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UNFCCC

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1. The Corner House is a not-for-profit research and advocacy group, focusing on environment, development and human rights. It has pursued research into climate change policy and carbon markets since 1998, working closely with environmentalists, academics, journalists, government officials and local advocacy organizations throughout Asia, Africa, Latin America, Europe, North America and the Pacific. It has published a number of books and papers on climate policy and contributed to numerous UN, parliamentary and public and popular forums on many continents on market-based and non-market-based mechanisms for climate mitigation. Throughout this time, it has closely monitored the development of the Kyoto Protocol and its market-based mechanisms, the European Union Emissions Trading Scheme (EUETS), the Chicago Climate Exchange, the UK Emissions Trading Scheme, and the voluntary carbon "offset" market, as well as alternative energy movements. The Corner House welcomes the opportunity, as specified in paragraphs 82, 86 and 87 of Draft Decision -/CP.16, to submit to the UNFCCC secretariat information on the evaluation of various approaches for promoting cost-effective climate mitigation.

2. The first task of such an evaluation is to acknowledge that the 13-year experiment with the Kyoto Protocol's flexible mechanisms (emissions trading, CDM and JI) is now over. This experiment has proved conclusively that carbon markets are incapable of helping either to address climate change or to promote sustainable development. The flexible mechanisms are organized around maintaining and increasing fossil fuel dependence – precisely the wrong objective, since the transfer of fossil carbon out of the ground and into the atmosphere, oceans, vegetation, soils and surface geological formations is at the root of the climate crisis. The flexible mechanisms have resulted in substantially increased emissions from fossil fuels in Annex I countries (which is part of their design) while failing to ameliorate, and in most cases, reinforcing, a very costly pattern of fossil-fuel dependence among non-Annex I countries (Anderson 2009, Bohm and Dabha 2009, Bond and Dada 2007, Brinkley and Less 2010, Bullock 2008, Clifton 2009, Docena 2010, Driesen 2008, Gilbertson and Reyes 2009, Helm 2010, Kill and Pavett 2010, Lohmann 2006, Lohmann 2010, Malueg 1989, Mausam 2008, Mausam 2009, Prins and Rayner 2007, Suppan 2009, Taylor et al. 2005). At the same time, they have undermined and blocked sustainable development in both non-Annex I and

Annex I countries, by damaging initiatives for pollution control, low-carbon technology, sustainable energy, sustainable agriculture, social development and social welfare (California Environmental Justice Movement 2010, Docena 2010, Gilbertson and Reyes 2009, Haya 2007, Mausam 2008, Mausam 2009, Lohmann 2008, Osuoka 2009).

3. Accordingly, the Parties to the UNFCCC should immediately begin phasing out their support for carbon markets (including the modified and extended carbon market instruments proposed at COP-15 and COP-16) and turn to better-designed and cheaper approaches to climate mitigation. This task will require a well-grounded re-analysis by the international community of what is required for a realistic, carefully-governed approach to climate investment.

4. First, it is not enough simply to invest in non-carbon energy and non-carbon transport, sustainably-heated houses or reduced-oil agricultural techniques. Many financial institutions are already doing a bit of that, while continuing or even increasing their investment in fossil fuels — the World Bank, for example. Nor will it be enough just to stop investment in fossil fuels, although that is part of the solution. Rather, successful climate investment will go into creatively building long-term, coherent historical pathways away from dependence on fossil fuels (Lohmann 2009a). That is different, and more complicated, and has far-reaching consequences.

5. Of course, this entails an immediate halt to investment in carbon trading systems, since such systems do not select for a livable future history, but rather for short-term cost savings on slightly modified business-as-usual pathways. But it also entails a halt to investment in fossil fuel substitutes. Nothing else — not agrofuels, not nuclear energy, not wind farms — can play the role that fossil fuels play in today's industrialized societies, including their political role of powering the machines that shape elites' struggles against the poor (Caffentzis 2008), and it is futile and enormously expensive to pretend that they can. The hope that a replacement for fossil fuels can be found that will allow everything else to remain exactly as it is has to be abandoned. Assumptions about demand, energy planning, development and social control that derive from the fossil age and its politics are of little practical use in a greenhouse world. It is not only fossil fuels that must be left in the ground, but also the practices and institutions that have made their extraction and burning possible and even necessary. Again, it follows that carbon market mechanisms, including the Kyoto Protocol's flexible mechanisms, cannot be a part of intelligent climate policy, since they are designed in a way that extends the life of fossil fuel-oriented infrastructure.

6. The future of climate investment belongs, rather, to locally-focused energy, locally-adapted agriculture and locally-appropriate transport. In agriculture, for example, the inefficiencies and simplifications that petroleum allowed now have to be set aside by a myriad of intricately-differing local practices that constitute the necessary condition for high yields without oil. A post-fossil fuel agriculture more attuned to local capabilities will require a rediversification and decentralization of knowledge, a turn toward the gardening side of farming in millions of separate locales. Future trade in agricultural goods will be built on bases of increased respect for and individual attention to local particularities.

7. To a lesser extent, the same is true of post-fossil fuel energy generation, and indeed of post-financial crash investment generally. Emergency investment needs to be directed toward the communal 'base' maintained by ordinary people, including things and services obtained by trade for purposes of resilience rather than speculation, instead of merely helping the financial sector and other power-holders. In short, climate investment must be directed more toward building and maintaining diverse baskets of concrete incommensurables than toward the indefinite processes of commensuration that serve mainly to expand liquidity, credit, capital velocity, uncertainty and trade in fictional commodities.

8. This will entail a shift in the types of knowledge used in making investment decisions. Hitherto, investment planning has typically been built on, for example, abstractions regarding 'future energy demand', formulated by institutions such as the International Energy Agency, that rest on the untenable assumptions that all remaining fossil fuels will be taken out of the ground, and that afterwards 'substitutes' for fossil fuels will be used. These claims, when acted upon, result in the accumulation of a particular kind of knowledge: how many tens of thousands of nuclear plants will have to be built; how many becquerels of radioactive waste will need to be guarded for how many thousands of years; how many millions of hectares of land will need to be taken over for gigantic solar arrays or the production of agrofuels and biochar; how all this can be done at the least cost to the corporate sector; and so forth. This accumulating knowledge finds its home in a cascade of conflicts, mishaps, technical fixes and accretions of yet further technical knowledge, as for example when 'second generation' cellulosic agrofuels emerge from the ashes of the 'first generation'. All this leads in turn to the buildup of techniques for commodifying and 'managing systemic risk' techniques whose historical blindness and technical inadequacy were again revealed during the recent financial crisis. In the end, this snowballing of ultimately useless climate investment "knowledge" tends to flatten other kinds of knowledge that will be more at a premium in a warming world — in particular, knowledge of resilient means differing communities might deploy in order to lead satisfying, mutually-acceptable lives without entailing the global threats and power differentials associated with fossil fuels or fossil fuel substitutes. What is required is a different knowledge process, one in which more assumptions (including those about energy demand) are opened for concrete questioning, and in whose creation more and different communities with different starting assumptions can be involved.

9. Specialists from many areas other than economics, finance, climate science and engineering accordingly must pitch in to help liberate the UNFCCC climate negotiations from the neoliberal straitjacket in which they has become encased. Historians, for example, can help analyse how structural change has been peacefully brought about in the past. Anthropologists and sociologists can help expose, disassemble or put in perspective destructive assumptions and practices implicated in commodification, imperialism and economic growth doctrine, as well as document existing resources for climate change solutions. Legal scholars can help highlight environmental protection instruments whose virtues have been eclipsed by neoliberal ideology (Driesen and Sinden 2009), and so on.

10. All this will require that state bureaucracies, research institutions, banks and other financial institutions be forced to make space for more investigation and discussion of how various communities and societies already support themselves without overreliance on fossil fuels; to move toward greater humility in their assessments of what is possible and not possible; and to stop shying away from acknowledging the centrality to climate investment of issues of class, colonialism, race, local geography and the politics of knowledge. It will also entail that limits be put on the overreaching, counterproductive attempts to commodify innovation enshrined in current intellectual property law (Frischman and Lemley 2006).

11. This approach will require increased support popular movements that are already addressing climate change outside the UNFCCC. Successful approaches to climate change cannot be just about urging globally-agreed targets for greenhouse gas reductions, offering a checklist of acceptable technologies, constructing new commodities, and then delegating investment to traditional financial institutions and governments — however reformed and regulated — who will then try to get prices right while keeping structures of power and knowledge much as they are. It will be much more about building broad-based movements for democratic, post-fossil, long-range social planning based on co-operative inquiry. Broad social change is inevitable, and the unrestrained attempts of the past few decades to commodify uncertainty, innovation and carbon-cycling capacity will have to be curbed sharply. Ways must be sought to find and enforce democratic consensus about what

resources must be shared where and when, for long-term collective benefit; what institutions will accordingly have to be phased out and what new institutions constructed to take their place; and how the political transition is to happen. Without this democratic process, supposed 'Green New Deals' are likely to be destructive of livelihoods and climatic stability alike. As some 300 development and environment organizations insisted in 2008, investment governance 'must be democratic, transparent, and accountable to all, especially the impoverished and vulnerable communities most affected by global warming. . . . Civil society groups, social movements and indigenous peoples, from developing and developed nations, must be formally represented within all governance structures' (IFG 2008).

12. The investigation, planning and implementation of a workable, realistic pattern of climate investment entails the centrality to the UNFCCC negotiating process of measures for ensuring public control of the global financial system. That entails not merely state control of the financial sector that has ballooned so destructively during the past few decades (Lanchester 2009, Panitch and Konings 2009), but also thorough democratization of financial decision-making structures, particularly those that are important in determining long-range energy and transport development. Some of the experience needed for the necessary transformations is already being built up in the course of the campaigns for change that have emerged in the wake of the financial crisis. These include campaigns to reduce the overwhelming influence of Wall Street; increase workers' and farmers' participation in management; disallow banks' claims about the value of the 'toxic' assets they hold; roll back limited corporate liability; challenge shareholder primacy; prevent public handouts (including those proposed through the CDM for CCS and nuclear development); force the World Bank to obey its review panel's recommendations to stop investing in fossil fuels; work toward tax justice; institute a maximum wage; and halt the propertizing and piracy of ideas and innovations that should be held in common.

13. Such approaches must guard against being distracted by elite attempts to replace fossil fuels with new high-tech alternatives, pour yet more public cash into insolvent private banks, make merely minor technical modifications to the regulation of finance, or retool carbon markets.

