Climate Crisis: Social Science Crisis

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Introduction

"Billions wasted on UN climate programme" (Vidal 2008). "European Union's efforts to tackle climate change a failure" (Snow 2007). "Effort to curtail emissions in turmoil" (Ball 2008a). ". . . may slow the changes needed to cope with global warming" (Kanter 2007). "It isn't working" (Vencat 2007). "Not effective" (Wheelan 2007). "A charade" (Wall Street Journal 2007). "Will such systems ever work?" (Kanter 2008). "Time to ditch Kyoto" (Prins and Rayner 2007). "Beware the carbon cowboys" (Harvey 2007).

Such headlines may seem alarming. But they are becoming more and more commonplace, and reflect rising concern – even among many supporters of the Kyoto Protocol, the European Union Emissions Trading Scheme (EU ETS), and other flagship programmes to curb climate change – that, after 10 grueling years of seemingly earnest global efforts, things are not going according to plan. Whether or not current international climate agreements turn out in the end to be fixable, it is obvious that they have not worked so far in alleviating what US President George W. Bush refers to as the "addiction to fossil fuels" that is chiefly responsible for global warming.

The headlines also point to serious gaps in the explanations most often offered for the failures of global climate policy. These explanations tend to stress a number of factors. Shorter-term political issues are said to be taking precedence over climate change. Fossil fuel-using lobbies are strong. The international legal regime is weak. Distrustful Southern governments are unlikely to buy into global solutions that appear to perpetuate colonialist inequalities (Roberts and Parks 2007). Various parties may abstain from stringent climate pacts in hopes of getting a "free ride" on others' actions. Above all, political leaders do not take what natural scientists are saying seriously enough, or are unable to accept that climate science's uncertainties are not an argument for inaction (Schneider 2001: 17), or are distracted by scientific fringe groups who deny that humans are changing the climate or that it would do any good to try to stabilize it. Thus President Bush has often been accused either of not "getting" climate science or of "censoring" it, and of denying US responsibility for global warming. Other leaders who do "get it" are meanwhile said to lack the "political will" to take meaningful action. The implication is that if the US paid more attention to climate science and climate history, and if political leaders in other countries took more initiative to seek

equitable means of sharing the adjustment burden and agree on appropriate emissions targets, then more rapid progress could be made.

There are important truths scattered through these conventional assessments of the failures of international climate policy. But the problems pointed to by the headlines quoted at the start of this article go a good deal deeper. For example, the shortcomings of the current international climate regime can no longer be said to have significant roots in ignorance of the likely physical effects of climate change. Public awareness of, and scientific consensus about, the seriousness of climate change have grown impressively during the last few years, yet have not resulted in noticeably more effective policy actions. Nor are the particular failures cited in the headlines quoted above due to the United States's refusal to participate in the Kyoto Protocol, China's or India's exemption from the Protocol's emissions reduction obligations, "free rider" problems, the weakness of current emissions targets, or generic obstacles to forging international environmental agreements, however important all of these issues may be. Rather, they have to do with the carbon trading instruments that came to dominate policy responses to climate change during the late 1990s. Although it was United States politicians who pushed these instruments on the international community during the Kyoto Protocol negotiations (Searles 1998), using the justification that they would make emissions reductions more "cost-effective", they had been developed at an earlier stage by North American economists and commodities traders including the financial derivatives pioneer Richard L. Sandor of the Chicago Board of Trade (Coase 1988; Dales 1968; Chicago Climate Exchange 2008a; see also Lohmann 2006: 45-62). Indeed, possibly never before have social scientists – who are seldom passive in the shaping of new marketplaces (Callon 1998, Mitchell 2002, MacKenzie et al. 2007) – participated in the construction of a market to the degree that neoclassical economists dominated the creation of today's climate policy instruments.

One superficial indication of the difficulties that have resulted is the failure to meet even the weak emissions targets that have already been negotiated. As Gwyn Prins and Steve Rayner point out, the Kyoto Protocol has produced "no demonstrable reductions in emissions or even in anticipated emissions growth" (Prins and Rayner 2007: 973). But this failure is a sign of deeper problems and is not a mere "problem of implementation" attributable to "teething pains" (Lohmann 2005). Rife with measurement impossibilities and property rights paradoxes (Lohmann 2006), the market instruments in question, singularly inappropriate for use with the global warming problem, tend to sacrifice the long-term environmental progress needed to address industrialized countries' contribution to global warming to a notion of short-term cost-effectiveness (Driesen 2008). In the process, decisionmaking about technology options and the earth's climatic future has increasingly passed into the hands of polluting corporations and big players in the financial markets. By and large, social scientists have failed not only to anticipate the problems that have resulted, but even to grasp them fully once they have occurred.

The more ambitious international climate agreements of the future are unlikely to bring about better results unless it is recognized that instead of aiding a transition away from fossil fuel mining and use, which must be the overriding goal of any coherent climate policy (Lohmann 2006: 17), the market instruments at the centre of today's international climate regime are designed in ways that actually entrench fossil fuel use and delay the changes that need to be initiated immediately. Future agreements will need to be based on an understanding not only of matters such as the maximum temperature increase that it would be desirable for international policymakers to aim at – a characteristic obsession of many climate change activists in industrialized countries – but also, more importantly, of how the type of historical change demanded by the climate crisis has actually taken place in the past and how such structural change might be mobilized today. In the intensive debate that will be needed to build this understanding, there is a deep need for social scientists critical of the neoclassical consensus to take a greater part than they have done to date. Not only must economics be subjected to more searching and informed criticism in climate policy discussions; other social sciences including sociology, history, anthropology and political science must also see their role expanded. It is less a lack of so-called "natural science" knowledge than a lack of "social science" knowledge that is damaging current efforts to come to grips with global warming – a failure attributable not only to governments, corporations and mainstream environmentalism, but also the institutions supporting social science research itself.

New Market Instruments and Historical Change

In what ways might contributions from a broader range of social scientists help correct a state of affairs in which climate change mitigation instruments are so ill-adapted to addressing the global warming problem? A necessary starting point – and the burden of this article – is to sketch the problems into which an overreliance on neoclassical economic thinking has plunged the international climate regime.

