Submission
to the
Senate Select Committee on Climate Policy

Inquiry into Policies Relating to Climate Change

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Summary

Carbon trading would be a very poor choice as a central policy for reducing Australia's carbon pollution, and an even poorer one as a contribution to a global solution to climate change. This is because it creates overall long-term disincentives for investment in clean energy and low-emission technology, and more fundamentally for setting Australia on a long-term pathway away from fossil fuel dependence. These disincentives arise largely as a result of carbon trading's design focus on saving industry money in meeting short-term emissions targets. The failure of carbon trading to incentivize the first steps toward a long-term non-fossil pathway also stems, even more fundamentally, from its reliance on price signals, which are unable by themselves to spur structural change of the kind demanded by the climate crisis, and in carbon trading's case are also, especially following the financialization of the carbon trading industry, vulnerable to bubbles and crashes of the type familiar from the ongoing credit crunch. In addition, carbon trading interferes with other measures for meeting emissions targets, such as renewable energy feed-in laws, energy efficiency support, and local efforts to develop or preserve low-carbon livelihoods. No carbon trading scheme of any kind is capable of sending appropriate investment signals for green collar jobs, research and development, and the manufacturing and service industries. It is not possible to remove these disincentives for constructive climate action from carbon trading, because they are an essential part of its design. In this respect, carbon trading is not remediable by reform or regulation.

1. Like financial derivatives markets, carbon markets isolate, objectify and construct a new product, which can be conceptualised in various ways ("carbon" is a misnomer in this context). One way of characterizing the product is to say that it is a commodification of climate benefits/disbenefits, which must necessarily be constructed as discrete, divisible, quantifiable and commensurable. Governments then decide supply levels, rendering the commodity more or less economically scarce, and either sell it or, more usually, give it away to large industrial polluters. Trade in the commodity, according to economic assumptions currently under challenge, is then

supposed to make climate change mitigation maximally efficient. Another way of conceiving of the commodity is to say that it consists of universally fungible greenhouse gas pollution rights backed by an implicit government guarantee that an optimal "climatically safe" amount of total rights in circulation can be, in principle, both specified and mandated.

2. The overall process by which a commodity for the carbon markets is assembled is summarized in Fig. 1.

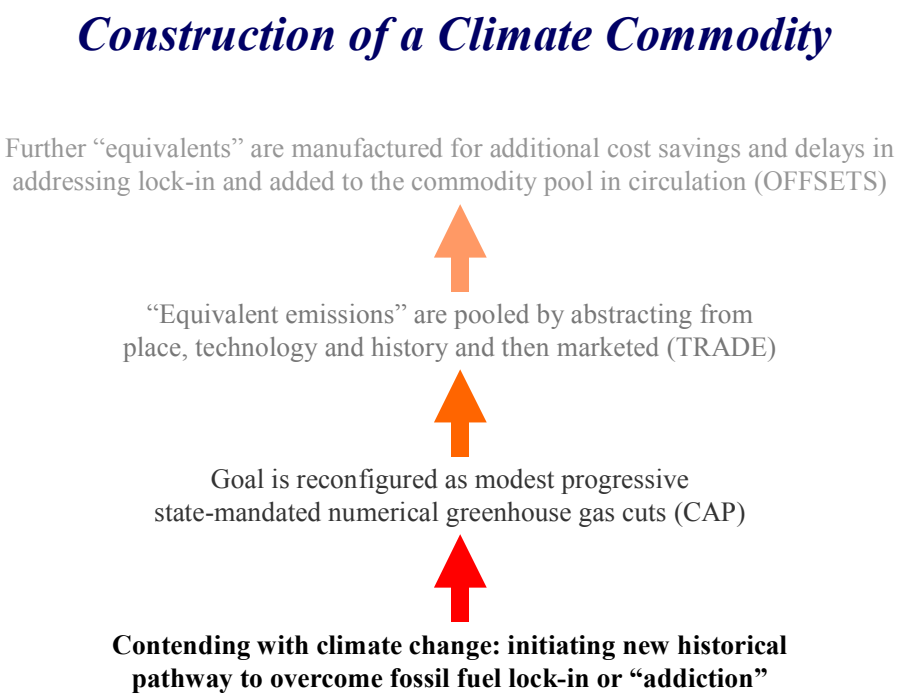

Fig. 1

3. In the crucial first stage, climate crisis mitigation is translated into measurable, divisible greenhouse-gas "emissions reductions". An individuated, tradeable commodity (a "thingified" climate benefit/disbenefit) is created whose "efficient" allocation in the form of pollution rights can become a programme for action ("cap and trade" or emissions trading proper), and whose status as asset, grant, or financial instrument is engineered to fit various accounting standards.[1]

4. A second class of divisible, measurable, thing-like climate-benefit units called "offsets" is then developed to be pooled together with "reductions", partly in order to enable wealthy industries and states further to delay reducing their own emissions, again in the name of "efficiency". These offsets are manufactured by special projects that are claimed to result in less greenhouse gases accumulating in the atmosphere than would be the case in the absence of carbon finance, such as tree plantations (which are supposed to absorb carbon dioxide emissions) or fuel switches, wind farms and hydroelectric dams (which are argued to reduce or displace fossil energy). In theory, "project-based" credits, no matter what their origin, are to be fungible with the emissions allowances distributed in the North. Indeed, in a sort of commensuration-

by-fiat, Articles 3 and 12 of the Kyoto Protocol stipulate, without argument, that these offset credits are *identical* with emissions reductions, thus legislating into existence a new, abstract, nonsituated, omnibus category of reductions/offsets. The new abstract entity is strictly analogous to the disembedded, aggregated category of "risk" conjured up by the uncertainty markets that played such a central role in the ongoing financial crisis.