14. In particular, new, constructive approaches to climate change mitigation must be guided by a better understanding of the past failures of the flexible mechanisms and other carbon market mechanisms of the type that have been proposed at COP-15 and COP-16, and of the limitations and scope of market-based approaches to survival issues generally. This will help in avoiding the mistakes of the past 13 years. The following Appendix is attached as an aid to this lesson-learning process.

APPENDIX

15. When Sir Nicholas Stern, climate change adviser to Tony Blair's government, famously said, in 2007, that global warming was "the greatest market failure the world has ever seen", the implication was that, given the proper price signals, addressing it could be a great market success. With the right information, the right regulation and the right taxes, together with new markets for greenhouse gas pollution, the task of prying apart fossil fuels from economic life and "decarbonizing" society could be largely "internalized" into everyday market activity (Stern 2009). Predictably, Stern became a climate businessman himself, and today serves as an adviser to IDEACarbon, a company whose ambition is to provide "ratings, research and strategic advice" on carbon commodities and finance to "buyers, sellers and hedgers".

16. The sequence is familiar. In addition to seeking and exploiting new supplies of cheap labor and raw materials and working to stimulate demand for the products of its restless investments, business

– with help from government – has always tried to benefit from the crises that it itself creates. In the US of the earlier 20th century, for example, worker protests were one impetus for fashioning a Fordist economy organized around the profitable mass production of inexpensive wage goods – an economy that by century's end came increasingly to rely on the exploitation of cheap labor in places such as northern Mexico and the new industrial cities of coastal China. New business uncertainties created by post-1970 liberalization and globalization became an opportunity to create new interest rate options and credit derivatives markets, whose liquidity relied on the participation of Wall Street and City of London speculators (Li Puma and Lee 2004). Opposition to habitat destruction occasioned by past enclosures has meanwhile provided opportunities for new enclosures creating "protected areas", while social concern about the deleterious effects of the type of global commodity trade sustained by companies such as Wal-Mart or Starbucks is being partly converted into demand for "green" consumer products purveyed by the same companies.

17. The same point can be expressed in the jargon of conventional economics. Successful corporations, in the words of investment banker Robert Monks, have always been "externalizing machines" (quoted in Bakan 2004), offloading pollution, land degradation and other unpriced costs of production onto society as a whole. Indeed, in political scientist Timothy Mitchell's crisp formulation, markets "would be impossible if people were made to account for every cost" (Mitchell 2002). Yet the various problems and crises that business activity throws onto society, once they are made "visible" to the market through price signals, can invite solutions that are themselves commodities that firms can sell for profit. Biodiversity, for example, or overburdened pollution sinks, can be transformed into abstract, tradable "environmental services" for which rents are charged.

18. It is often claimed, by both business and environmental economists, that this "internalization of externalities" not only will be profitable, but can transform commerce itself into a form of environmental conservation or even commons regime (Barnes 2006; cf. Caffentzis 2004).
By giving incentives to market actors to consider human survival and flourishing, the claim is, new environmental services markets will make capitalism "sustainable".

19. The problem is that whichever vocabulary we use – business creating opportunities for itself out of its own crises, or capitalism "internalizing" the externalities it creates – commodity solutions always reinterpret and transform the social and environmental challenges that they confront. As a result, any process of "internalization" of harms creates its own externalities. Internalization itself is externalization (Callon 1998). In order to be "internalized", any harm must be simplified, reformatted, made abstract, quantifiable and transferrable in a process that obscures many of its characteristics while introducing fresh problems. In the process of developing skills at internalization, moreover, internalizers set aside, lose or destroy other skills, theirs and others' (Lohmann 2008). For instance, turning biodiversity into a commodity means transforming it into measurable units, inevitably divorcing it from the human and nonhuman context in which it has evolved while abstracting from habitat, species, genus, or the like. Creating bankable "wetlands credits" capable of expanding opportunities for the circulation of capital, similarly, involves "ignoring a great deal of ecological information" (Robertson 2004). In order to be priced low enough to be traded, in addition, "environmental service" commodities unavoidably conceal the immense amounts of human labor, study and other activity that go into creating, maintaining and restoring ecosystems (Barreda 2010); and those who are paid are seldom those who have expended the most effort in this direction. Competition among environmental service businesses only increases pressures to disaggregate and decontextualize in the service of cost reductions. The result is oversimplified natures and new human harms that constitute further "externalities" that must in turn be "internalized" (whether through the creation of further commodities or through expert "governance", "standards" or "regulation"). Hence internalization is only one moment in the larger dynamic of continuing externalization through which accumulation proceeds. The question is not

whether but when a new internalization will be required or enabled; each act of internalization gives rise to a need for yet further internalizations. This endless process is continuous with the history of accumulation, not something that breaks or "corrects" it. Neither a strategy for "making capitalism sustainable" nor mere opportunistic "greenwash" for supposedly more fundamental processes, it is one of the customary ways business profits from the difficulties and barriers that it itself helps throw up.

20. What the "externalities" are that invite an "internalizing" response, what gets internalized, and what happens in the process at any particular time and place, depends on the case in question. By themselves, abstract denunciations of the internalization strategy (e.g., that "market-based solutions to environmental problems cannot work because all such solutions are controlled by the system that caused the problems in the first place") do as little to carry the debate forward as the equally abstract claims they are often directed against – for example that a "Capitalism 2.0," "Capitalism 3.0" or "natural capitalism" that "fully incorporates nature into its system of value" will bring the history of environmental struggle to a happy end, or that structures of "governance" can evolve to take care of any residuum. It is only in the experience of particular cases that the depth of the conflicts and contradictions emerge. Only then does the dynamic of the internalizing process reveal itself not as a (successful or failed) attempt at "environmental problem-solving" but rather as a continuous changing of the subject. The attempts of the past two decades to "give carbon a price" illustrate the problem.

21. How can a market be made out of climate? The answer is not immediately obvious. Global warming results mainly from the transfer of carbon from a fossil pool locked underground to a separate pool circulating aboveground among the atmosphere, oceans, vegetation, soil, fresh water and surface rocks. This transfer is irreversible over humanly relevant time scales. The resulting dangerous buildup of carbon dioxide in both the atmosphere and the surface layer of the oceans, moreover, cannot be prevented by planting trees. An immense extent of land would be required and the majority of the newly-sequestered carbon would soon wind up in the atmosphere and the oceans anyway. The earth's living vegetation (today containing perhaps 600-1000 billion tons of carbon) is incapable of absorbing an injection of 4000-plus billion tons of extra carbon (Falkowski et al. 2004) from fossil stores built up over millions of years. Some 25 tonnes of ancient marine life, after all, was required to produce each liter of today's gasoline; and the equivalent of the earth's entire production of plant and animal life for 400 years is today burned every year in the form of fossil fuels (Haberl 2006, Dukes 2003).

22. It follows that sustaining – or "producing" – the use-value of a livable climate requires keeping remaining fossil fuels in the ground. This is a task that most societies in history have accomplished without thinking about it, but one of surpassing difficulty for today's global elites because coal, oil and gas have been crucial for a century and a half to commodity production, accumulation and corporate control over workers and land. Fossil carbon fuels the machines that increase labor productivity, break worker and farmer resistance, destroy various kinds of knowledge, and enable trade to span the world. It has been fundamental to the growth of urban industry and to the suburbanization that later became a sponge for absorbing surplus capital, as well as to the construction of the "machines on the land" – vast industrial monocultures – that feed cities and factories alike. Underpinning the price stability of nearly every other commodity, fossil carbon is indispensible to the military forces, "economies of scale," and long supply chains that characterize centralized control over resources. Fossil fuels' high energy content allow both rapid expansion of production and the predictability that is needed in a competitive environment; cheap oil, Timothy Mitchell (2009) argues, even helped make possible the whole 20th century conception – beloved to governments everywhere – of "the economy" as an object that could grow without limit. Fossil fuels' particular pattern of distribution, meanwhile, allows some companies to monopolize access to them and pocket huge rents.

23. Moreover, even if corporations and governments could be convinced of the necessity for a transition away from fossil-fuel dependence, and were willing to relinquish the search for "substitutes" for fossil fuels that might perform exactly the same political and economic functions (there are none), they would need to undertake enormous, immediate long-term investment programs in new, non-fossil energy, transport, agricultural and consumption regimes, particularly in the North, and see to it that state subsidies are shifted from fossil fuels to existing initiatives defending or constructing low-carbon means of livelihood. Given path dependence (Arthur 1994) and the way that fossil fuels have become "locked in" (Unruh 2000) to industrialized societies' ways of life, that constitutes the main avenue for constructive action by states and corporations within the few decades that remain to deal with the climate crisis. But the planning horizon required is much longer than the logic of capital accumulation can allow for.

24. Many social movements are confronting this logic by directly or indirectly addressing the belowground-to-aboveground transfer of carbon. Movements to "keep the oil in the soil, the coal in the hole and tar sand in the land" have taken shape in the Niger Delta, Alberta, Appalachia and elsewhere. A proposal by Ecuadorian environmentalists and indigenous groups has requested support from industrialized countries for a project not to exploit petroleum in an area of outstanding biodiversity on the explicit condition that the scheme not be treated as an internalization of externalities but as part acknowledgement of historical responsibility for anthropogenic climate change. In many countries, including even the US and Britain, local opposition is stopping the development of dozens of coal-fired power plants. Campaigns to ban banks from supporting fossil-intensive projects are in full swing across the world. Such movements increasingly recognize, moreover, that the struggle to keep fossil fuels underground is continuous with movements in support of ecological and peasant agriculture, more democratic public health and energy provision, cleaner air and water, and an end to militarism, environmental racism, and what Eduardo Gudynas calls "neoextractivism".

25. Yet however realistic the analysis that such movements have of the climate crisis and climate politics, they have yet to build up enough strength to begin to reverse overall trends in the use of fossil fuels. Could new markets in climate goods, as is often suggested, complement rather than undermine their efforts? In order to do so, they would have to buy and sell contributions toward the long-term shift away from fossil fuels that the movements are calling for. That is, they would have to commodify what Yale law professor Douglas Kysar (2010) calls "legal and political actions" that have "dramatic impact" on historical trends. Such climate commodities, Kysar proposes, could be sold by, for example, "indigenous groups that entirely block new exploration activities" or "forest-dwelling communities that successfully fight to stop logging." In this imipossible vision, Goldman Sachs speculators, sitting down to craft products for sale to investors, would "devote themselves … to the identification and promotion of critical political interventions by disempowered voices for sustainability." The Ecuadorian proposal described above would be converted into a "model of climate capitalism." Accumulation would be a matter of investing in commodities that maximized radical, structural societal change over the long term.