Like all new markets, the carbon markets associated with the Kyoto Protocol, the European Union Emissions Trading Scheme, and other, newer trading programmes strive both to establish property rights and to make a range of different things equivalent so that they can be exchanged. This is true of both aspects of carbon markets: cap and trade (or emissions trading) on the one hand, and offset trading (or trading in project-based carbon credits) on the other.

Cap and Trade

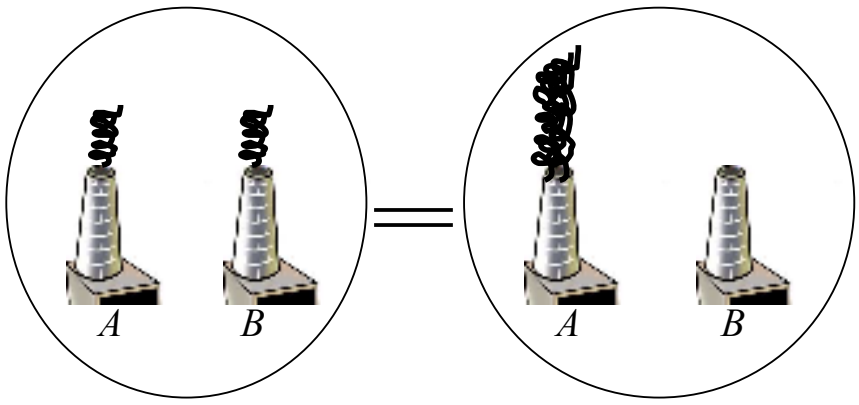
The theory of cap and trade is based on Equation 1. A government imposes a cap on overall emissions (represented by the circle). One conventional way of achieving that cap is to dictate limits to how much each industrial installation covered by the scheme (represented by A and B) is allowed to pollute. If the overall cap on a sector's emissions is 100 tonnes annually, for example, the

government might require A and B to limit their emissions to 50 tonnes a year each.

Emissions trading, however, promises to make achieving the overall cap cheaper for both A and B, and thus, so the theory goes, for society as a whole. Suppose, for example, that before the cap represented by either circle in Fig. 1 was imposed, A and B each produced 100 tonnes of pollution a year. Suppose further that it is expensive for A to reduce its emissions to 50 tonnes but cheap for B to do so. Suppose, in fact, that it is cheaper for B to reduce its emissions to zero than it is for A to reduce its emissions at all. In that case, why not allow B to make A's reductions for A? That is, why not allow A to continue pollution as usual provided that it pays B to reduce B's emissions to zero? Assuming that the price B charges for the necessary pollution permits is more than B's cost of reducing emissions to zero, yet less than A's cost of reducing emissions to 50 tonnes, B makes money off the deal at the same time that A saves money. Both come out ahead – yet the same environmental goal of limiting overall pollution to 100 tonnes a year is met. No matter what size the circle that government regulation draws, the cost of keeping pollution within that circle will be lowered by emissions trading. Governments will thus be able to ratchet down the emissions cap (that is, draw smaller and smaller circles) each year, believing that they are doing so in the cheapest way possible.

Equation 1

Cap and Trade



The elegant equation of Fig. 1, however, makes a market possible only by undermining the potential for effective long-term action against global warming.

Part of the problem lies in the assumption that setting a series of steadily more stringent emissions targets constitutes a plan for stabilizing the climate. It does not. Emissions reductions programmes can be set in motion without any steps being made that would ultimately result in ensuring that most remaining fossil fuels remain in the ground – the overriding goal of any rational climate policy. Numerical emissions targets, no matter how ambitious, are no substitute for historically-informed political programmes to set industrialized societies on pathways toward the required structural social and technological changes. Whether emissions reductions have anything to do with addressing global warming depends on *how* those reductions are made. This is precisely the question that cap and trade (and its variants such as cap and auction) are designed to ignore: cap and trade ignores the fact that cutting a hundred million tonnes of emissions through routine efficiency improvements that leave everything else as it was will have long-term emissions consequences very different from cutting a hundred million tonnes through investment in new renewable technologies or ways of organizing social life (Lohmann 2006: 101-121).

First, the theory pays no attention to what kind of industries A and B are. The "A" industries – the big carbon permit buyers – are likely to be the companies most locked into fossil fuel use and therefore also the ones where change is most necessary and most urgent. Major electricity generators, for instance, are among the world's most important producers of greenhouse gases and a prime target for early action on climate change. They tend to have billions of dollars tied up in fossil fuel plant whose lifetime is measured in decades. That makes it particularly important that a start be made on greening the sector now rather than later. Once a fossil-fuelled plant is up and running, it becomes enormously expensive for it to switch to renewable generation. Cap and trade, however, is designed precisely in a way that gives such industries reasons for delaying structural change, not only because it provides them with the get-out clause of buying pollution permits, but also because 40-year price signals are, to put it tactfully, uncertain (Lohmann 2006: 114). In that way, cap and trade helps keep the wheels on the fossil fuel industry. Rather than the incentives for investment in systematic change in energy systems that accompany targeted regulation such as performance standards, renewable portfolio standards or feed-in tariffs, it provides incentives for business as usual. In this sense, cap and trade (as well as cap and auction) aims away from the target of climate mitigation, not toward it.

Of course, cap and trade also provides plentiful incentives for many "B" industries – including those that may be dirty now but have the advantage of being less structurally addicted to fossil fuels – to develop lower-carbon ways of doing business as fast as they can. It also gives independent businesses reasons to develop new low-carbon technologies to sell to the "A"s, the industries heavily addicted to fossil fuels. The increasing availability of superior technologies incentivized in this way, the argument goes, just might make up for the incentives for delay that are also built into cap and trade.

Sound business sense, however, virtually guarantees that the overall effect of cap and trade will be delays, together with less of the social or technological innovation of the crucial type than would be possible with more targeted forms of investment and regulation. Smart businesses that attempt to profit from selling carbon pollution rights will concentrate on realizing the cheapest opportunities for emissions reductions first, regardless of whether they lead to long-term structural change away from fossil fuels (Driesen 2008). Cap and trade's goal of reaching modest numerical emissions targets cheaply is simply not the same as the goal of mitigating global warming, which entails taking immediate steps (Kelbekken and Rive 2005) toward a radical structural break with the deeply rooted dependence industrialized societies have on fossil fuels. In economic jargon, cap and trade is indifferent to path dependence (Arthur 1999) or "lock-in" (Unruh 2000) and the resultant need to go beyond economic "optimisation" in addressing structural problems such as global warming. Insofar as cap and trade disincentivizes, not incentivizes, the social and technological changes needed, it can hardly be said to provide a cost-effective means for achieving those changes.