5. The resulting markets do not provide incentives for moving away from fossil fuel dependence. On the contrary, they are explicitly designed in a way that helps keep the wheels on the fossil fuel industry. In particular, they do not provide good incentives for long-term investment in the innovative clean energy and low-emission technologies that are required. To understand why, it will be useful to consider the two components of carbon trading – cap-and-trade and offsets – one by one.

6. To begin with cap and trade: the emissions cap, which does the environmental work of cap and trade, is imposed by government regulation and is represented by the ovals of Fig. 2.

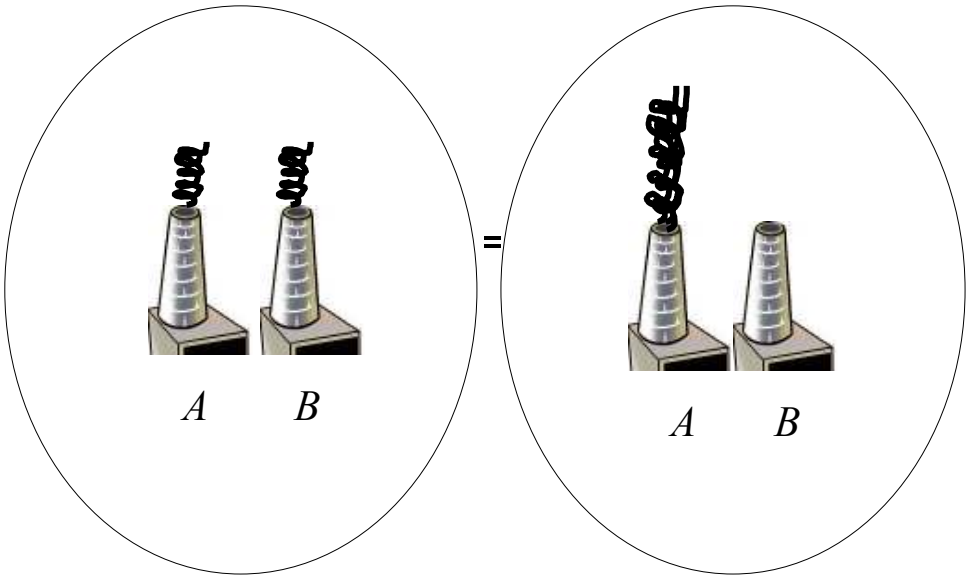

Fig. 2

One conventional way of achieving that cap is to dictate limits to how much each industrial installation covered by the scheme (represented by A and B) is allowed to pollute. If the overall cap on a sector's emissions is 100 tonnes annually, for example, the government might require A and B to limit their emissions to 50 tonnes a year each. The "trade" of cap and trade, however, promises to make achieving the overall cap cheaper for both A and B, and thus, so the theory goes, for society as a whole; this is the component that achieves the efficiency objective. Suppose, for example, that before the cap represented by either oval in Fig. 2 was imposed, A and B each produced 100 tonnes of pollution a year. Suppose further that it is expensive for A to reduce its emissions to 50 tonnes but cheap for B to do so. Suppose, in fact, that it is cheaper for B to reduce its emissions to zero than it is for A to reduce its emissions at

all. In that case, the better economic choice is to allow B to make A's reductions for A. Installation A can be allowed to continue pollution as usual provided that it pays B to reduce B's emissions to zero. Assuming that the price that B charges for the necessary pollution permits is more than B's cost of reducing emissions to zero, yet less than A's cost of reducing emissions to 50 tonnes, B makes money from the deal at the same time that A saves money. Both come out ahead – yet the same environmental goal of limiting overall pollution to 100 tonnes a year is met. No matter how big government regulation draws the oval, the cost of keeping pollution within that oval will be lowered by emissions trading. Governments will thus be able to ratchet down the emissions cap (that is, draw smaller and smaller ovals) each year, as in the hypothetical case represented in Fig. 3, believing that they are doing so in the cheapest way possible.

