturers have chosen to reduce their emissions voluntarily. An alternative approach to cutting HFC-23 emissions from the small number of refrigerant producers in the developing world (17 at the last count) would be to pay them for the extra cost of installing the simple technology needed to capture and destroy HFC-23. This technological solution would cost the developed world less than €100 million, saving an estimated €4.6 billion in CDM credits that could be spent on other climate-protecting uses. Similar technological fixes could work for industrial emissions of nitrous oxide from nylon feedstock and fertilizer manufacture.

TRADING PLACES

Supporters of HFC-23 projects argue that the entire point of the CDM is to identify low-cost opportunities to reduce emissions and once identified they should not be skimmed off the top of the market. But the CDM is both a market and a subsidy from

industrialized to developing countries. As a subsidy, it should be judged by how effectively it reduces emissions for each dollar expended. In these terms, the CDM is a very inefficient subsidy. An alternative mechanism for reducing HFC-23 would require a separate protocol to the United Nations Framework Convention on Climate Change but would be administratively tractable because of the small number of installations involved. Indeed, a similar mechanism has proved successful in compensating developing nations for the cost of switching from ozone-depleting substances under the Montreal Protocol.

Future emissions scenarios suggest that unless China and India can be convinced to build mostly efficient, low-carbon-emitting electricity-generating plants from natural gas rather than coal over the next one to two decades, little can be done to stem the tide of global climate change. Perversely, the presence of cheap non-CO₂ credits such as HFC-23 in the market is a disincentive to developing new carbon-limiting energy projects that would help to achieve this goal.

There is an obvious solution to what is wrong with the CDM: make the global carbon market a market for CO₂ rather than for all six Kyoto Protocol gases. The first two years of the CDM have generated high participation that could be harnessed to put the developing world, especially China and India, on a path to a low-carbon future. The existing structure of the carbon market is fixed for the period of the Kyoto Protocol. To attempt a change in mid-course would alarm investors, but European Union governments as well as Japan can send a clear signal that after 2012 they are interested in purchasing CO₂-only credits and that preference will be given to projects in the energy sector.

Given sufficient warning, the energy sector in China and India will probably meet this new demand for low-cost carbon credits from the developed world. Industrial emissions of HFC-23, nitrous oxide, and methane should, at the same time, be addressed by a separate agreement that fully compensates producers of these gases for the cost of abating

emissions. Rich nations would save money by paying the actual cost of abatement rather than inflated market prices and use these savings for further climate abatement through the CDM or other policies and measures.

But fixing the carbon market is unlikely to be enough to put major developing nations on a path to low-carbon energy. Because the CDM awards credits for the difference between baseline and actual emissions from a project, its impact will always be marginal. Ultimately, it is the baseline emissions path that must be altered if the problem of global warming is to be resolved.

What matters in the long term is the type of energy infrastructure that gets locked into place in the world economy. Tackling that problem requires identifying economic, national security, as well as energy priorities of the major developing economies and then finding ways to align them with low-carbon energy infrastructures. The CDM, no matter what the price of carbon, is unlikely to convince China that it makes more sense to depend on foreign sources of natural gas than on cheaper domestic coal. Similarly, India is unlikely to pursue nuclear energy to significantly reduce its carbon emissions, given the challenges of non-proliferation and nuclear waste, without greater international support.

The CDM might have a role to play here by creating a secure market for future technology for low-carbon energy. But this won't happen while market resources are diverted into abating waste gases associated with the refrigerant, nylon, and fertilizer industries. In the period beyond 2012, signatories to Kyoto should recognize that measures in addition to the global carbon market are needed to set the developing world on a path towards a sustainable-energy future. These include substantial increases in technology investment, agreements to share low-carbon technologies as they are developed and a commitment to fostering resilient energy markets and security arrangements so that it is in the interest of key developing nations to foster low-carbon economic growth.