The US's pioneering cap and trade system for achieving cost savings in reducing sulphur dioxide – which was the model for the Kyoto Protocol and subsequent carbon trading systems – can offer policymakers an important lesson in this respect. The sulphur dioxide trade may or may not have saved money in attaining limited reduction goals, but one thing it did not do was foster technological innovation of the sort that will be crucial for tackling the climate crisis (Taylor 2005). Los Angeles's Regional Clean Air Incentives Market, for its part, appears actually to have sidelined developments in fuel cells, low-emitting burners and turbines that had previously been subsidised by a percentage of car registration fees, and the failure of at least one emerging method of reducing nitrogen oxides to break into the market can be attributed to the "spatial flexibility" provided by trading, which allowed emitters to ignore innovative but still expensive technology options (Moore 2003: 24). Innovations under the 'bubbles' of early US pollution trading programs also tended merely to be rearrangements of conventional technologies rather than the invention, development or commercialisation of technologies likely to be useful for achieving a longer-term social or environmental goal (Liroff 1986: 100) The EU ETS, too, as Tony Ward of Ernst & Young notes, "has not encouraged meaningful investment in carbon-reducing technologies" (Harvey 2006). "[L]owering cost does not increase incentives for valuable innovation," concludes trading expert David Driesen. "[T[argeted regulatory programmes encourage renewable energy development better than global emissions trading programmes . . . [there is] a tradeoff between short-term cost effectiveness and investment in . . . long-term economic and environmental progress" (Driesen 2008: 56-8; see also Choi 2005). That a choice has to be made between cap and trade and climate effectiveness became increasingly clear in 2007, when leaked documents suggested that the British government is reluctant to subsidize renewable energy partly because it views it as a "more expensive way of reducing carbon emissions than the European Emissions Trading Scheme" (*The Guardian* 2007). The subtext was that going through with plans to support renewable energy could depress the carbon price and undermine the burgeoning

London carbon exchanges as well as the nuclear industry. Among other things, the UK government's renewables strategy has no provisions for setting large scale energy producers on a different technological path, or even trying to reduce their emissions, because those producers "are covered by the EU Emissions Trading Scheme" (UK Department for Business, Enterprise and Regulatory Reform 2008: 20-1). In sum, a well-implemented cap and trade system might possibly help make a fossil fuel-dependent system a bit more efficient around the edges, but is not an appropriate instrument for incentivizing the fresh industrial path that the global warming problem requires. If the problem that it addresses is not the climate change problem, then whether it is "efficient" in addressing other goals is irrelevant.

Cap and trade's neglect of the importance of *how* cuts are made (as long as they are made as cheaply as possible) is not the only obstacle it is putting in the way of constructive climate action. Cap and trade is also designed to abstract from *where* those cuts are made. The idea of redistributing pollution around the landscape to "maximize cost-effectiveness" is embedded in its very design. But this "virtue" is also a vice: it strengthens environmental racism and other forms of discrimination, since the industries most firmly locked into fossil fuel exploitation or use, and most likely to be carbon permit buyers, tend disproportionately to affect poorer and disadvantaged communities (Drury 1999). Again, the US sulphur dioxide cap and trade programme should have provided cautionary lessons. Although national sulphur dioxide emissions from power plants decreased by 10 per cent from 1995 to 2003 under the scheme, more than half of the US's dirtiest power plants increased their annual soot-forming SO_2 emissions over the period. As a result, "communities living in the shadows and downwind of these polluting power plants are actually breathing dirtier air" (US Public Interest Research Group 2005). Cap and trade's built-in insensitivity to the different ecological effects that pollution can have in different biomes creates additional environmental and social problems, which are likely to damage its case among still other constituencies.

It is often argued that reliance on a trading mechanism that discourages immediate steps toward a long-term transition away from fossil energy is the price that has to be paid for governments' ability to persuade corporations to accept emissions caps of reasonable severity. Without trading, it is suggested, serious regulation would be politically impossible, whereas with trading, governments will be able to impose caps that will create a cost for carbon – and possibly even some day to drive that price high enough to force the "A" industries of Fig. 1 to undertake long-term structural change.

There are two flaws with this argument, however. First, the claim that trading makes effective action on global warming politically easier, or is necessary for effective regulation, is not well substantiated. State action on environmental issues that does not involve trading has a thousand-year history (Lohmann 2006: 334) down to the present, when, for example, countries like Germany have been able to cut sulphur dioxide emissions from power plants far more than the US did, but without trading (Moore 2003: 7-8), and when even the US has succeeded in

banning or limiting many pollutants without trading or even much concern with cost (Driesen 2008: 62). Including trading clauses may indeed have been necessary for getting the US to acquiesce in the Kyoto Protocol in 1997, but in the end the Kyoto Protocol itself has proved ineffective – and the US has abandoned it anyway.

In addition, emissions trading itself makes serious regulation politically difficult, since it sets up a destructive dynamic of rent-seeking. The Kyoto Protocol, the EU ETS, and all other cap and trade systems are "polluter earns" arrangements: the lion's share of pollution rights is simply given away free to the biggest private-sector emitters. Not surprisingly, business fights to get and keep as big a chunk of this windfall as possible. In the first phase of the EU ETS, for example, the largest industrial greenhouse gas emitters in Europe were granted, free of charge, more rights to emit greenhouse gases than they were already emitting. Even though the price of carbon subsequently crashed as a result, big electricity generators were able to make windfall profits by passing on to consumers the nominal "opportunity cost" of withholding their free carbon assets from the market. It is estimated that in five European countries, windfall profits for power generators from cap and trade will reach US$112 billion by 2012 (*Point Carbon* 2008c). Much of this revenue will be invested in fossil fuels, exacerbating the climate crisis. Environmental groups' attempts to limit this gift of excess pollution rights to Europe's worst greenhouse offenders have proved no match for industrial lobbies (Michaelowa et al. 2005: 3-5, Grubb et al. 2005: 132-33), and years after the start of the scheme, caps remain ludicrously inadequate and carbon prices of no relevance to the project of achieving structural change away from fossil fuels. Worse, "holes" in Europe's caps have been opened which allow in a flood of extra carbon credits from abroad, in effect loosening, not tightening, the caps (see below), and provisions to bank permits for future use have made it still easier to avoid change. It is customary to suggest that banning extra "offset" credits and auctioning pollution rights instead of giving them away would get rid of these problems. Yet such a "fix", even if it were carried out, could not avoid the underlying political challenge that the biggest businesses and speculators would still seek political means of appropriating permit assets at the lowest cost, again requiring a strong political movement in opposition. As if this were not enough, carbon trading also adds to the necessary hard work of large-scale political organizing by shrouding the politics of climate change in a blizzard of numbers, acronyms and financial-market jargon that even environmentalists and specialist journalists typically cannot penetrate (Lohmann forthcoming b).