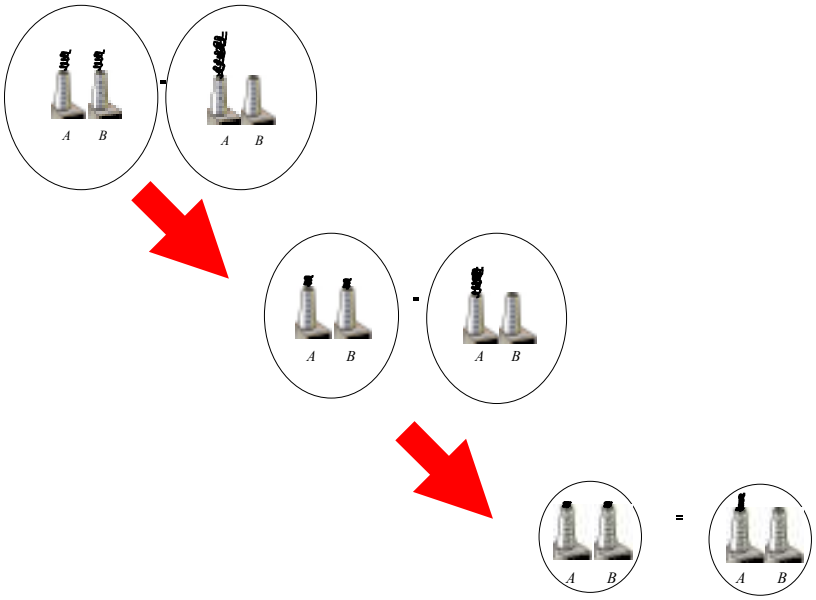

Fig. 3

7. This programme of commodity formation at once disembeds the climate problem from the challenge of initiating a new historical pathway to overcome current dependence on fossil fuels, which are by far the major contributor to human-caused climate change. The elegant equation of Fig. 2 makes a market possible only by undermining the potential for effective long-term action against global warming. Part of the problem lies in the assumption that setting a series of steadily more stringent emissions targets constitutes a plan for stabilizing the climate. It does not. Emissions reductions programmes can be set in motion without any steps being made that would ultimately result in ensuring that most remaining fossil fuels remain in the ground – the overriding goal of any rational climate policy. Numerical emissions targets, no matter how ambitious, are no substitute for historically-informed political programmes to set industrialized societies on pathways toward the required structural social and technological changes. Whether emissions reductions have anything to do with addressing global

warming depends on *how* those reductions are made. This is precisely the question that cap and trade (and its variants such as cap and auction) are designed to ignore: cap and trade ignores the fact that cutting a hundred million tonnes of emissions today through routine efficiency improvements that leave a fossil-fuelled infrastructure as it is will have long-term emissions (and climatic) consequences very different from cutting a hundred million tonnes today through investment in renewable technologies with a high potential for wide adoption, or through initiating radically different ways of organizing food production.[2]

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

9. Of course, cap and trade also provides plentiful incentives for many "B" industries – including those that may be dirty now but have the advantage of being less structurally addicted to fossil fuels – to develop lower-carbon ways of doing business as fast as they can. It also gives independent businesses reasons to develop new low-carbon technologies to sell to the "A"s, the industries heavily addicted to fossil fuels. The increasing availability of superior technologies incentivized in this way, the argument goes, might make up for the incentives for delay that are also built into cap and trade. Sound business sense, however, virtually guarantees that the overall effect of cap and trade will be delays, together with less of the social or technological innovation of the crucial type than would be possible with more targeted forms of investment and regulation. Smart businesses that attempt to profit from selling carbon pollution rights will concentrate on realizing the cheapest opportunities for emissions reductions first, regardless of whether they lead to long-term structural change away from fossil fuels.[3] Cap and trade's goal of reaching modest numerical emissions targets cheaply is simply not the same as the goal of mitigating global warming, which entails taking immediate steps[4] toward a radical structural break with the deeply rooted dependence industrialized societies have on fossil fuels. In economic jargon, cap and trade is indifferent to "lock-in"[5] and the resultant need to go beyond economic "optimisation" in addressing structural problems such as global warming. "[L]owering cost does not increase incentives for valuable innovation," concludes emissions trading expert David Driesen, noting that

there is "a tradeoff between short-term cost effectiveness and investment in ... long-term economic and environmental progress."[6]

10. Such conclusions echo those of economists such as W. Brian Arthur, who suggest that in contexts in which increasing returns are significant, leaving research and development of critical technologies largely to private firms incentivized by price – one of the premises of the carbon market – cannot guarantee that the "fittest technology in the long run sense will be the one that survives."[7] The dislodging of path-dependent systems, as Gwyn Prins and Steve Rayner observe, "is usually initiated by quite unexpected factors resistant to being accounted for in advance". Carbon prices are unlikely to be able to "deliver the escape velocity required to get investment in technological innovation into orbit, in time," particularly in the absence of a "significant increase in publicly funded research and development for clean energy technology and changes to innovation policies."[8] Other economists note that while they may be "quite effective for introducing changes on the margin … there is little evidence of price incentives inducing a fundamental transformation in the economy or society."[9] The carbon price, argues Jim Watson of the Energy Group at Sussex University,

"… is a very poor weapon in what is supposed to be a war to save humanity … Governments are relying way too much on the price of carbon to deliver everything … It has to go hand in hand with regulations and technological developments, and they are sadly lacking … The oil price shocks of the 1970s didn't wean us off oil, so why should we believe that a high carbon price will wean us off carbon?"[10]