26. Kysar's tongue-in-cheek thought-experiment gives a preliminary hint of the problems of market-based approaches to climate change. To make accounting, ownership and capital accumulation possible, Kysar's climate market would have to subsume the qualitative relations that make up movement-building and historical process to quantitative ones, unleashing a cascade of bizarre consequences. For example, assuming the social value of Kysar's climate commodity (the "quality" of the product, from consumers' point of view) to be a livable climate, consumers would need to know, and producers to guarantee, what increment of historical change toward a halt to fossil fuel extraction each commodity sale represented. But who would quantify the extent to which each unit of the commodity contributed to undoing the social complexities of fossil-fuel path-dependence,

and how? If different units contributed different increments of historical change depending on the particular pathway they were aggregated into, and the paths were incompatible, how would the units be commensurated? How would the historical effects of private ownership on the dialogue and movement-building comprising the "labor" producing the climate commodity be calculated? (E.g., would street demonstrators wearing corporate logos on their T-shirts lose their effectiveness?) If the experts in counterfactual history called upon to help price the commodity attached a particular value to rolling back the dominance of a rampant financial sector, would Goldman Sachs still sell the associated securities? And so on. The only way of removing such difficulties for accumulation would be to demote the market to being a provider of unspecified and unquantifiable "climate services" – in which case it would lose most of its usefulness for policymakers and appeal to other potential customers.

27. The alternative to such an immediate, dizzying multiplication of paradoxes is to construct a market based on a different commodity, aimed not directly at instituting a qualitative process of historical change, but instead at saving corporations money in attaining state-enforced collective quantitative targets for reductions of molecules emitted. This is what the US's sulfur dioxide trading system instituted in the 1990s does, and is the model followed by the Kyoto Protocol's carbon market, the EU Emissions Trading Scheme, and all other actually-existing climate markets (see BOX: Who Built the Climate Market?). The advantages are obvious. Molecules can be counted (in many pollution markets, a ton is the unit of measurement). Molecules come "pre-standardized" in the sense that they are the same the world over. Molecules can also be owned. So, at least in principle, can the sinks that absorb them – for example, oceans, trees or land that absorb carbon dioxide. Quantifiability and ownability make it possible to buy and sell rights to emit CO_2 – essentially, rights or access to the earth's carbon cycling capacity in the oceans, the atmosphere, soil, vegetation and rock. And with measurement and private property comes, too, the possibility of large-scale accumulation.

28. Accordingly, actually-existing climate services markets are based on the equations:

a better climate = a reduction in CO_2 emissions

and

CO_2 reduction A = CO_2 reduction B.

29. But if there is to be a market in CO_2 emissions reductions, someone must "produce" them and someone must buy them. (To put it another way, if there is to be a market in greenhouse gas pollution dumps, someone must make them scarce, someone must "own" them and someone must "rent" them.) Setting up this apparatus can only be the job of governments, who must impose both the need for reductions (by making pollution dumps scarce) and the means of "producing" or owning them. Governments accomplish the former by imposing "caps" or limits on emissions on companies or economic sectors. To accomplish the latter (that is, create a reduction commodity), governments need the additional equation:

forced reduction of CO_2 emissions to level c within time period p = tradable right to emit CO_2 up to level c by the end of period p.

30. Carbon dioxide reductions (and by inference climate action) can then be achieved by production of tradable pollution rights, whose scarcity or otherwise is determined by government fiat. *Progressive* carbon dioxide reductions, accordingly, can be achieved by relying on the equation:

reducing CO_2 emissions progressively = issuing fewer tradable rights to emit CO_2 in period p + 1 than were issued in period p.

31. The producers or owners of these rights are, in the first instance, governments themselves. European Union Allowances, for example, are "produced" in a preset amount by politicians and bureaucrats under the European Union Emissions Trading Scheme (EU ETS). They are then sold or, more usually, given away free to large private sector polluters. (A dramatic rise in rent charged for natural resources, after all, has always been one of the most feared barriers to capital accumulation.) Assigned Amount Units, one of the climate commodities of the Kyoto Protocol carbon market, are meanwhile "produced" by conferences of the parties to the UN Framework Convention on Climate Change before being distributed, again free of charge, to the national governments of industrialized countries. Rather than originating from farms, mines or industrial assembly lines, the supply of this type of climate commodity depends entirely on what one observer calls the "political pen" (Gallagher 2010). Once in the hands of polluters, the commodity can be bought and sold so that pollution is distributed in a way that minimizes aggregate costs.

32. In some pollution trading systems – for example, the US sulphur dioxide market invented in the 1990s – governments are the only commodity producers (although they typically quickly transfer ownership to private corporations). However, in most climate markets, other parties are encouraged to produce a second type of commodity for sale in the same markets in order to make more cost savings and investment and speculative opportunities possible. These "offsets" (for example, in the CDM) are funded by polluters subject to a government "cap" but are manufactured by projects outside the "cap." Such divisible, measurable, thing-like climate-benefit units projects are allowed to produce pollution rights if they can satisfy regulators that they emit less greenhouse gas than would be the case in the absence of carbon finance. Their funders receive pollution rights in return that they can use in lieu of emissions reduction obligations under European and Japanese climate laws (or sell on to third parties, or speculate with). Thus:

$$CO_2e \text{ reduction under a cap} = \text{offset outside the cap.}$$

33. For example, European Union Allowances (EUAs), the emissions permits traded under the EU cap, are exchangeable with Certified Emissions Reductions (CERs) (Kyoto Protocol carbon market offsets generated in Southern countries outside the European cap):

$$EUA = CER$$

Assigned Amount Units (AAUs) are also theoretically exchangeable with CERs, helping to unify different trading schemes –

$$AAU = CER = EUA.$$

– although in practice this exchangeability is limited. Each offset, of course, must also be equivalent with all others:

$$\text{offset } A = \text{offset } B.$$

The product of a wind farm offset in Oaxaca, for example, must be commensurable with that of an HFC-23 offset in China, a hydroelectric dam offset in Brazil, or an efficiency improvement in South Korea.

BOX: WHO BUILT THE CLIMATE MARKET?

Climate trading based on a "molecular" commodity model began to be developed in earnest shortly after

the institution of the institution of the US sulfur dioxide market. The background was the continuing ideological dominance of neoliberalism, the continuing geopolitical dominance of the US, growing financialization, and the imperative for surplus capital to find an outlet at a time of disappointing returns on traditional investment, but the motives driving the individual inventors of carbon markets were predictably complex and varied. Richard Sandor, a wealthy Chicago trader and economist who was one of the originators of interest rate derivatives in the 1970s, helped develop the idea of pollution markets in the 1980s, collaborated on a UN Conference on Trade and Development (UNCTAD) initiative entitled "Building a Global CO_2 Emissions Trading System" in the early 1990s and, in the 2000s, with philanthropic support, set up the Chicago Climate Exchange, where, by 2010, he was making an annual salary of a million dollars. At UNCTAD, Sandor worked under Frank Joshua, who later became global director for emissions trading services at Arthur Andersen before joining NatSource, a big carbon commodity trader. Also at UNCTAD was Alice LeBlanc, at the time a staff member of the corporate-friendly Washington NGO Environmental Defense, which had helped write the legislation for the US's sulfur scheme in the 1990s in hopes that such "market-based solutions" could win the support of the private sector for pollution control measures at a time of deregulatory fervor. LeBlanc later joined Sandor at the Chicago Climate Exchange before becoming head of the climate change office of the ill-fated insurance and speculation firm AIG. Robert Stavins, an neoclassical economist at Harvard who had also played a part in the US sulfur dioxide program, contributed further theoretical support. Also inspired by the US sulfur dioxide scheme was Michael Grubb of the Royal Institute for International Affairs in London, who suggested early on that it could serve as a model for a world carbon market. Ted Hanisch, a Norwegian government official, meanwhile began to explore ways in which carbon trading could provide a way for his country to "compensate" for its oil production and industrial and shipping emissions. In 1996, Graciela Chichilnisky, a high-powered mathematician and neoclassical economist at Columbia University, pitched the idea to US officials.

In 1997, the Clinton regime, represented by Al Gore (who later went into the carbon business himself as a private individual), played the decisive role in ensuring that the Kyoto Protocol became a plan for a world climate market. Although the George W. Bush regime withdrew from the Kyoto agreement in 2001, much to the discomfiture of trading firms such as ENRON, market development continued under the leadership of figures such as Ken Newcombe, who headed the World Bank's Prototype Carbon Fund before moving on to Climate Change Capital (a boutique merchant bank founded by, among others, attorney James Cameron, who had also helped negotiate the Kyoto Protocol), Goldman Sachs' carbon trading desk, and the carbon trading firm C-Quest Capital. Robert Stavins's European students and colleagues meanwhile helped push the carbon market idea in the EU, which, unable to get agreement on a European carbon tax, adopted the EU Emissions Trading Scheme (EU ETS) as the centerpiece of its climate policy in the 2000s. The EU ETS is today the world's biggest carbon market. By January 2010, when the global carbon market had reached a value of well over US$100 billion, Sandor was assuring a Hong Kong private equity conference that

"... the next wave of commoditization will be the commoditization of air and water; and I put it to you that these will be the biggest commodities in the world. So, value propositions will be anything that deals with the capacity, scarcity and quality of these two things" (quoted in MacLeod 2010).