A second flaw in the theory that trading makes climate action more feasible politically centres on the claim that once carbon gets a price, ensuring a historical shift away from fossil fuels is only a matter of crafting policies to drive it high enough (yet not so high that it bankrupts important corporations). Unfortunately, the notion that there must exist such an ideal range of prices, capable of satisfying such diverse requirements simultaneously – a conception with overtones of benevolent predestination that seems out of place in a secular, scientific age – is not only, again, unsubstantiated, but also highly implausible. So too is the notion

that concrete historical pathways can be selected for merely by engineering such prices. While prices can give economic actors reasons for choosing one option rather than another, they are of less use if those options have not already been made available through dedicated public investment programmes, redirected research and development and the like. No matter how high petrol prices rise, for example, motorists will not switch to public transport unless an attractive and comprehensive public transport system is available. Prices are not omnipotent: they have never brought about the sweeping type of technological and social change needed to tackle the global warming crisis (Buck 2006). Even the highest prices are usually incapable of incentivizing technological change unless they are imposed toward the tail end of an extensive and lengthy background of development and social and political commitment (Lohmann 2006: 116). In California, for example, the price of permits to emit particulate matter approaches half a million dollars per kilogramme – a price high enough, seemingly, to constitute a serious clean-up incentive for fossil fuel-dependent electricity generators. But because power generation is still sufficiently "locked-in" to particulate-emitting technologies, individual corporations and their state benefactors are predictably seeking indirect ways out of having to pay permit costs. Hence the existence of a proposal to create a "reserve" of permits valued at hundreds of millions of dollars to give out free of charge to the offending corporations – in effect invalidating the entire rationale of the trading system. Even in the limited arena of particulate pollution, the idea that prices could be made high enough to incentivize serious changes, yet not so high that they would threaten to bring useful economic activities to a halt, proved to be an illusion. With respect to climate change, the message is even starker, as Jim Watson of the Energy Group at Sussex University points out:

"The carbon price . . . is a very poor weapon in what is supposed to be a war to save humanity. . . Governments are relying way too much on the price of carbon to deliver everything . . . It has to go hand in hand with regulations and technological developments, and they are sadly lacking . . . The oil price shocks of the 1970s didn't wean us off oil, so why should we believe that a high carbon price will wean us off carbon?" (Lovell 2007).

Putting a price on carbon emissions through tradable permits or even a carbon tax, agrees Jeffrey Sachs of Columbia University in a recent *Scientific American*, will not deliver needed emissions reductions nor "lead to the necessary fundamental overhaul of energy systems" (Sachs 2008) Pollution trading, in sum, provides no short-cuts around political organizing for larger-scale social and technological restructuring.

In addition to being an inappropriate lead instrument for tackling global warming, cap and trade has technical requirements that simply cannot be met, demanding a far more sensitive, centralized and powerful system for measurement and enforcement than is needed for conventional regulation (Lohmann 2006: 94-101, 187-190; Bell 2006). Even in most industrialized countries, the emissions measurements needed to underpin trading, or even to detect compliance with

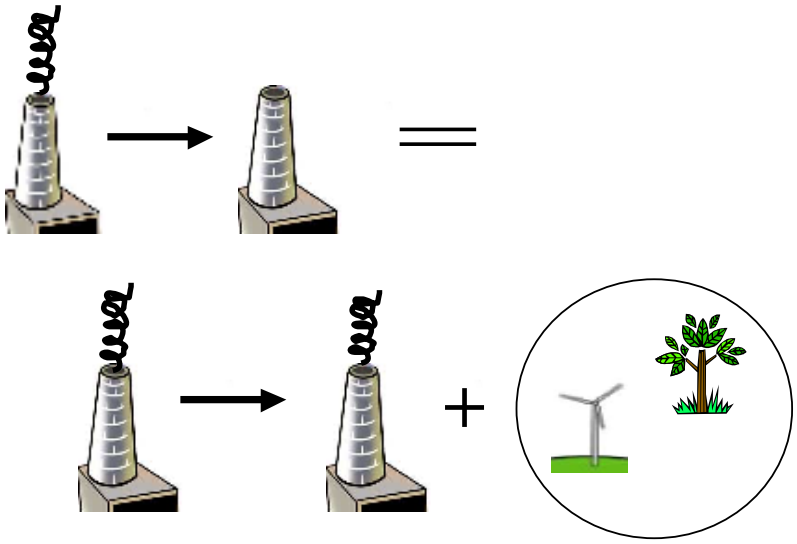
Kyoto targets, are not being made, throwing the very existence of the carbon emissions commodity into doubt. As will be explained below, the situation with respect to carbon "offset" trading is even worse. There, measurements cannot be carried out even in principle, making carbon markets that mix the two types of pollution rights (emissions permits and offset credits) impossible in formal terms.

Carbon Offsets

The second component of carbon trading, carbon offsets, was devised to provide an additional source of pollution rights enabling wealthy industries and states to delay efforts to reduce their own emissions. Like cap and trade, it is justified by an innovative equation (Equation 2).

Equation 2

Carbon Offsets



Instead of cutting their emissions (top), industries, nations or individuals finance purportedly "carbon-saving" projects elsewhere (bottom right), which are generally cheaper to implement. Examples include tree plantation or ocean-fertilization projects (which are supposed to absorb carbon dioxide emissions) as well as hydroelectric dams, wind farms, efficiency schemes, and other projects that "displace" fossil energy or are argued to result in less greenhouse gases being released to the atmosphere than would otherwise be the case.