Putting a price on carbon emissions through tradable permits or even a carbon tax, agrees economist Jeffrey Sachs of Columbia University in a recent *Scientific American*, will not deliver needed emissions reductions nor "lead to the necessary fundamental overhaul of energy systems".[11] While prices can give economic actors reasons for choosing one option rather than another, they are of less use if those options have not already been made available through dedicated public investment programmes, redirected research and development and the like. No matter how high petrol prices rise, for example, motorists will not switch to public transport unless an attractive and comprehensive public transport system is available. Prices are not omnipotent: they have never brought about the sweeping type of technological and social change needed to tackle the global warming crisis. Even the highest prices are usually incapable of incentivizing technological change unless they are imposed toward the tail end of an extensive and lengthy background of development and social and political commitment.

11. To put the point in a way that connects it more closely to the financial crisis, systemic risk escalates when incentives for structural change in the polluting buying sector are blocked. The project of finding a "cost-effective way of addressing global warming" through carbon markets becomes incoherent insofar as creating the market framework necessary to make sense of the notion of "cost-effectiveness" entails losing touch with what is supposedly being costed. Insofar as cap and trade disincentivizes, not incentivizes, the social and technological changes needed, it can hardly be said to provide a cost-effective means for achieving those changes. As leading climate scientist James Hansen has recently remarked, "cap and trade would practically guarantee disastrous climate change for our children and grandchildren."[12]

12. The US's pioneering cap and trade system for achieving cost savings in reducing sulphur dioxide – which was the main model for the Kyoto Protocol and subsequent carbon trading systems – offers some empirical illustration of the point. According to staff of the Environmental Protection Agency, speaking in their personal capacity, "the few and relatively minor experiments in emissions trading in our country have produced virtually no technological innovation, much less the kind of innovation necessary to power our economy on renewable resources rather than fossil fuels."[13] The sulphur dioxide trade may or may not have saved money in attaining limited reduction goals, but in any case it did not foster technological innovation of the type that would be relevant to the climate crisis.[14] Los Angeles's Regional Clean Air Incentives Market, to cite another example, appears to have sidelined developments in fuel cells, low-emitting burners and turbines that had previously been subsidised by a percentage of car registration fees, and the failure of at least one emerging method of reducing nitrogen oxides to break into the market can be attributed to the "spatial flexibility" provided by trading, which allowed emitters to ignore innovative but still expensive technology options.[15] Innovations under the "bubbles" of early US pollution trading programs also tended merely to be rearrangements of conventional technologies rather than the invention, development or commercialisation of technologies likely to be useful for achieving a longer-term social or environmental goals.[16]

13. Cap and trade may also interfere even more directly with technological renewal. For example, the UK government openly admits that because large-scale energy producers "are covered by the EU Emissions Trading Scheme," official renewables strategy has no provisions for setting large-scale energy production on a non-fossil fuel technological path.[17] A leaked document suggests, in addition, that one reason that the British government is reluctant to pursue renewable energy targets is that they would threaten EU ETS carbon prices and the survival of the London financial district's growing carbon trading industry.[18] Article 26 of the EU Emissions Trading Directive, meanwhile, bans governments from legislating "inefficient" carbon dioxide emissions limits on energy generators covered by the EU ETS.[19]

14. Despite the irremediable inability of cap and trade to address the crucial structural issues, many advocates of carbon trading continually return to the academic mystique which holds that it ought to be possible to incentivize effective climate action primarily by price: that in theory, at least, somewhere there must be an ideal "Goldilocks" range of carbon prices, high enough to select for "the necessary fundamental overhaul of energy systems"[20] even in the absence of dedicated public investment programmes, redirected research and development and the like, yet not so high that they irreparably damage the profits of the crucial corporations that the system is designed to accommodate. But there are reasons for questioning this mystique in addition to price's inability to incentivize long-term structural changes of the kind required.

15. One lesson comes from the EU ETS, under which initial emissions budgets were absurdly generous. In the first phase, the largest industrial greenhouse gas emitters in Europe were granted more rights to emit greenhouse gases than they needed to cover their current emissions. The result was the carbon market's first big price crash (to

close to zero) in April 2007. Playing some part in this embarrassment were measurement and verification failures involving, among other things, falsified corporate emissions histories, and monitoring and enforcement limitations are likely to continue. Cap and trade demands a far more sensitive, centralized and powerful state apparatus for measurement and enforcement than is needed for conventional regulation,[21] and even in most industrialized countries, the emissions measurements needed to underpin trading, or even to detect compliance with Kyoto targets, are not being made, rendering the existing carbon emissions commodity largely fictitious even in its own terms. As climate change expert Steve Rayner points out, "the cap-and-trade approach relies on underdeveloped monitoring and accounting systems that inevitably leave plenty of wiggle room for unscrupulous speculators to work the system, amassing fortunes while achieving nothing for the atmosphere."[22]