Although the failure of the US Congress to pass legislation mandating a nationwide carbon market in that country has subsequently caused Sandor to abandon his Chicago Climate Exchange, and although both the European and Kyoto schemes have been beset by lack of climate results (Brinkley and Less 2010), scandal and widespread and growing public opposition, most governments still profess to believe that "giving carbon a price" constitutes progress in climate policy (Lohmann 2005). Among UN member nations, there is little debate on the issue, the most notable exception being the Bolivian government's critical statements. Meanwhile, financial centers such as the City of London and Wall Street have become increasingly important in market development. Specialized carbon funds now number around 100, and considerable lobbying power is exercised by the International Emissions Trading Association (IETA) – a group of 176 transnational financial, law, energy and manufacturing corporations including Goldman

Sachs, Morgan Stanley, Deutsche Bank, Citigroup, Chevron, ConocoPhilips, Shell, Total, Petrobras, Endesa, Mitsubishi, Duke Energy, Standard Chartered Bank, Vattenfall, American Electric Power, Eskom, Dow Chemical, Poyry AS, General Electric and Baker & McKenzie. By promoting increased offset use, a greater range of types of offset, sweeping standardization, rubber-stamp regulation, banking and borrowing of carbon credits across compliance periods, increased participation of financial intermediaries, and an unregulated over-the-counter market that would encourage speculation (Point Carbon 2010), the IETA consistently works to develop the carbon commodity in ways that would make trading in it more profitable to the financial sector. A second industry group called the Carbon Markets and Investors Association, and comprising 50 companies including Merrill Lynch, Standard Bank, Standard & Poors, RBS, Munich Re, KMPG, JP Morgan, Camco and BNP, is also important. Carbon business figures and officials responsible for developing UN and governmental climate policy, meanwhile, continue to belong to very much the same social world. For example, the current Executive Secretary of the UN Framework Convention on Climate Change, Christiana Figueres, was, up until the time of her appointment in 2010, senior adviser to C-Quest Capital, a private carbon finance company focusing on CDM investments; principal climate change adviser to Endesa Latinoamerica, the largest private utility in Latin America, and the vice-chair of the rating committee of the Carbon Rating Agency, a private firm applying credit rating expertise to carbon assets.

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34. Such equations help market actors mass-produce uniform, tradeable, ownable units of CO_2 reduction (or pollution rights) at the lowest cost for the maximum profit. For example, because carbon dioxide molecules are the same everywhere, it follows that

$$CO_2 \text{ reduction in place } A = CO_2 \text{ reduction in place } B,$$

and, as a corollary,

$$EUA \text{ produced in place } A = EUA \text{ produced in place } B.$$

35. Carbon businesses under competitive pressure are thus free to choose the cheapest sites for "reduction production".

Offsets make possible a further abstraction from place, since

$$CO_2 \text{ reduction in place } A = \text{offset in place } C.$$

That is, offsets take the "spatial fix" of cap and trade (which moves pollution around the "capped" landscape to wherever it is cheapest to abate) one step further, to territories not covered by caps, notably the global South, where carbon cleanup is even cheaper (Bond 2010a, Bond 2010b).

36. The foundational equation

$$\text{a better climate} = \text{a reduction in } CO_2 \text{ emissions}$$

also immediately permits abstraction from technology type as long as the technologies in question emit (or do not emit) the same number of CO_2 molecules:

$$CO_2 \text{ reduction through technology } A = CO_2 \text{ reduction through technology } B.$$

37. Carbon market investors will thus also tend to be indifferent to technology choice, selecting the instrument that gives the best cost value per CO_2 molecule emitted over the short term and commensurating different historical pathways associated with the adoption of different types of technology. More indirectly, the focus on molecules rather than historical trajectory encourages an

abstraction from time:

$$CO_2 \text{ reduction at time } A = CO_2 \text{ reduction at time } B.$$

In the EU Emissions Trading Scheme, for example, pollution permit banking has been introduced in order to avoid undue price volatility and other disruptions.

38. Because CO_2 molecules are the same regardless of whether they originate from the burning or decomposition of vegetation or the burning of unearthed fossil fuels, investors can also make use of the equation

$$CO_2 \text{ of fossil origin} = CO_2 \text{ of biotic origin}$$

in order to benefit from the cost differential between investing in technologies that use less fossil fuels and investing in, say, forest conservation – the latter being, in the words of Sir Nicholas Stern, is a "very good deal" in economic terms. The influential McKinsey and Co. "CO_2 abatement cost curves", for example, are often used to justify the inclusion of forestry projects in carbon markets.

39. Nor need we stop with CO_2. The focus on molecules opens up the possibility of seeking other greenhouse gases for use in the manufacture of the climate commodity, reduction in the emissions of which can be achieved at lower cost. Thus a whole range of CO_2 "equivalents" has been found to CO_2, including methane, nitrous oxide and various chloroflourocarbons including the industrial by-product HFC-23. While all of these compounds are more potent greenhouse gases than carbon dioxide, they behave so differently in the atmosphere, and over such different time spans, that it is a formidable feat of abstraction to quantify their "global warming potential" in comparison to to CO_2. Nevertheless, the Intergovernmental Panel on Climate Change has risen to the challenge, stipulating that, for example, methane is 72 times more potent than carbon dioxide over a 20-year time span, 25 times more potent over a 100-year time span, and 7.6 times more potent over a 500 year period. Fluctuating estimates have also been provided for nitrous oxide and HFC-23 for all three time spans.

40. Carbon markets then further abstract from these figures by discarding the 20-year and 500-year time horizon columns and forgetting about the often enormous "error bands" (in the case of HFC-23, plus or minus 5000). What remains are the equations

$$CH_4 = 25 \; X \; CO_2$$

$$N_2O = 298 \; X \; CO_2$$

and

$$HFC\text{-}23 = 14{,}800 \; X \; CO_2$$

41. In other words, the markets, having abstracted from the climate crisis to CO_2 molecules, now abstract from CO_2 to a highly simplified "carbon dioxide equivalent", or CO_2e, which becomes a new fetish. It becomes even easier to run together, in a seemingly "apolitical" and "self-evident" way, activities with different effects on climate history. Thus ex-World Bank executive Robert Goodland (2010), noting that "domesticated animals cause 32 billion tons of carbon dioxide equivalent, more than the combined impact of industry and energy," can effortlessly draw the conclusion that "replacing livestock products with better alternatives would ... have far more rapid effects on greenhouse gas emissions ... than actions to replace fossil fuels with renewable energy." The cost savings achieved by substituting the new molecular "raw materials" for carbon dioxide are considerable, greatly enhancing opportunities for accumulation. For example, because CH_4 is stipulated to be 25 times more dangerous to climatic stability than CO_2, burning off just one ton of the compound in Mexico can generate saleable rights to release 25 tons of CO_2 in Europe. Wherever methane capture and burning is inexpensive due to economies of scale, businesses are

taking advantage. For instance, more than two dozen giant hog farms operated by Granjas Carroll de Mexico, a subsidiary of the US-based Smithfield Farms, are earning extra revenue by capturing the methane given off by the huge volumes of pig excrement they produce and burning it, and then selling the resulting carbon credits to Cargill International and EcoSecurities. Merely by destroying a few thousand tons of HFC-23, similarly, Quimobasicos of Nueva Leon, Mexico's biggest exporter of pollution rights, is set to sell over 30 million tonnes of carbon dioxide pollution rights to Goldman Sachs, EcoSecurities and the Japanese electricity generator J-Power (UN Risoe Centre 2010). Doing so costs the company something like 3 pesos per ton of CO_2 "equivalent", which, at current prices, it – or the intermediaries it sells to – can then retail abroad for over 200 pesos a ton. Industrial buyers of the pollution rights can in turn then save over 200 pesos a ton by using the rights in lieu of paying fines for not meeting their legal emissions requirements, or over 25 pesos a ton by using them in lieu of EUAs.

42. The full extent of the usefulness of the equation

a better climate = a reduction in CO_2 emissions

for the cheap mass production of climate commodities can only be appreciated by examining in still more detail the constantly-ramifying series of equations for which it is the foundation.

43. One particularly productive element in the cloud of equivalences that make offsets possible is the equation

CO_2e reduction under a cap = "avoided" CO_2e emission outside the cap.

This equivalence allows offset projects that emit greenhouse gases (and most do) to license the emissions of still more greenhouse gases elsewhere – as long as they emit less than "would have been released" in the absence of carbon finance. For instance, capped polluters or carbon traders in Europe can purchase carbon pollution rights from projects that promote coal mining in China, provided that the projects burn off some of the methane that seeps out of the mines, on the ground that by converting methane into carbon dioxide, the projects do less damage to the atmosphere than would have been the case otherwise.

44. Another variant of the equation would allow the forest conservation projects known as REDD (Reducing Emissions from Deforestation and Forest Degradation) to generate carbon credits even if they allowed an *increase* in deforestation, as long as the increase were "less than would have happened otherwise":

CO_2e reduction under a cap = "avoided deforestation" outside the cap.

One NGO, the Optimum Population Trust, is meanwhile inviting private buyers to invest in "pop-offsets" supporting the Trust's population control efforts, using the equation:

CO_2e reduction = "avoided humans" = more condoms.

45. In addition to allowing carbon investment to shift physical location in order to raise profit rates, such equations permit it to move into a fifth dimension of "hypothetical worlds". By channeling capital to "avoided emissions," offset investors make money by, in effect, cleaning up nonexistent worlds and taking credit (literally) for their dirt not having become reality. The dirtier that experts can convince regulators that those nonexistent worlds are, the more capital can be accumulated, both from pollution rights sales and, on the buyers' side, from the resulting delays in investment in no-carbon infrastructure. Indeed, through this logic, governments are incentivized not to enforce or promulgate environmental legislation, since it is by being as dirty as possible that a country creates

the most money-making opportunities from carbon markets. As elsewhere within neoliberal policymaking, the distinction between legal sanctions and market incentives tends to be eroded. To use the algebraic form:

legal sanction = market incentive.

Officially recognized by the UNFCCC, this equation is frequently used to generate additional profits by national and transnational capital.

46. The equation

CO_2e reduction under a cap = "avoided" CO_2e emission outside the cap

also entails other, more subtle, yet equally far-reaching political "equivalences." For example, it follows from this equation that what would have happened in the absence of carbon credit sales is determinate and quantifiable in the same way that CO_2e reductions under a cap are determinate and quantifiable. That is, it becomes a requirement of mass production of the carbon commodity that counterfactual history be given the same epistemic status as actual history, that political debate about alternative futures be treated as arguments about the correctness of technical predictions, and so forth.

47. Many of the equations above, of course, are not the creation of climate markets alone. Indeed, insofar as they are regarded as the answer to the climate crisis, all policies imposing an emissions "cap" – whether there is a "trade" attached or not – embody an underlying CO_2 fetish. So do many other forms of regulation that do not involve a market at all, as well as carbon taxes. Indeed, as early as 1976, long before carbon markets got off the ground, the physicist Freeman Dyson (1976) was "equalizing" all CO_2 whether of fossil or biotic origin in his proposal to use vast tree plantations to soak up industrial emissions, thus abstracting from the different roles of the two types of CO_2 in climate history. Later, in 1990, technocratic environmentalists in the US seeking to assign responsibility for global warming once again acted out the molecular fetish in the course of a project to "equalize" all greenhouse gas emissions whether they originated from Southeast Asian rice paddies or North American SUV manufacture. Still more recently, apologists for carbon capture and sequestration (CCS) have appealed to CO_2 molecule-counting in order to insist on the interchangeability, for climatic purposes, of halting fossil fuel burning and continuing the burning but burying the resulting carbon dioxide in new underground enclosures through a complex machinery of converters and pipelines.