Just as cap and trade commodifies the earth's carbon-cycling capacity before parcelling it out to polluting industries, so offsets tend to commodify land, water, air, genes and community futures in new ways in order to "expand" that global capacity to allow more use of fossil fuels. Most sites for this new form of commodification are in the global South, particularly countries such as China,

India, Korea and Brazil. That means that carbon trading affects less-industrialised countries like India not only indirectly, by hastening climate change, but also directly, by encouraging the development of "offset" projects designed to compensate for industrialised countries' emissions.

Take, for example, the principal strategy of German-based energy company RWE for meeting its pollution targets under the EU ETS. Instead of cutting its emissions significantly, RWE plans to invest in UN-backed "offset" projects destroying N_2O (a powerful greenhouse gas) at factories in Egypt and South Korea and HFC-23 (an even more powerful climate-forcing gas) at chemical plants in China. The company is also exploring the possibility of buying carbon credits from projects that would capture and burn methane (yet another harmful greenhouse gas) from landfills and coal mines in China and Russia, and another 90 million tonnes of CO_2 emission rights from a range of projects in India (Lancaster 2007). Overall, the European Union has proposed that member states be able to use offset credits to meet up to 25 per cent of their national emission reduction targets in the period leading up to 2020 (Point Carbon 2008a, Tanuro 2008). Through 2012, as energy consultants Wood MacKenzie point out, UN offset credits "will easily exceed the shortage of carbon emissions permits within Europe, making it cheap for European firms to avoid cutting their own emissions at all" (Wynn 2007).

Even more obviously than cap and trade, then, offsets are designed in a way that helps entrench or even increase dependence on fossil fuels in the industrialised North. This is one reason that they are opposed, for example, by many Northern renewable energy developers and by Northern environmentalists seeking emissions reductions at home. California's environmental justice movements, for example, see carbon trading as a "charade to continue business as usual" (*Los Angeles Times* 2008). Carbon trading, they note, is threatening promising efforts to prevent the state from building 21 planned fossil-fuelled generating plants – all to be located in poorer, predominantly nonwhite communities – and set itself on the path to a greener economy. The California groups argue that carbon trading would channel funding into out-of-state carbon offsets at a time when it should go instead toward a renewable energy refit programme that would make large numbers of green jobs possible for underprivileged communities. If the state government decides to back carbon trading, wrote one state senator, "it could very well harm low income residents, make fewer funds available for energy efficiency investments and renewables, and undermine Los Angeles' ability to reach its goals" (Padilla 2008).

Despite offsets' regressive role in climate change mitigation, they are often defended as a way of helping to finance the South's efforts to embark on a "greener" development path, and perhaps also provide a stimulus to Northern exporters to develop innovative renewable energy technologies. Yet the evidence indicates that, far from promoting greener energy paths in poorer countries, the bulk of offsets set up under the UN's carbon market reinforce a fossil-dependent industrial path there as well. Most Kyoto Protocol carbon offset credits are

generated not by renewable energy but by projects that contribute nothing to the transition to a green economy. (See Table 1.) Many credits are produced by doing nothing more than bolting extra machinery onto existing factories in order to capture and destroy potent greenhouse gases such as HFC-23 or nitrous oxide, which are by-products of manufacturing processes and which, through the equations making trading possible, have been "made equivalent to" carbon dioxide in terms of their "global warming potential", generally on shaky empirical grounds (MacKenzie forthcoming). Many offset projects in the works would directly support fossil fuel industries, such as schemes to burn off methane from coal mines or use carbon dioxide to pump out the remaining sticky oil at the bottom of nearly-exhausted wells. The "offset" market, it turns out, is propping up fossil fuel dependence in the South as well as the North.

Table 1
CDM projects by type, November 2007

Project type	*Credits issued*	*Number of credited projects*	*Number of projects in the pipeline*
HFCs	42m	11	19
N_2O	16m	4	44
Biomass	7m	74	462
Energy efficiency (own generation)	6m	13	235
Hydropower	3m	41	612
Landfill gas	2m	11	177
Wind	2m	33	311
Agriculture	2m	29	177
Geothermal	0.1m	2	10
Solar	0	0	8
Tidal	0	0	1
TOTAL	83m	247	2551
2020 TOTAL (proj.)	*4.067b*		*5390*

It is sometimes claimed that once the market has picked "low-hanging fruit" such as HFC-23 projects from the offset orchard, it will seek out more difficult, expensive and useful schemes. The idea, again, is that although carbon trading admittedly brings about delays in needed reinvestment, eventually it will set things right by directing finance to the right places. However, this is to misunderstand the structure of the incentive that offset trading provides. That incentive favours ingenuity in coming up with ever-new ways of producing cheap pollution rights for individual economic actors, but not necessarily ingenuity in finding collective

pathways to a non-fossil economy. As Guy Turner of New Carbon Finance admitted at a European Commission meeting in June 2007, "CDM is not like peak oil. We will not run out of cheap CDM options any time soon. People may think we will, but we won't."

The Kyoto offset market's structural bias in favour of fossil fuels is reinforced by the reality that the companies best equipped to navigate its complicated regulatory apparatus are larger, often fossil-dependent corporations with government connections and the money to hire carbon consultants and accountants. While it is no surprise that the biggest Northern buyers of carbon credits include such large-scale corporate greenhouse gas producers as Shell, BHP-Billiton, EDF, Endesa, Mitsubishi, Cargill, Nippon Steel, ABN Amro and Chevron, the roster of major carbon credit *sellers* comprises corporations of a strikingly similar bent in the South. These range from top Indian corporations such as the Tata Group, ITC, Birla, Reliance, Jindal, and so on to Korea's Hu-Chems Fine Chemical, Brazil's Votorantim and South Africa's Mondi and Sasol (UNFCCC 2008). Such well-financed companies use the carbon offset market not as a way of propelling their countries into a new green economy, but generally as a means for topping up finance for environmentally-damaging projects to which they are already committed. As a top official at the Asian Development Bank, which itself has attempted to use the carbon market as a slush fund to help support unsustainable projects (Lohmann 2006: 147) admits,