16. Just as significant is the rent-seeking that is also endemic to carbon markets, and that gives them special vulnerability to regulatory capture. Corporations aware that the grants of carbon permits they are being allocated are a lucrative asset (the Kyoto Protocol, the EU ETS, and all other existing cap and trade systems are overwhelmingly "polluter earns" arrangements: the lion's share of pollution rights is simply given away free to the biggest emitters) simply lobby governments for as much as they can get, taking advantage of inadequate emissions verification requirements. Under the EU ETS, accepted accounting procedures meant that electricity generators such as RWE, CEZ and Scottish Power were able to pass on to consumers the nominal "opportunity cost" of withholding their free carbon assets from the market. It is estimated that in five European countries, windfall profits for power generators from cap and trade will reach US$112 billion by 2012.[23] Much of this free money is being ploughed back into long-term fossil fuel investments, further locking in global warming. Environmental groups' inadequate attempts to reduce the damage done by the EU ETS by insisting on permit auctioning, or at least stricter limits on the gift of excess pollution rights to Europe's worst greenhouse offenders, have proved no match for industrial lobbies,[24] who have also not hesitated to deploy lawsuits and diplomatic pressure to resist official attempts to tighten caps.

17. While rent-seeking gives the lie to carbon markets' assumption that governments will be able to set caps in line with scientific findings about the dangers of climate change, there are also deeper reasons for questioning the dependence of cap and trade on state target-setting. This stems from the very assumption, common to all cap and trade schemes, that optimal, "climatically safe" amounts of total emissions rights allowed could be determined in a way that commensurates climate damages with economic gains and losses. In words that could have come from critics of the Black-Scholes option-pricing equation, the Harvard economist Martin Weitzman has recently warned Nicholas Stern about such assumptions:

"the climate-change economist can help most by not presenting a cost-benefit estimate for what is inherently a fat-tailed situation with potentially unlimited downside exposure as if it is accurate and objective – and perhaps not even presenting the analysis as if it is an approximation to something that is accurate and objective …"[25]

18. To the limited extent that caps are nominally being tightened, moreover, "holes" are being punched in them to admit a flood of carbon credits from outside the EU (one

effect of the multi-stage commodity formation process diagrammed in Fig. 1 is that offset credits become mixed with emissions allowances), in effect loosening emissions regulation (see below).

19. Where pollutant prices do rise to a meaningful level, whether by accident or design, a similar politics applies. In California, for example, the price of permits to emit particulate matter approaches half a million dollars per kilogramme – a price high enough, it would seem, to constitute a serious clean-up incentive for fossil fuel-dependent electricity generators. But because power generation is still "locked in" to particulate-emitting technologies, individual corporations and their state benefactors seek ways of avoiding permit costs. Hence a proposal to create a reserve of permits valued at hundreds of millions of dollars to give out free of charge to the offending corporations[26] – in effect invalidating the entire rationale of the trading system. Similarly, if structural alternatives to fossil fuel dependence do not become available through non-price action, any steep emissions cuts are likely to result in unmanageable price increases, bankruptcies and, ultimately, legislation to relax caps or scrap trading entirely.

20. Cap and trade's neglect of the importance of *how* cuts are made (as long as they are made as cheaply as possible) is not the only obstacle it puts in the way of constructive climate action. Cap and trade is also designed to abstract from *where* those cuts are made. The idea of redistributing pollution around the landscape to "maximize cost-effectiveness" is embedded in its very design. But this "virtue" is also a vice: it strengthens environmental racism and other forms of discrimination, since the industries most firmly locked into fossil fuel exploitation or use, and most likely to be carbon permit buyers, tend disproportionately to affect poorer and disadvantaged communities.[27] Again, the US sulphur dioxide cap and trade programme should have provided cautionary lessons. Although national sulphur dioxide emissions from power plants decreased by 10 per cent from 1995 to 2003 under the scheme, more than half of the US's dirtiest power plants increased their annual soot-forming SO_2 emissions over the period. As a result, "communities living in the shadows and downwind of these polluting power plants are actually breathing dirtier air".[28] Cap and trade's built-in insensitivity to the different ecological effects that pollution can have in different biomes creates additional environmental and social problems, which are likely to damage its case among still other constituencies.

21. It is often argued that reliance on a trading mechanism that discourages immediate steps toward a long-term transition away from fossil energy is the price that has to be paid for governments' ability to persuade corporations to accept emissions caps of reasonable severity. Without trading, it is suggested, serious regulation would be politically impossible, whereas with trading, governments will be able to impose caps that will create a cost for carbon – and possibly even some day to drive that price high enough to force the "A" industries of Fig. 2 to undertake long-term structural change.

22. There are two flaws with this argument, however. First, the claim that trading makes effective action on global warming politically easier, or is necessary for effective regulation, is not well substantiated. State action on environmental issues

that does not involve trading has a thousand-year history down to the present, when, for example, countries like Germany have been able to cut sulphur dioxide emissions from power plants far more than the US did, but without trading,[29] and when even the US has succeeded in banning or limiting many pollutants without trading or even much concern with cost (Driesen 2008: 62). Including trading clauses may indeed have been necessary for getting the US to acquiesce in the Kyoto Protocol in 1997, but in the end the Kyoto Protocol itself has proved ineffective.