48. But while the equation "a better climate = a reduction in CO_2 emissions" is not unique to climate markets, it is crucial for them because it is the basic material out of which a workable framework for profit maximization is constructed. And it is accumulation, rather than emissions reductions, that is carbon trading's *raison d'etre*. As Patrick Birley, a metals and derivatives exchange veteran who was Chief Executive of the European Climate Exchange until October 2010, explained bluntly, the carbon market (as opposed to the regulatory infrastructure of the "cap" imposed by governments) "doesn't reduce a single tonne of carbon going into the atmosphere. It's got nothing to do with it … Cost savings is the issue" (quoted in Lang 2010).

49. In a final step of commodity construction, the carbon commodity that has been formed by commensurating and aggregating clouds of diverse items such as carbon dioxide emissions reductions in UK power plants, "avoided" nitrous oxide emissions in Korean factories, methane capture in Brazilian landfill sites, hypothetical carbon in Indonesian trees in the year 2040, and so forth is in turn commensurated with more conventional commodities traded in London, Chicago and New York:

CO_2e reductions/offsets = other commodities.

This liquidity-fostering equation is built up bit by bit as carbon commodities are bundled together with oil, wheat and other products in index funds; used as hedges; and so forth. There are now even proposals to use carbon assets as mortgages or collateral for country-to-country loans: the International Emissions Trading Association (IETA) has proposed that carbon credits be used to back "green bonds" issued by Southern countries (with IETA members' paid assistance) to attract private sector investment in low-carbon development under international climate agreements (Suppan 2010, Sullivan 2010).

50. Even without this equation, of course, banks, hedge funds and investment houses can profit from speculating on carbon price movements, the price differential between EUAs and CERs, and so forth. But it is when carbon commodities, represented by colored numbers on LCD screens and progressively entangled with the computer programs of Wall Street, become easily exchangeable with other commodities that, thoroughly assimilated into financial sector activities, they become fully paid-up participants in contemporary capitalism.

51. The imaginary "market for activism" postulated by Douglas Kysar and described above could never succeed because of the impossibility of making its goals a reliable source of capital accumulation. Yet a market based on molecules also does not work. Indeed, the more years of hard work go into constructing and governing such markets, the more richly antagonisms proliferate. For one thing, translating climate damage into prices helps generate a restless dynamic that necessarily leaves engagement with the historical process that could address anthropogenic global warming further and further behind, including the knowledge and other activities that went into protecting the climate in the past and could contribute toward a transition away from fossil fuels in the future. It should surprise no one that, to cite the words of Oxford University energy policy professor Dieter Helm (2010), that the EU Emissions Trading Scheme has moved "from being a means to a carbon end, to being more of an end in itself" and that more than a decade of Kyoto carbon markets "might so far even have contributed to increasing global emissions". Success in commodity formation has meant failure in climate action. Furthermore, just as the creation and quantification of the working day was a major site and instrument of social conflict in early capitalism, so the assemblage of equations that go into the creation of a climate commodity are major sites and instruments of class struggle in today's nascent carbon markets (see Table). Accumulation in the carbon markets takes place, not through "decarbonization" (Bumpus and Liverman 2009), but through forms of dispossession similar to those that characterized the run-up to the recent financial crisis (Harvey 2010).

52. The basic equation

a better climate = a reduction in CO_2 emissions

itself starts the process by creating the conditions for a capitalist commodity only at the cost of taking a step away from the climate problem. This is because reducing emissions and tackling the climate crisis are two different things. For one thing, emissions can be reduced even at the global level, at least in the short term, without any steps being taken that would result in fossil fuels' being left permanently in the ground. The recent financial crisis and industrial slowdown, for example, resulted in more CO_2 emission reductions than all the world's climate markets put together, yet has not changed structural dependence on fossil fuels in any way. Second, no linear relationship between CO_2 reductions and climate benefit exists, meaning that it is impossible to verify that any given quantum of reduction has a given quantum of climate benefit. Third, by equating "survival" and "luxury" emissions, the equation has provoked two decades of criticism from Southern

environmentalists and social movements such as La Via Campesina (Agrawal and Narain 1990).

53. To create tradable rights to emit molecules according to the equation

forced reduction of CO_2 emissions to level c within time period p = tradable right to emit CO_2 up to level c by the end of period p,

rather than coming to grips with industrial ecology and structural change, is to take another step away from the climate issue. First, the fact that governments are both suppliers and regulators of emissions commodities has encouraged rampant rent-seeking and complicated allocation systems that profit, rather than penalize, heavy polluters. The politically powerful fossil fuel users most responsible for anthropogenic climate change (in the Kyoto carbon market, industrialized nations; in the EU ETS, fossil fuel-intensive heavy industry) have lobbied for and received the lion's share of the free assets, resulting in a “polluter earns” rather than “polluter pays” system. In the EU ETS, much of the billions of dollars of pollution rights acquired from governments responding to industry threats to migrate to where carbon costs are lower has gone into further fossil fuel investment.

54. Second, prices, even very high prices, are poor drivers of the long-term structural change demanded by a changing climate. Corporations choose cheaper alternatives, but if alternatives have not been made available through the efforts of governments or other entities with a longer-term view, they cannot be chosen. In addition, successful rent-seeking, together with many other factors, has ensured that carbon prices are both too low and too uncertain to drive even marginal change. Facing a bewildering congeries of signals, carbon market actors have few incentives to behave even in trivially positive ways. For example, not even the one sector that has been consistently short of emissions rights under the EU ETS – electricity generators – has received any incentive to invest in a transition away from fossil fuels. In a “good” scenario, European coal-fired generators' EUA costs would do no more than encourage them to build new natural gas-fired plants (provided they could suppress their uncertainties about long-term gas supplies), while mixed-fuel generators would at best be incentivized to optimize the use of their natural gas plants at the expense of their coal-fired ones. In reality, the situation is even worse. By January 2009, EUA prices had shrunk to a third of the marginal cost of fuel-switching, due to such factors as a fall in natural gas prices, economic depression, and lack of interest from long-sided investors who might be expected to foresee tighter caps in the future but in fact are wary of continuing and unpredictable price volatility and the uncertain political future of carbon markets.

55. The problems multiply further with the succeeding equations. The feats of abstraction involved in the equation

CO_2 reduction in place A = CO_2 reduction in place B,

for instance, are far-ranging. Every factor associated with emissions in a particular place that might make a difference to a global historical trajectory away from fossil fuels is eliminated in favor of price. That includes the greater political influence action might have in place A than place B; the greater influence on technology development a reduction in emissions from a particular industrial process might have in a high-income country where it is more expensive than in a low-income country (Alfredsson 2009); the different global warming effects of locally-specific interactions among greenhouse gases (Jacobson 2009, Farrell et al. 1999, Solomon and Gorman 1998, Travis et al. 2002). The equation also abstracts from the different ecological characteristics of different regions, and the differences in biological effects of pollution between them. Most crucially for popular resistance, it abstracts from wealth and the tendency for pollution to be concentrated in what in the US are called “poorer communities of color”. In other words, it makes it possible to use class and racial differences as a way of making money by capitalizing on the history of

discrimination. As such, its use has provoked opposition from networks of underprivileged communities in North and South alike, ranging from the California Environmental Justice Movement (2010) to India's National Forum of Forest Peoples and Forest Workers (*Mausam* 2008, *Mausam* 2009).

56. By abstracting from technology type, similarly, the equation

$$CO_2e \text{ reduction through technology } A = CO_2e \text{ reduction through technology } B$$

makes it possible, indeed necessary, to make climatically wrong choices in the name of molecule prices – for example, to use routine, cheap efficiency improvements to delay long-term non-fossil investment, or to build destructive hydroelectric dams that do nothing to displace coal and oil (Driesen 2008). By abstracting from the need to break dependence on fossil fuels, with their extraordinary energy density, the equivalence also tends to conceal the land-intensive nature of many attempts to "replace" fossil fuels. Among these are agrofuel schemes in countries such as Brazil and Indonesia as well as wind power projects such as those in Oaxaca's Tehuantepec isthmus, where many indigenous communities have cheaply signed over land to private wind farm developers from Spain and Mexico who profit not only from electricity sales but also from using or selling pollution rights in Europe.

57. The equation

$$CO_2 \text{ of fossil origin} = CO_2 \text{ of biotic origin,}$$

meanwhile, by abstracting from the fact that while all CO_2 molecules are chemically identical, they are not identical in terms of climate history, weakens the effect of emissions caps by allowing less effective cuts in biotic-origin CO_2 to be substituted for fossil-CO_2 reductions. This equation, too, provides "scientific"/economic sanction for extensive land grabs, since many land-based approaches to reducing CO_2 molecule emissions (reduced pastureland conversion, degraded pasture restoration, afforestation, and so forth) fall in favourable places on the "abatement cost curves" formulated by climate economists.

58. McKinsey, for example, calculates that 2 gigatons of CO_2 e could be reduced globally from "slash and burn agriculture conversion" at a cost of less than €2 per ton of CO_2e. The low cost estimate, however, is based on, and legitimates, plans for "primitive accumulation" or "accumulation by dispossession." McKinsey's figures are based on the opportunity cost of not deforesting or degrading land, which in the case of small-scale agriculture, much of whose yield is not sold on the market, can be very low (Dyer and Counsell 2010; Gregersen, El Lakany et al. 2010). They thus favor climate action being taken on land controlled by people who are the poorest in economic terms, who are then likely to be displaced at high human cost (not included in the calculations) and to see their store of knowledge of low-carbon subsistence livelihoods depleted as a result (also not included in the calculations).

59. McKinsey's numbers also abstract from the difference between forest clearing for commercial agriculture on the one hand and, on the other, rotational forest farming that involves subsequent re-growth of forests and storage of carbon. Again, this provides an impetus to deskill forest dwellers. Aritana Yawalapiti, an indigenous leader in the upper Xingu region of Brazil, reported in November 2010 that REDD carbon forestry promoters visiting his territory had told his community that they would have to reduce forest burning if they were to be paid for producing carbon pollution licenses. But, Yawalapiti objected,

"we always burn at a place where we fish, hunt or open a small farmland area … we open a space to farm, we plant, we collect manioc, after some years everything recuperates again … the forest

grows back, while we plant at another place."