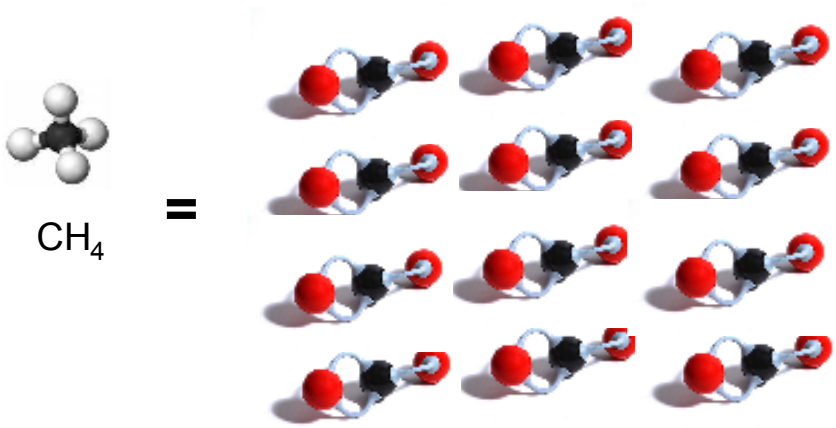
"When the CDM was introduced 10 years ago, there was much expectation from the developing countries that it would provide the necessary upfront financial and technical support for new sustainable development projects that would reduce greenhouse gas emissions. Today . . . it is mostly functioning to provide additional cash flow to projects that are already able to move forward with its [sic] own financing" (Schafer-Preuss 2008).

By contrast, community-based carbon-saving or renewable energy projects are poorly positioned to obtain finance from Northern credit buyers and their contractors and suppliers, who are looking for large blocks of low-cost, easy to obtain pollution licenses and are reluctant to involve themselves in projects involving sustainability considerations and local sensitivities. As one Rabobank official puts it, "few in this market can deal with communities." "The carbon market doesn't care about sustainable development," confirms Jack Cogen of Natsource, a leading credit buyer. "All it cares about is the carbon price" (Lohmann 2006: 115). As Louis Redshaw of the Emissions Trading Department of Barclays Capital explains, "we buy credits from many, many sources . . . We look at the market price. We don't look at any particular technology" **(**Sunday Times 2007). Organizations hoping to harness carbon finance for climate-friendly community work are frequently disappointed. As one veteran renewables activist and specialist in Africa put it, "When the company for which I worked for 10 years got into carbon trading, I became increasingly distraught. It was no longer about 'sustainable development', it was about tonnes of CO_2 on make-believe spread sheets" (Anon 2007).

The offset market is proving to be counterproductive in other ways as well, as the story of the Indian company SRF illustrates. SRF recently invested around $3 million in machinery enabling its refrigerant factory to capture and destroy a substance called HFC-23, which is an extremely powerful greenhouse gas. In order to provide "flexibility" to polluting corporations, the Kyoto Protocol's carbon market architects had decided to value one molecule of HFC-23 as "equivalent" to 11,700 molecules of carbon dioxide. (They also formulated other equations for methane and other greenhouse gases; see Equation 3.) That allowed SRF, merely by destroying a very small quantity of HFC-23, to make US$600 million in sales of Kyoto carbon pollution licenses to companies such as Shell International Trading, Barclays Capital and Icecap, a London-based emissions trading company. SRF then invested the profits in a new plant that produces another potent greenhouse gas known as HFC-134a, whose designated "global warming potential" is 1,300 times that of carbon dioxide.

SRF's carbon deal is problematic on many levels. In addition to allowing industrialized countries to delay addressing their fossil fuel dependence, multiplying climate dangers and long-term mitigation costs, it does nothing to decarbonize India's own industrial pathway, and has even subsidized additional greenhouse gas releases. Furthermore, the market-driven stipulation of "equivalences" that allow HFC-23 reductions to be traded for CO_2 reductions are known to be gross oversimplifications, increasing the probability that the trade is actually worsening climate change. The effects and lifetimes of different greenhouse gases in different parts of the atmosphere are so complex and multiple that any straightforward equation is impossible; the original carbon dioxide equivalence figure for HFC-23 of 11,700 originally put forward by the Intergovernmental Panel on Climate Change in 1995-1996 was revised in 2007 to 14,800, and the error band of this estimate is still a huge plus or minus 5,000 (MacKenzie, forthcoming). The SRF scheme also had local deleterious impacts. Residents of the area near the firm's installation have complained about chemical leaks which they claim have affected crops and water. Suresh Yadav, a local landowner, said: "Fifty per cent of my crops are damaged by the chemicals. Our eyes are pouring, we can't breathe, and when the gas comes, the effects last for several days" (*Sunday Times* 2007). As elsewhere in India and the global South, finally, the UN carbon offset market is probably providing incentives to government officials not to promulgate or enforce environmental laws. If their countries are allowed to remain "dirty" today, the reasoning goes, they will be able to make money by cleaning up tomorrow (Lohmann 2006: 176-77).

Equation 3



Among the many new "equivalences" facilitating "flexible" market approaches to the climate crisis is this equation, taken from a recent presentation by Canadian financial market regulators (Drouin and West 2008) and based on a finding by the Intergovernmental Panel on Climate Change. A single methane molecule (left) is said to have the same "global warming potential" as nearly a dozen carbon dioxide molecules (right), despite the gross scientific oversimplifications involved.

One reason why the carbon offset market has been shaken by so many scandals over the past few years (Harvey 2007, Davies 2007), and why it will continue to be so, is that the quantity of climate benefits or disbenefits associated with offsets is scientifically unverifiable. The carbon "savings" of an offset project can only be calculated by showing how much less greenhouse gas is entering the atmosphere as a result of its presence than would have been the case otherwise. That entails identifying a single, unique business-as-usual storyline to contrast with the storyline that contains the project. The market dictates, in other words, that without the offset, only a single world is possible – a claim that has no scientific basis. As many offset proponents themselves frankly acknowledge, a project baseline is something which "cannot be measured" (Fischer 2005; 1807) and is founded merely on a "value judgement" (Ball 2008) As Lambert Schneider of Germany's Oko Institute put it at a recent conference, "If you are a good storyteller you get your project approved. If you are not a good storyteller you don't get your project through" (Schneider 2007). World Bank officials, accounting firms, financial analysts, brokers, regulators and carbon consultants themselves often admit privately that no ways exist to demonstrate that carbon finance is what made a project possible (Lohmann 2006: 145-152, Haya 2007: 9). Researcher Dan Welch sums up the difficulty: "Offsets are an imaginary commodity created by deducting what you hope happens from what you guess would have happened" (Welch 2007). This unverifiability makes it relatively easy for a skillful and well-paid carbon accountant whose work is largely shielded from public scrutiny (Brunnengraber 2006: 224-25) to help fabricate huge numbers of pollution rights for sale to Northern fossil fuel polluters. At the same time, it

makes impossible any distinction between fraud and non-fraud, rendering any attempt at reform ultimately pointless (Lohmann forthcoming b).