23. In addition to being an inappropriate lead instrument for tackling global warming, cap and trade has technical requirements that simply cannot be met, demanding a far more sensitive, centralized and powerful system for measurement and enforcement than is needed for conventional regulation.[30] Even in most industrialized countries, the emissions measurements needed to underpin trading, or even to detect compliance with Kyoto targets, are not being made, throwing the very existence of the carbon emissions commodity into doubt. As will be explained below, the situation with respect to carbon "offset" trading is even worse. There, measurements cannot be carried out even in principle, making carbon markets that mix the two types of pollution rights (emissions permits and offset credits) impossible in formal terms.

24. Carbon offsets constitute a further development of the climate commodity, reinforcing the climatic, political and social "blowbacks" of cap and trade while adding some new ones of their own, disconnecting carbon markets still further from the climate problem and storing up market valuation problems for the future. In the Kyoto market, offsets were devised partly as a compromise between wealthy industries' and states' desire for an additional source of pollution rights to enable them to buy time before reducing their own emissions and, on the other, the desire of Southern states for some financial benefit from the international climate regime. Outside the Kyoto framework, they serve a mix of purposes, including compliance with emissions laws, public relations, educational tool, and modern-day indulgence.[31]

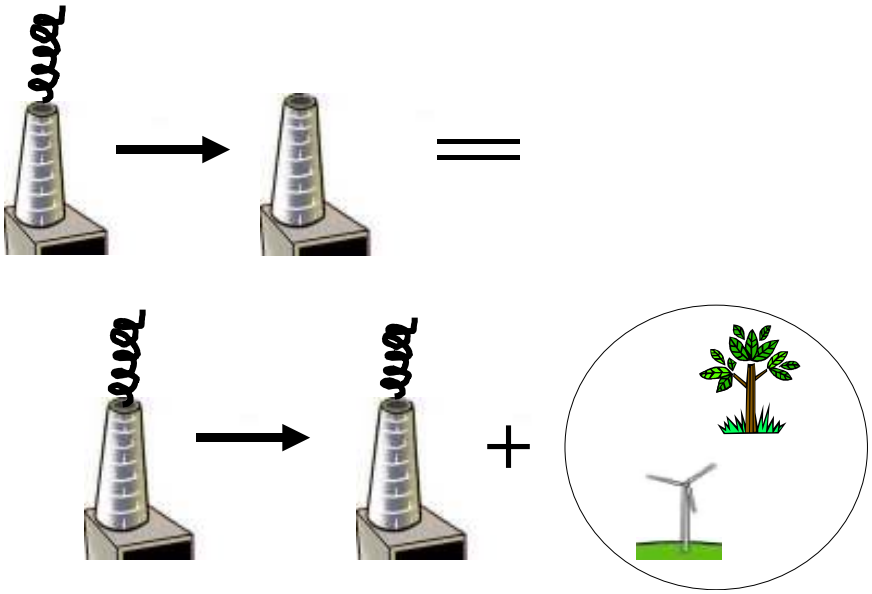

Fig. 4

25. Like cap and trade, offsets rely on the creation of new equivalences (Fig. 4). In this case the principal equivalence is between emissions reductions and purportedly "carbon-saving" projects. Instead of cutting their greenhouse gas pollution (top arrow), industries, nations or individuals finance a mixed and ingenious range of schemes elsewhere (bottom right), which are cheaper to implement. Examples, as mentioned above, include carbon sequestration schemes such as plantations or ocean-fertilization projects as well as dams, wind farms, fuel switches, efficiency schemes, fly-ash or coal-ash reprocessing programmes, and other projects that can be argued to result in less greenhouse gas being released to the atmosphere than would otherwise be the case. Just as cap and trade commodifies the earth's carbon-cycling capacity before parcelling it out to polluting industries, so too many offsets tend to commodify land, water, air, genes and community futures in new ways in order to expand that global capacity to allow more use of fossil fuels. Although many offsets are constructed in industrialized countries including the US, most sites for this new form of commodification within the Kyoto market are in the global South, particularly countries such as China, India, Korea and Brazil. That means that carbon trading affects less-industrialised countries not only indirectly, through any hastening effect cap and trade has on climate change, but also directly, by encouraging the development of "offset" projects designed to license continued emissions by industrialised countries.