Even if such activities, as is sometimes proposed, were supported with carbon payments, the result would be, in effect, an appropriation of the fruits of many generations of carbon-preserving human activity. As Yawalapiti noted,

"How did they explain [it]? … that the smoke goes into the air … that the project would be for that reason … that we should preserve our forest. But what does that mean? We have always preserved our forests. We know about forest, we have knowledge about everything here."

Pirakuma Yawalapiti, another indigenous leader from the region, said,

"They should not pressure us the way they do, [saying] that we will lose unless we [participate in forest carbon markets]. Lose what? I won't lose anything. I am here in the middle of my forest, that I safeguard. … Let's imagine a small farmer. He has a small piece of forest, and so does his neighbor. Then, one day, along comes the carbon business, and it gives him some money. As I understand it, that is very serious, for the carbon market to pay people for that kind of thing. That would eventually harm them, their families and their communities, because the market would allow more pollution. … if it is true that they would be paying us so that they can keep polluting, well, I would not accept that. How could I accept that? That would mean they want to buy us, so we would agree that they could pollute more. … They come here and tell us we must agree to [carbon trading]. But why? Precisely who will get the money? I do not accept the carbon market here in Xingu Park" (Sommer 2010).

As banners carried by Karen indigenous people from Thailand during a demonstration outside the Bangkok climate negotiations in 2009 explained, "people who live with the forest don't want REDD … we conserve forests because forests are life, not a commodity."

60. The internalization of the global warming "externality" in carbon prices, in other words, gives rise to fresh externalities of a familiar kind, as the contradiction between use-value and exchange-value is re-activated at each step. As Nathaniel Dyer and Simon Counsell (2010) comment, the "argument that we need a new economic model to account for [climate change] externalities and to put our economies on a sustainable path" has ironically led to cost-curves which, with their "hidden costs and partial analysis," are "similar to the narrow economic approach that contributed to the problem that we are now attempting to solve."

61. The crucial "offset" equation

$$CO_2e \text{ reduction under a cap} = \text{"avoided"} \ CO_2e \text{ emission outside the cap,}$$

that is,

$$\text{actual } CO_2e \text{ reduction} = \text{counterfactual } CO_2e \text{ reduction,}$$

conceals and engenders yet other forms of the contradiction. By making accumulation dependent not only on finding or postulating, but also if possible on creating, as much greenhouse gas as possible, so that it can then be "avoided", applications of the equation continually generate consequences which, from a climatic and social development perspective, are perverse.

62. First, the equation generates incentives to create more climate-damaging substances so that they can then be cleaned up. This phenomenon is most visible with respect to HFC-23 and N_2O, manufacturing byproducts whose cleanup now often generates more profit for their manufacturers than the primary products of the processes in question (Pearce 2010). But the phenomenon is

general.

63. Second, the equation creates both the incentive and (because of its unverifiability) the opportunity to claim maximally dirty baselines. The consequence is climate damage rather than the climate benefit which was the use-value the commodity was supposed to embody.

64. Third, by giving companies incentives not to obey environmental laws and governments incentives not to promulgate or enforce them, the equation

legal sanction = market incentive

generates sharp opposition from environmental protection movements in countries such as the Philippines, South Africa and Nigeria, where oil companies gain extra profit for supposedly avoiding gas flaring activities that are illegal and unconstitutional anyway (Osuoka 2009, Docena 2010).

65. Fourth, the isolation of a single counterfactual story-line as a background for offset "savings" – a necessary condition for quantification of the offset commodity – treats history deterministically with the exception of the activities of carbon financiers and offset project managers, provoking further resistance (FASE 2003, Suptitz et al. 2004, Gilbertson and Reyes 2009).

66. All of these effects also generate what George Soros calls "reflexivity," in which calculative technologies continually undermine their own efficacy, rendering commodity valuation and commodity production problematic and engendering systemic instabilities (Soros 2008, Li Puma and Lee 2004).

67. Indeed, the combination of extreme simplification and unfathomable complexity which the climate commodity relentlessly generates – and which is exacerbated by attempts to regulate it – should not be entirely unfamiliar: it also appears in the trade in complex financial derivatives that precipitated the recent global financial crisis.

68. As in the financial markets, encouraging quantitative experts to "perfect" formulas for mass-producing commodities has led to a dynamic of continually-regenerating antagonisms. Just as the new financial derivative markets' methods of isolating, measuring, slicing, dicing and circulating diverse types of risk in order to expand credit and leverage ultimately lost touch with the realities of uncertainty, leading, ironically, to a drying up of credit, so carbon markets, by identifying global warming solutions with reductions in an abstract pool of tradable pollution rights which are then linked with 'offsets' manufactured through quantitative techniques, end up blocking pathways toward less fossil fuel dependence, and ultimately constructive climate action. Climate change no less than price uncertainties has proved to be a singularly recalcitrant subject for the headlong, overconfident efforts at commodification characteristic of the neoliberal era.

69. The self-deconstructive tendencies of the carbon commodity are magnified with financialization. For example, just as mortgage-backed securities concealed the economic realities bearing on lower-income neighbourhoods in Cleveland or Miami, so carbon securitization packages, with perhaps even longer value chains, hide the heterogeneous climatic and social impacts and conditions of assemblages of offset projects, exacerbating already intractable challenges of asset valuation (Weissner 2009, quoting Kenneth Rogoff).

70. The artificial and largely "electronic" nature of carbon commodities, moreover, makes it easy for fraudsters to exploit the system; the past two years have already witnessed a string of misdeeds including an attempted nation-scale land swindle (Peel and Harvey 2010), multi-billion-dollar tax

cheats (Chan 2010), double-selling scandals and electronic thefts, including, most seriously, the purloining and illicit sale of millions of CO_2 pollution permits from several European countries and companies between November 2010 and January 2011, forcing temporary closure of the EU ETS (Point Carbon 2011). The "equivalence"

$$EUA = AAU = CER$$

was meanwhile used in 2010 by the Hungarian government, on the advice of Deutsche Bank, as a justification for putting on the market 800,000 CERs that had already been used; the government promised to cancel someday an "equivalent" number of AAUs.

71. The commensuration and aggregation of carbon commodities with other commodities in the financial markets, in addition, and in particular the prospect of their being integrated into index funds attracting large influxes of speculative capital, heightens threats to both subsistence and climate stability. Speculators rushing into carbon could have a disruptive influence on food prices if carbon and food are both bundled into index funds, while, by the same token, climate action could come increasingly under the influence of speculative activity in unrelated sectors as well as the carbon sector. "Green bonds" backed by carbon assets, moreover, instead of recognizing the climate debt the North owes the South, would create a new Southern debt to the North, backed by Southern land and Southern public funds, while encouraging the North to continue using fossil fuels. Because the bonds, "fully commoditizable and tradeable," would be sliced up and recombined according to the "risk" assessed by Northern credit ratings agencies, their value would be determined largely in derivatives markets over which neither Southern countries nor climate experts would have much influence.

EQUATION		**DEVELOPERS**	**WHAT IS ABSTRACTED FROM**	**RESULTING ANTAGONISMS AND CONTRADICTIONS**
	Subsidiary equation			
a better climate = reduction in CO_2 emissions		Sandor, Environmental Defense Fund, AIG, UNCTAD, Chichilnisky, Grubb, Gore, etc.	History, fossil fuel use, politics, uncertainty and indeterminacy of climate dynamics	Inefficacy in tackling cli change
forced reduction of CO_2 emissions to level *c* within time period *p* = tradable right to emit CO_2 up to level *c* by the end of period *p*		Sandor, EDF, Stavins, Grubb, United Nations, European Union, etc.	Private property	Rent-seeking, climatic ine
	capped place A = capped place B		Place, class	Resource grab from weak locations; hot spots; biodi erosion
	technology A = technology B		Technology type	Bad technology choice, cl damage
	time A = time B		Time	Delay, climate damage
	biotic-origin CO_2 emissions = fossil-origin CO_2 emissions	Dyson, etc.	Gas origin, climate history, climate dynamics	Climatic inefficacy, resou grab from Indigenous Pec
	ERU = AAU		Context of bargaining	Climatic inefficacy, tradi scams
CO_2 emissions reductions = CO_2e emissions reductions			Gas type and behavior	Climatic inefficacy, delay
	reduction in CO_2 emissions = 1/25 reduction in CH_4 emissions	IPCC		Resistance to *basureros*, resistance by wastepicker growth in climatically dar megaprojects including co

				mines, industrial pig farm
	reduction in CO_2 emissions = 1/14,800 reduction in HFC-23 emissions	IPCC		Delay, perverse incentives more greenhouse gas proc etc.
	reduction in CO_2 emissions = 1/298 reduction in N_2O emissions	IPCC		Delay, perverse incentives more greenhouse gas proc etc.
CO_2 e reduction under a cap = offset		Kyoto Protocol, Ted Hanisch, FACE Foundation, etc.	Place, counterfactuality, uncertainty, indeterminacy, knowledge	Delay, unverifiability, clim damage, resource grabs, c conflict
	EUA = CER	EU		
	AAU = CER	UN		
	capped place A = uncapped place B			
	CO_2 e emission = "avoided CO_2 e emission"	UNFCCC Executive Board, DNV, TUV Sud, SGS, Ted Hanisch, etc.		Delay, unverifiability, per incentives for more green gas production, climatic d erosion of rule of law, pop opposition
		CO_2 e emission = "avoided deforestation"	Avoided Deforestation Partners, Merrill Lynch, Environmental Defense Fund, Woods Hole, Harvard University, etc.	Place, counterfactuality, uncertainty, indeterminacy, knowledge, climate history, climate dynamics	Climatic damage, land gra loss of knowledge, class c
		CO_2 e emission = "avoided humans" = more condoms	Optimum Population Trust		Climatic damage, class an gender conflict
offset A = offset B				Place, historical and technological context	Unverifiability, climatic d
	Wind farm in Mexico = HFC-23 project in China			
	HFC-23 project in India = hydroelectric dam in Brazil			
	Wind farm in Mexico = hydroelectric dam in Brazil = efficiency project in South Korea			
CO_2 e reductions + offsets = other commodities		Commodities traders, Wall Street, etc.	Commodity use-value	Subprime carbon, food pr volatility, regressive redistribution, class confli climate damage

Table

72. The above helps show why the market-based instruments designed to save costs in climate mitigation known collectively as carbon trading are necessarily counterproductive. The strategic question then becomes how the UNFCCC can help build the most effective possible movements to address the climate threat that is now posed by these markets.