The risk that profiteering will be rife in offset trading without any climate gain is heightened by the conflicts of interest that run through the carbon markets and their regulatory apparatuses. This pattern has become increasingly evident as global warming has become a problem of capital management, and criteria used to gauge the effectiveness of climate mitigation policy are increasingly influenced by private carbon consultants, big permit buyers, bankers and hedge fund managers. Thus the World Bank benefits from financing fossil fuel development at the same time it takes a cut from carbon market transactions that are meant to help clean up the resulting mess (Redman 2008). Barclays Capital, a major investor in the carbon markets, boasts openly that "two of our team are members of the Methodology Panel to the UNFCCC CDM Executive Board", part of the UN carbon market's regulatory body (Leeds 2008). Lex de Jonge, head of the carbon offset purchase programme of the Dutch government, is also the vice chair of the Clean Development Mechanism Executive Board, charged with regulating the UN carbon offset market (Point Carbon 2008 April). Back in 2000, the UN scientific panel responsible for setting out the basics of calculating how many carbon credits could be produced by trees was populated partly by experts whose business ventures were in a position to profit from the findings, or who went on to found such businesses (Lohmann 2001). More recently, the chair of the crucial Ad Hoc Working Group at the April 2008 UN climate conference in Bangkok was Harald Dovland, senior adviser since September 2007 to Econ Pöyry, a private firm involved in carbon markets as well as a subsidiary of a company providing technical and professional services for pulp and paper mills contributing directly to deforestation (Econ Poyry 2008; Lang 2003). The head of the Indonesian branch of EcoSecurities, a carbon firm that has helped put together one in ten of all Southern-based offset projects approved so far by the UN, was appointed as a special adviser to the president of the 2007 UN climate conference, whose deliberations would materially affect the profitability of the firm. The private sector carbon auditors approved by the UN, meanwhile, due to their strong interest in gaining future contracts from the companies that hire them to review their offset schemes, are unlikely to be unduly critical; the head of the board responsible for the UN's offset programme confirms that there is a "clear and perceived risk of collusion" between the two. Not surprisingly, between the start of the market and the end of 2006, auditors passed over 92 per cent of the South-based projects that were proposed to them (Ball 2008b). In 2006, the UN's Clean Development Mechanism Board approved 96 per cent of the projects proposed to it and 91 per cent in 2007.

Within the insular, tightly-knit climate mitigation community, experts or "carbocrats" (Lohmann 2001) are constantly passing through revolving doors between private carbon trading consultancies, government, the UN, the World Bank, environmental organizations, official panels, trade associations and energy corporations. For example, James Cameron, an environmental lawyer who helped negotiate the Kyoto Protocol, now benefits from the market he helped create in

his position as Vice Chairman of Climate Change Capital, a boutique merchant bank. Henry Derwent, a former director of international climate change at the UK's Department for Environment, Food and Rural Affairs, who was responsible for domestic and European climate change policies, is now president and chief executive of the International Emissions Trading Association, an industry alliance. Kate Hampton, former climate chief at Friends of the Earth, and Jon Sohn, formerly of World Resources Institute, are also now at Climate Change Capital, which Ken Newcombe, who set up the World Bank's carbon finance business, joined as well before becoming head of the US carbon trading desk at Goldman Sachs. Sir Nicholas Stern, author of the British government's Stern Report on Climate Change, joined IDEAcarbon, another private firm in the carbon trade, in August 2007, and Axel Michaelowa, who has a long history of working with the CDM Executive Board, helped form the firm Perspectives GmbH, another carbon consultancy. When not only buyers, sellers, consultants and brokers, but also many putative market watchdogs, have an interest in maintaining or increasing the number of carbon credits in circulation, the possibility of meaningful checks and balances, already marginal due to the scientific unverifiability of carbon crediting, virtually disappears. While of long standing, this crucial aspect of the political economy of climate policy remains uninvestigated by social scientists.

The commercial carbon boom is not merely a financial opportunity and a distraction from genuine climate action, however. It has also had severe negative effects on the ground in countries such as India, which already boasts hundreds of offset projects contributing to the appropriation of local land, water and air. In the flat farmland outside Raipur, for example, factories producing sponge iron for export to China pumps out smoke that dims the sun and blackens trees, soil and workers' faces alike. Yet in return for documents claiming that they are making part of their operations more energy-efficient, many of the owners are selling carbon pollution licenses to the North through the UN. Local activists are concerned: with or without efficiency improvements, Chhattisgarh's largely coal-fired iron works will continue to spoil farmland and crops, usurp local groundwater, displace villagers, and damage the health of local residents. Farmers that are displaced are rarely hired to work in the factories, which are staffed mostly by labourers brought in from outside. Many displaced women are forced into prostitution. Closure orders were slapped on several of the plants for pollution violations in December 2006. To the activists, the firms' carbon schemes look like little more than opportunism on the part of a dirty and exploitative industry. Twenty kilometers away from the biggest complex of factories, many residents of Chauranga village would agree: they resorted to vigilante action to keep a nearby factory from operating for fear their livelihoods would be lost.

Highly-polluting sponge iron factories encroach on the rice fields of Chhatisgarh state in India. Most such installations are seeking extra finance for their operations from sales of carbon pollution rights to buyers in industrialized countries under Kyoto Protocol rules.