26. For example, the German-based energy company RWE plans to meet its pollution targets under the EU ETS not by cutting its emissions significantly, but rather by investing in UN-backed "offset" projects destroying N_2O (a powerful greenhouse gas) at factories in Egypt and South Korea and HFC-23 (an even more powerful climate-forcing gas) at chemical plants in China. Such industrial gas projects, along with similar schemes to burn methane associated with oil wells or coal mines, become a spectacularly "efficient" way of addressing climate change – in spite of the fact that they do nothing to address the fossil fuel question – because of the equivalences set up by climate market architects among various greenhouse gases.[32] RWE is also exploring the possibility of buying carbon credits from projects that would capture and burn methane (yet another harmful greenhouse gas) from landfills and coal mines in China and Russia, and another 90 million tonnes of CO_2 emission rights from a range of projects in India.[33]

27. Overall, while the European Union has proposed that member states be able to use offset credits to meet up to 25 per cent of their national emission reduction targets in the period leading up to 2020,[34] in reality, the dominant EU-15 group of countries plans to meet nearly 38 per cent of the cuts required to meet its 2008-2012 target through overseas-originated offset credits (Fig. 5).[35] Recent research demonstrates that it will be to the advantage of emitters covered by the EU Emissions Trading Scheme to attempt to cover as much as 56 per cent of their targets during the 2013-2020 period by buying in offsets from abroad. For industries covered by the Effort Sharing Decision, the figure is 72 per cent.[36] Seeking carbon brokerage business, Wall Street firms have meanwhile lobbied for an increasing proportion of carbon offsets to be allowed in US cap-and-trade systems as well.

Cap and trade + offsets

(Caps with holes)

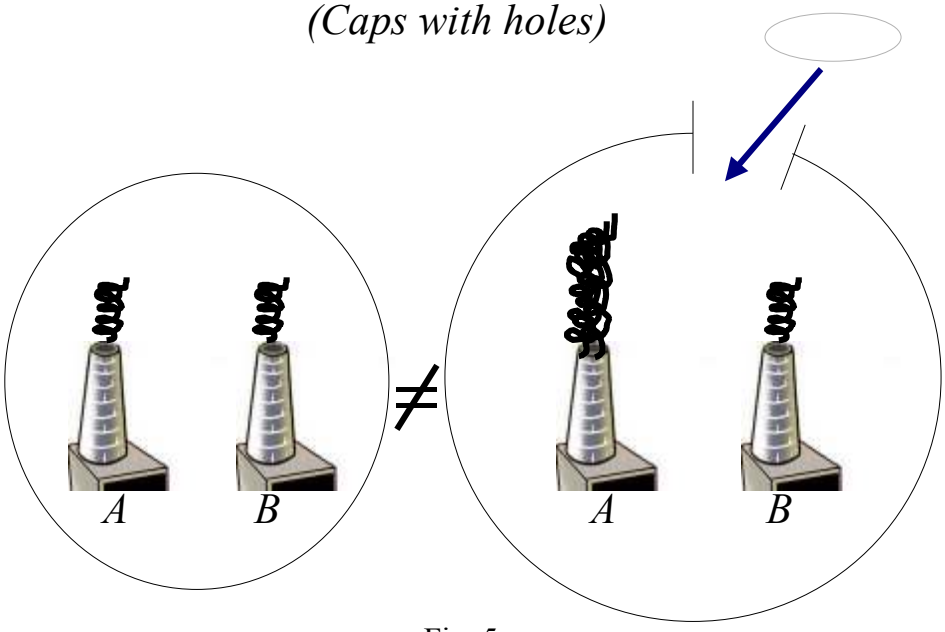

Fig. 5

28. Even more transparently than cap and trade, then, offsets are designed in a way that helps entrench or even increase dependence on fossil fuels in the industrialised North – in addition to provoking the opposition of environmental justice activists in both South and North. California's environmental justice movements, for example, see carbon trading as a "charade to continue business as usual".[37] Carbon trading, they note, is threatening promising efforts to prevent the state from building 21 planned fossil-fuelled generating plants – all to be located in poorer, predominantly nonwhite communities – and set itself on the path to a greener society. The California groups argue that carbon trading would channel funding into out-of-state carbon offsets at a time when it should go instead toward a renewable energy refit programme that would make large numbers of green jobs possible for underprivileged communities. If the state government decides to back carbon trading, wrote one state senator, "it could very well harm low income residents, make fewer funds available for energy efficiency investments and renewables, and undermine Los Angeles' ability to reach its goals".[38]

29. Perhaps the most fundamental point to note about carbon offsets, however, is that they increase global emissions rather than decreasing them. Even if an emissions "reduction" sold by an offset project developer could be verified to be successful, any gain would, by definition, be nullified by increased emissions allowed to the buyer. However, this best-case scenario appears to be rare in reality. A report by International Rivers Network found that three out of four Kyoto Protocol Clean Development Mechanism (CDM) projects were already up-and-running by the time they were approved to generate CDM credits, strongly suggesting that the projects would all have happened anyway.[39] David Victor of Stanford University concludes that "it looks like between one and two thirds of all the total CDM offsets do not represent actual emission cuts."[40] One European Commission official has admitted that at least 40 per cent of CDM projects are not additional to what would otherwise

have happened.[41] A report by the US Government Accountability Office to Congress says the CDM's "effects on emissions are uncertain … available evidence suggests that some offset credits were awarded for projects that would have occurred even in the absence of the CDM".[42]