73. The first step in doing so is to acknowledge that carbon markets, and the bulk of current global climate policy, are not fruitfully viewed on the model of a technical process of "problem-solving." They constitute not a rational, cost-saving response to global warming but rather a collection of reflexes loosely aimed at taking advantage of new opportunities for rent-seeking and capital accumulation. It is no accident that the markets' dominant players, architects and potential and actual regulators – including, in addition to European and North American governments and

neoliberal policymakers and their advisers, traders like Goldman Sachs and industries like RWE and Chevron – typically do not even bother trying to defend them against charges that they are environmentally ineffective (Organization for Economic Cooperation and Development 2010, Derwent 2010, Stavins 2010, United States Commodity Futures Trading Commission 2011). Nor are carbon market players typically much concerned about the likelihood that the new carbon markets may not be any more robust or stable than the markets for complex derivatives that helped precipitate the recent financial crash; the weaknesses of carbon commodity valuation techniques have been well-understood for more than 10 years with as yet no appreciable effect on policy.

74. A second step is to recognize that efforts to improve the governance or "regulation" of carbon markets by the UNFCCC or other actors may or may not open up space for effective and democratic climate action. What matters is not whether regulators promulgate more regulations (carbon markets and their commodities have always consisted mainly of regulation; see Stewart 1990), but whether any additional regulations work as a component of a broader movement in the direction of decommodification. Regulations that, by contrast, develop the commodity further by generating more equations like those examined in this paper will merely give the contradiction between use-value and exchange-value more "room to move." For example, regulators and businesses (the distinction is particularly difficult to make out in this market; see Lohmann 2009b) have proposed many additional equivalences and surveillance procedures in order to make plausible the problematic equation

$$\textit{actual } CO_2e \textit{ reduction} = \textit{counterfactual } CO_2e \textit{ reduction}$$

by providing criteria for determining when a carbon offset project goes beyond "business as usual." Predictably, however, the consequence has only been further complexities and antagonisms, whose effect has been to reinforce the supply-side dominance in the offset markets of large polluting corporations in the global South, who are better able than others to devote resources to navigating the growing regulatory and planning mazes. Corporations such as Sasol, Mondi, Rhodia, Tata, Birla, Jindal and so forth thus can continue to use the equation to gain additional revenues for activities that reinforce fossil fuel use in countries such as South Africa, Korea or India.

75. Because this effect, logically speaking, should itself enter into calculations of carbon saved and lost, Keynesian or Sorosian "reflexivity" again rears its head, putting additional impossible demands on offset accounting.

76. To take another example, the regulatory principle according to which development projects must obtain the free prior informed consent of affected communities becomes virtually useless once "climate mitigation" has been globalized through carbon offset projects. A forestry project in Australia selling pollution licenses to Conoco, for example, would have to obtain the consent not only of the affected community in Australia, but also all of the communities affected by Conoco operations in other parts of the world – clearly an impractical requirement. In this context, to interpret criticism of the equations sketched in this paper as a demand for them to be "fixed" and "elaborated" is self-deluding. Like other acts of "internalization," carbon market regulation that relies on "more and better" commodification merely creates new "externalities," making climate policy even more counterproductive than it already is.

77. Only those regulations that limit or reduce commodification have much of a chance of limiting the damage carbon markets do, or better, of playing a (small) part in the longer-term project of moving policy away from carbon trading entirely toward climate policies that could achieve the relevant social and environmental objectives.

78. As is suggested by the taxonomy of equations discussed in this article, commodification and

decommodification have many forms and degrees, and even governments that work within a carbon trading framework are sometimes forced to undertake modest decommodification projects that, on a long-term strategic view, can be seen as unwitting outriders of a larger struggle toward more thoroughgoing decommodification. For example, following scandals over pollution rights manufactured through HFC-23 destruction, the EU has recently decided to limit the application of the equation

$$HFC\text{-}23 = 14{,}800 \; X \; CO_2$$

by banning HFC-23 credits from sale from 2013. Following other scandals and controviersies, governments are also moving in an uncoordinated way to undermine the equation

$$EUA = CER = AAU.$$

79. There is also a growing consensus among experts that offsets should be abolished – which can be conceptualized as an attempt to deactivate the equation

$$CO_2e \text{ reduction under a cap} = \text{offset outside the cap.}$$

80. More generally, regulators are under considerable pressure to move in the direction of decommodification by restricting

- *Who* can sell or buy carbon commodities and for what reason – for instance, moves to restrict access of speculators to the markets.
- *What* traders can sell or buy – for instance, moves to get rid of HFC-23 and N_2O credits, restrict the exchangeability of allowances, or limit securitization.
- *Where* they can sell or buy the commodity – for instance, restrictions on over-the-counter trading or on trading technology.
- *When* they can sell or buy – for instance, limits on limiting banking and borrowing.
- *How* traders can sell or buy – for instance, rules that would restrict the velocity of trading.

Such moves toward “less and better” commodification, because they shrink the scope of carbon trading and thus reduce its factitious “efficiency” as well as the opportunities it provides for the financial sector, are bound to continue to rouse the opposition of some of the most powerful actors in the carbon markets, including many big polluters, as well as the more doctrinaire market architects. With sufficient resolve, the Parties to the UNFCCC can both anticipate and minimize the effects of this opposition.

81. In this and other respects, regulatory moves that happen to throw obstacles in the path of commodification can coincide with, and ultimately reinforce, more general decommodification campaigns.

82. Yet while certain types of regulation may play an incidental part in a political movement toward decommodification of the globe's carbon-cycling capacity, they cannot substitute for it. A more strategic, encompassing focus on decommodification of climate benefit is essential, following the leadership of the growing movements worldwide challenging the commodification of water, electricity, health services and fossil fuels, as well as movements for improved land rights, labor rights, tax reform, alternative energy, alternative transport and food sovereignty.

REFERENCES

Agrawal, Anil and Sunita Narain (1991) *Global Warming in an Unequal World: A Case of Environmental Colonialism*, Centre for Science and Environment, New Delhi.

Alfredsson, Eva (2009) "Perspectives on Cost Efficiency and Technological Change", Presentation at Swedish Society for Nature Conservation, Stockholm, 12 September.

Anderson, K. (2009), Testimony before the UK Parliamentary Environmental Audit Committee, 23 June, http://www.parliamentlive.tv/Main/Player.aspx?meetingId1⁄44388.

Arthur, W. Bryan (1994) *Increasing Returns and Path Dependence in the Economy,* Cambridge University Press, Cambridge.

Bakan, Joel (2004) *The Corporation,* Free Press, New York.

Barnes, Peter (2006) *Capitalism 3.0: A Guide to Reclaiming the Commons*, Berrett-Koehler, San Francisco.

Barreda, Andres (2010) Personal communication.

Bohm, Steffen and Dabha, Siddhartha (eds.), *Upsetting the Offset: The Political Economy of Carbon Markets*, London, Mayfly Books, 2010, http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/UpsettingtheOffset.pdf.

Bond, Patrick (2010a) "Climate Justice Politics across Space and Scale", *Human Geography* 3(2): 49–62.

Bond, Patrick (2010b) "Carbon Trading, New Enclosures and Eco-Social Contestation", *Antipode*.

Bond, Patrick and Dada, Rehana, *Trouble in the Air: Global Warming and the Privatized Atmosphere*, Durban, University of KwaZulu-Natal Press, 2007, http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/trouble.pdf.

Brinkley, Andres and Simon Less (2010) "Carbon Omissions: Consumption□Based Accounting for International Carbon Emissions", Policy Exchange, London.

Bullock, Simon, *A Dangerous Distraction: Why Offsetting is Failing the Climate and People – The Evidence,* London, Friends of the Earth, 2008, http://www.foe.co.uk/resource/briefing_notes/dangerous_distraction.pdf.

Caffentzis, George (2004) "A Tale of Two Conferences: Globalization, the Crisis of Neoliberalism and Question of the Commons", presentation at the Alter-Globalization Conference, San Miguel de Allende, Mexico, 9 August.

Caffentzis, G. (2008) 'A Discourse on Prophetic Method: Oil Crises and Political Economy, Past and Future', *The Commoner* 13: 53–71.

California Environmental Justice Movement (2010) *EJ Matters website,* http://www.ejmatters.org/EJ%20Matters%20Website/index.html.
Clifton, Sarah-Jayne, *A Dangerous Obsession: The Evidence against Carbon Trading*, London, Friends of the Earth, 2009, http://www.foe.co.uk/resource/reports/dangerous_obsession.pdf.

Callon, Michel (1998) “An Essay on Framing and Overflowing: Economic Externalities Revisited by Sociology” in Callon, M., *The Laws of the Markets*, Blackwell, Oxford, pp. 244-69.

Chan, Michelle (2010) *10 Ways to Game the Carbon Markets,* San Francisco, Friends of the Earth, http://www.foe.org/sites/default/files/10WaystoGametheCarbonMarkets_Web.pdf.

Derwent, Henry (2010) “What's Wrong with Emissions Trading?”, Institute of Directors Lecture, Geneva, 30 September.

Docena, Herbert, *The CDM in the Philippines: Costly, Dirty, Money-making Schemes,* Bangkok, Focus on the Global South, 2010, http://www.thecornerhouse.org.uk/resource/clean-development-mechanism-philippines.

Driesen, D.M. (2008), ‘Sustainable Development and Market Liberalism’s Shotgun Wedding: Emissions Trading under the Kyoto Protocol’, *Indiana Law Journal*, 83 (1), pp. 21–69.

Driesen, D.M. and A. Sinden (2009) ‘The Missing Instrument: Dirty Input Limits’, *Harvard Environmental Law Review* 33(1): 65–116.

Dukes, J.S. (2003) ‘Burning Buried Sunshine: Human Consumption of Ancient Solar Energy’, *Climatic Change* 61: 31–44.

Dyer, Nathaniel and Simon Counsell (2010) “McREDD: How McKinsey ‘Cost-Curves’ are Distorting REDD”, Rainforest Foundation, London, November.

Falkowski, P., R.J. Scholes, E. Boyle et al. (2000) ‘The Global Carbon Cycle: A Test of Our Knowledge of Earth as System’, *Science* 290 (5490): 291–6.