In Maharashtra, meanwhile, the Sayadhri Range of the Western Ghats has been profoundly affected by wind energy development at the hands of Suzlon, Bharat Forge and other companies. As the plateau has become cluttered with wind

energy generators, power lines and fences, the villages below have found themselves barred from the common lands they once used for grazing and gathering, and much wildlife has disappeared. As investigations by Nishant Mate of the National Forum of Forest Peoples and Forest Workers have revealed, when one village, Kadve Kurd, where villagers hold documents dating back to colonial times attesting to their land rights, tried to stop generators from going up on the plateau, they were intimidated by police (Ghosh and Kill forthcoming). The wind generating company involved tried to force one villager to sell his land to the project for Rs. 50,000, then made death threats, compelling him to leave his village for two months, and also tried to derail his attempts to use the courts to hold on to his land; company agents burned village records he was using as evidence of possession. Several companies involved in the wind developments have requested carbon finance from the UN's Clean Development Mechanism, including Tata Auto, Bajaj Auto, ENERCON and Bharat Forge. One local activist noted that "the windmills protect the polluting companies" by boosting their green credentials. Villagers are not supplied with electricity from the windmills.

A third example is from the Bhilangana river in Uttaranchal, near the village of Sarona. There, Swasti Power Engineering Ltd. is benefiting from Clean Development Mechanism money in its development of a 22.5 megawatt run-of-the-river hydroelectric project that would devastate local farmers' finely-tuned (and extremely low-carbon) customary terraced irrigation system that provides them with rice, wheat, mustard, fruits and vegetables. A survey for the project conducted over ten years ago reported that there were no villages near the project; Sarona residents were never consulted and first learned about the project only in 2003, when construction machines arrived. Older women in the village led the first actions of opposition, and in March 2005, 120 villagers were jailed for four days, and another 79 arrested in July. In November 2006, at least 29 people were arrested and forced to sign a document that they would cease resistance. One village woman told Tamra Gilbertson of Carbon Trade Watch, "The children were at school and they took us all to jail. I was so worried for the children being alone for so long, but the older children cared for the younger ones and they made food together." In police raids since, people have had their clothes torn off and been beaten, and women in the village have been assaulted, dragged by their hair and tortured. Yet the villagers continue to embrace nonviolent tactics. One villager stated, "We did not put sand in the petrol tanks – we are non-violent, and want an honest fight" (Gilbertson 2008). In the mountainous river valleys of Uttaranchal, some 146 such dam projects are proposed or underway, and hundreds of hydroelectric schemes in India are seeking carbon finance. The thousands of such offset projects now underway worldwide continue to be underinvestigated by independent social scientists and even by non-government organizations (Michaelowa and Michaelowa 2007: 4).

Conclusion

Some two decades ago, carbon trading seemed to the small clique of US traders, economists and non-governmental organisations that had begun developing the

idea (Lohmann 2006: 45-62) to have the potential to recruit industry to the cause of fighting global warming, since it was designed to save costs for fossil fuel-intensive corporations and give them breathing space before they would have to cut their emissions. In Kyoto in 1997, the idea was successfully pushed onto UN climate negotiators by the US delegation, and a cluster of world carbon markets today constitutes the major international response to global warming.

The enormous commercially-oriented social and political infrastructure that has resulted has not only diverted resources toward reinforcing richer societies' addiction to fossil fuels, undermining innovation and constructive climate action, and redistributing more of the world's goods from poor to rich. It has also dangerously narrowed the range of social science research and discussion topics concerning climate change that are considered to be either fundable or "politically correct." Today, most social scientists involved in global warming issues, like many environmentalists, operate within the conceptual universe of the new neoliberal project of climate commodification and trading. Many work with or advise governments or the growing carbon-trading sector, or aspire to do so. Independent academics too tend to concentrate more heavily on chronicling or proposing refinements to price instruments than on lending a hand with the more urgent project of studying effective means for addressing climate change. Even engaged scholars with progressive or political economy orientations often wind up awkwardly attempting to effect a marriage between an egalitarian philosophy and neoliberal market environmentalism (Boyce and Riddle 2007; Foundation for the Economics of Sustainability 2008; Baer, Athanasiou and Kartha 2007, Brewer and Lakoff n.d.; for a critique of a parallel effort in a non-climate field see Mitchell 2007). Instead of investigating the emerging politics of keeping fossil fuels in the ground, the possibilities for building new movements for public investment, the mysteries of societal and technological innovation, available resources for alliances between climate movements and other social movements, existing knowledge of low-carbon technologies and ways of life, ways of supporting community or regional projects for the reform of energy and transport infrastructure, and so on, many concerned social scientists restrict themselves to studying theoretical market refinements such as "sustainable offsets", improved North-South technology transfer financed by carbon trading revenues, trading-with-auctioning, cap-and-dividend, cap-and-share and so forth. Social scientists who are critical of other aspects of neoliberalism may meanwhile shy away from studying its role in climate politics out of a sense that "the environment" is "not our department". It is one sign of the narrowing of debate that has resulted that even among many on the left in industrialized countries who are sceptical of carbon trading, climate action has come to be seen as nothing more than a choice between trading and another market instrument, carbon taxes.

To attribute the extraordinary shrinkage of the space for political thinking that afflicts today's climate change debate simply to the ascent of "market ideology" over the past 40 years takes one only so far. Michel Callon (2007) has tantalizingly suggested that it may be more fruitful to look for a parallel in the *énoncé collectif* represented, for example, in the collaborative medieval prescription *vox Dei, vox*

populi, which, as historian Alain Boureau has argued, "played an important role in mobilizing and stabilizing debate around the building of the English nation between the 8th and 12th centuries." For Boureau, such an *énoncé collectif* is a "verbal or iconic fragment that creates around itself a certain convergence of languages and thoughts, through the play of a structural fuzziness that allows the capture of an implicit thematic and welcomes the most diverse projections and appropriations" (1992: 1072). Yet however the narrowing of debate is to be described, it represents a challenge for climate movements and social science alike. Gwyn Prins and Steve Rayner, two social scientists who have bucked the current conformism, acknowledge freely that

". . . those advocating the Kyoto regime will be reluctant to embrace alternatives because it means admitting that their chosen climate policy has and will continue to fail. But the rational thing to do in the face of a bad investment is to cut your losses and try something different" (Prins and Rayner 2007: 975).

That may also be a condition for getting critical social science back on track in a way that can better serve a human future.[1]

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