Farrell, Alex, Robert Carter, and Roger Raufer (1999) “The NOx Budget: Market-Based Control of Tropospheric Ozone in the Northeastern United States,” *Resource and Energy Economics* 21: 103-124.

FASE et al. (2003). Open letter to executives and investors in the Prototype Carbon Fund, Espiritu Santo, 23 May.

Frischmann, B.M. and M.A. Lemley (2006) ‘Spillovers’, *Columbia Law Review* 107: 257–301.

Gallagher, Emily (2009) “The Pitfalls of Manufacturing a Market: Why Carbon Will Not Just Sit Down, Shut Up, and Behave Like a Proper Commodity,” New America Foundation, 14 July.

Gilbertson, Tamra and Reyes, Oscar, Carbon Trading: *How It Works and Why It Fails* (available also in Spanish as *El Mercado de Emisiones: Cómo Funciona y por qué Fracasa*), Uppsala, Dag Hammarskjold Foundation, 2010, http://www.thecornerhouse.org.uk/resource/carbon-trading and http://www.carbontradewatch.org/downloads/publications/mercado_de_emisiones.pdf.

Goodland, Robert and Anhang, Jeff (2010) “Livestock and Climate Change”, *Worldwatch*, November/December: 10-19.

Gregersen, Hans, Hosny El Lakany, Alain Karsenty and Andy White (2010) “Does the Opportunity Cost Approach Indicate the Real Cost of REDD+? Rights and Realities of Paying for REDD+”, Rights and Resources Initiative, Washington.

Haberl, H. (2006) 'The Global Socioeconomic Energetic Metabolism as a Sustainability Problem', *Energy* 1(1): 87–99.

Harvey, David (2010) *The Enigma of Capital and the Crises of Capitalism*, Profile Books, London.

Haya, B. (2007), Failed Mechanism: How the CDM is Subsidizing Hydro Developers and Harming the Kyoto Protocol (Berkeley: International Rivers), http://www.internationalrivers.org/files/Failed_Mechanism_3.pdf [accessed 1 August 2009]).

Helm, David (2010) "Government Failure, Rent-Seeking, and Capture: The Design of Climate Change Policy", *Oxford Review of Economic Policy* 26(2): 182–196.

International Forum on Globalization (IFG) (2008) 'Towards a Global Climate Fund'. Climate Strategy Session on Copenhagen's Economic Architecture, Washington, DC (15–16 November). International Forum on Globalization Working Group, http://www.ips-dc.org/articles/towards_a_global_climate_fund.

Jacobson, Mark Z. (2009) "Effects of Local CO_2 Domes and of Global CO_2 Changes on California's Air Pollution and Health," testimony before the Environmental Protection Agency Hearing on the California Waiver, Washington, 5 March.

Kill, Jutta and Pavett, Steven, *Trading Carbon: How it Works and Why it is Controversial,* Moreton-in-Marsh, FERN, 2010, http://www.thecornerhouse.org.uk/resource/trading-carbon.

Douglas Kysar (2010) "Not Carbon Offsts, but Carbon Upsets", *The Guardian*, 29 August 2010.

Lanchester, J. (2009) 'It's Finished', *London Review of Books* 28 May: 3–9.

Lang, Chris (2010) "What is Carbon Trading for?", REDD-Monitor, Jakarta, 7 July. http://www.redd-monitor.org/2010/07/07/what-is-carbon-trading-for/.

LiPuma, Edward and Benjamin Lee (2004), *Financial Derivatives and the Globalization of Risk* (Durham, NC: Duke University Press).

Lohmann, Larry (2005) "Marketing and Making Carbon Dumps: Commodification, Calculation and Counterfactuals in Climate Change Mitigation", *Science as Culture*, Vol. 14, No. 3, pp. 203-235.

Lohmann, Larry (ed.) (2006) *Carbon Trading: A Critical Conversation on Climate, Privatization and Power*, Dag Hammarskjold Foundation, Uppsala, http://www.thecornerhouse.org.uk/resource/carbon-trading-0.

Lohmann, Larry (2008) "Carbon Trading, Climate Justice and the Production of Ignorance: Ten Examples", *Development*, Vol. 51, No. 3 (2008) pp. 359–365, reprinted in a French translation by Marie Koczorowski as "Commerce du carbone, justice et ignorance" in *Ecologie et Politique* No. 39 (2009), pp. 135-45; in a Finnish translation in Outi Hakkarainen and Mira Kakkonen (eds.), *Kenan Ilmasto?*, Into Kustannus, Helsinki, 2010; and in a Swedish translation in *Le Monde Diplomatique* (forthcoming 2010).

Lohmann, Larry (2009a) "Climate as Investment," *Development and Change* Vol. 40, No. 6 (2009), pp. 1063-1083.

Lohmann, Larry (2009b) "Regulation as Corruption in Carbon Offset Markets," in Trusha Reddy (ed.), *Carbon Trading in Africa*, Institute for Security Studies, Cape Town (forthcoming 2010),

reprinted in Steffen Bohm and Siddhartha Dabha (eds.), Upsetting the Offset: The Political Economy of Carbon Trading, Mayfly Books, London (2010), pp. 175-191.

Lohmann, Larry, "Neoliberalism and the Calculable World: The Rise of Carbon Trading", in Kean Birch, Vlad Mykhnenko and Katherine Trebeck (eds.), *The Rise and Fall of Neoliberalism: The Collapse of an Economic Order?,* London, Zed Books (2010), reprinted in Steffen Bohm and Siddhartha Dabha (eds.), *Upsetting the Offset: The Political Economy of Carbon Trading*, Mayfly Books, London (2010), pp. 25-37 and, in Polish translation, in *Przeglad Anarchistyczny*, No. 12 (forthcoming 2010).

Malueg, D.A. (1989), 'Emissions Credit Trading and the Incentive to Adopt New Pollution Abatement Technology', *Journal of Environmental Economics and Management*, 16 (1), pp. 52–7.

Mausam: Indian Climate Change Magazine (2008), http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Mausam_July-Sept2008.pdf.

Mausam: Indian Climate Change Magazine (2009), http://www.thecornerhouse.org.uk/sites/thecornerhouse.org.uk/files/Mausam2-5.pdf.

Mitchell, T. (2002) Rule of Experts: Egypt, Technopolitics, Modernity. Berkeley, CA: University of California Press.

Mitchell, T. (2009) "Carbon Democracy", *Economy and Society* 38(3): 399-432.

Organization for Economic Cooperation and Development (2010) "Scaled-Up Market Mechanisms – What is Needed to Move Forward? A Summary of Recent OECD/IEA Analyses", OECD, Paris.

Osuoka, Isaac (2009) "Paying the Polluter? The Relegation of Local Community Concerns in 'Carbon Credit' Proposals of Oil Corporations in Nigeria", ms., April.

Panitch, L. and M. Konings (2009) 'Myths of Neoliberal Deregulation', *New Left Review* 57: 67–83.

Pearce, Fred (2010) "Carbon Trading Tempts Firms to Make Greenhouse Gas", *New Scientist*, 16 December.

Peel, Michael and Fiona Harvey (2010) "Police Probe as Carbon Deal Hit by Bribe Accusation," Financial Times, 4 June, http://www.ft.com/cms/s/0/3e9cb276-6f47-11df-9f43-00144feabdc0.html.

Point Carbon (2010) 4 June, 8 June, 15 July.

Point Carbon (2011) 19 January, 24 January.

Prins, G. and Rayner, S. (2007), 'Time to Ditch Kyoto', *Nature* 449, pp. 973–5.

Robertson, M. M. (2004). 'The Neoliberalization of Ecosystem Services: Wetland Mitigation Banking and Problems in Environmental Governance', *Geoforum* 35(3): 361-373.

Solomon, B.D. and Gorman, H.S. (1998) "State-Level Air Emissions Trading: The Michigan and Illinois Models", *Journal of the Air Waste Management Association* 48 (12): 1156–1165.

Sommer, Rebecca (2010) "Pirakuma Yawalapiti, Xingu Spokesperson, about Carbon Trading",

video interview, Xingu River, Brazil, http://www.youtube.com/watch?v=_JSM6gaM9CA, http://www.youtube.com/watch?v=JMs3szvzfeA&feature=related.

Soros, George (2008), *The New Paradigm for Financial Markets: The Credit Crisis of 2008 and What it Means*, Public Affairs, New York.

Stavins, Robert (2010) "What Happened (and Why): An Assessment of the Cancun Agreements", Harvard University Belfer Center for Science and the Environment, Cambridge, MA, 13 December.

Stern, N. (2009) 'An Outline of the Case for a "Green" Stimulus'. London School of Economics', http://www.lse.ac.uk/collections/granthamInstitute/publications/An%20outline%20of%20th e%20case%20for%20a%20%27green%27%20stimulus.pdf.

Stewart, R. B. (1990) 'Privprop, Regprop, and Beyond', *Harvard Journal of Law and Public Policy* 13.

Sullivan, Sian (2010) "The Environmentality of 'Earth Incorporated': On Contemporary Primitive Accumulation and the Financialisation of Environmental Conservation", paper presented at the conference An Environmental History of Neoliberalism, Lund University, 6-8 May.

Suppan, Steve (2009), 'Speculating on Carbon: The Next Toxic Asset', Institute for Agriculture and Trade Policy, http://www.iatp.org.

Suppan, Steve (2010) 'Trusting in Dark (Carbon) Markets? The UN High-Level Advisory Group on Climate Finance', Minneapolis: Institute for Agriculture and Trade Policy.

Suptitz, A. P. L. et al. (2004). Open letter to the Clean Development Mechanism Executive Board, Minas Gerais, June.

Taylor, M., Rubin, E.L. and Hounshell, D.A. (2005), 'Regulation as the Mother of Invention: The Case of SO2 Control', *Law and Policy*, 27 (2), pp. 348–78.

United Nations (2010) 'CDM Pipeline'. United Nations Environment Programme and Risoe Centre, http://www.cdmpipeline.org.

United States Commodity Futures Trading Commission (2011) "Report on the Oversight of Existing and Prospective Carbon Markets", Interagency Working Group for the Study on Oversight of Carbon Markets, Washington, 18 January.

Unruh, G. C. (2000) "Understanding Carbon Lock-In", *Energy Policy* 28: 817–830.

Weissner, Rebecca (2009) "Tax Carbon Rather than Trade in It", *The Australian*, 17 October.