30. In fact, it is impossible to verify whether or not the claimed "reduction" has been over and above any that would have occurred anyway – which means that this problem can never be resolved. The carbon "savings" of an offset project can only be calculated by showing how much less greenhouse gas is entering the atmosphere as a result of its presence than would have been the case otherwise. That entails identifying a single, unique business-as-usual storyline to contrast with the storyline that contains the project. The market dictates, in other words, that without the offset, only a single world is possible – a claim that has no scientific basis. As many offset proponents themselves frankly acknowledge, a project baseline is something which "cannot be measured"[43] and is founded merely on a "value judgement" (Ball 2008) As Lambert Schneider of Germany's Oko Institute put it at a recent conference, "If you are a good storyteller you get your project approved. If you are not a good storyteller you don't get your project through".[44] World Bank officials, accounting firms, financial analysts, brokers, regulators and carbon consultants themselves often admit privately that no ways exist to demonstrate that carbon finance is what made a project possible.[45] Researcher Dan Welch sums up the difficulty: "Offsets are an imaginary commodity created by deducting what you hope happens from what you guess would have happened."[46] As carbon trader Mark Trexler noted years ago, "there is no technically 'correct' answer"[47] to the riddle of "additionality" in offset markets. It will always be impossible to determine whether an offset credit reflects a genuine emission reduction or not.

31. The unverifiability of offset quantification makes it relatively easy for skillful and well-paid carbon accountants whose work is largely shielded from public scrutiny[48] to help fabricate huge numbers of pollution rights for sale to Northern fossil fuel polluters, who have little incentive to inquire closely into their origin. At the same time, it makes impossible any distinction between fraud and non-fraud, rendering any attempt at offset regulation or reform ultimately pointless.[49]

32. Revealingly, the unworkable efforts to domesticate, simplify and quantify unknowns involved in the attempt to construct carbon offset markets are analogous to those that have resulted in the current financial crisis. All carbon credit accounting (and thus carbon accounting *tout court* in any market that attempts to make cap and trade allowances and carbon offset credits fungible) relies on expert assessment of counterfactual scenarios. Just as "quants" working in the derivatives markets disaggregate different kinds of uncertainty from their contexts, carbon accountants disentangle each carbon project from an imaginary baseline presented not as indeterminate and dependent on political choice but as measurable, singular, determinate and a matter for economic and technical prediction. This procedure, which, as argued above, can have no scientific basis, has attracted even more professional ridicule than the risk management models that quants have attempted to apply in the derivatives markets.[50]

33. The depth of the parallel can be seen from the fact that it would be technically impossible for market calculations of carbon gained and lost to take account of the

extent to which offset projects undermine the raw materials for climate solutions; or, for that matter, the other "opportunity costs" generated by the carbon markets, including the incalculable climatic impacts of the markets' disincentivizing of structural change in the industrial North. Yet, to borrow hedge fund trader Richard Bookstaber's words on the financial markets, these costs constitute "externalities for the entire … system that are hard to measure but dominate their apparent value."[51] This is one of the ways in which what George Soros classifies as a problem of "reflexivity"[52] – militating against any tendency toward equilibrium in financial markets – also applies to carbon offset markets.

34. Despite their damaging effects on the climate, offsets are often defended as a way of helping to finance the South's efforts to embark on a greener development path, and perhaps also provide a stimulus to Northern exporters to develop innovative renewable energy technologies. Yet the evidence so far indicates that the bulk of offsets set up under the UN's carbon market reinforce a fossil-dependent industrial path in the South as well as the North, further exacerbating climate change. Most Kyoto Protocol carbon offset credits are generated not by renewable energy but by projects that contribute nothing to a transition to a non-fossil dependent society. As of December 2008, three-quarters of Kyoto offset credits issued were manufactured by large firms making minor technical adjustments at a few industrial installations to eliminate HFCs and N_2O. No credits came from the development of solar or tidal power.[53] By 2020, the proportion of credits from HFC and N_2O projects is expected to decline to a quarter (although increasing tenfold in absolute terms), but not because of any trend toward projects which verifiably curb the flow of fossil carbon out of the ground, but through a growth in, for example, credits from hydropower projects (over 19 per cent), most of which were planned or under construction before carbon finance was even considered,[54] landfill gas burning projects (8 per cent), fuel switches (7 per cent) and schemes to burn off methane seeping from coal mines (5 per cent). Credits from solar and tidal power will remain negligible, and although wind power credits will rise to 8 per cent of the total, the degree to which wind displaces, rather than simply adds to, fossil energy, is disputed, as are the other benefits of giant industrial wind farms.[55] Offset projects undertaken outside the Kyoto framework have a profile which in some ways is even more supportive of expanded fossil fuel use: offsets being sold on the voluntary market include credits generated by using carbon dioxide to pump out the remaining sticky oil at the bottom of nearly-exhausted wells, and there is strong lobbying to allow coal-burning power plants to generate further pollution rights by capturing carbon dioxide out of their stacks, liquefying it, and pumping the strongly alkaline product into underground "toxic waste dumps" through CCS, or carbon capture and sequestration.

35. An additional way in which the carbon credit trade is creating environmental blowbacks is illustrated by Rhodia (France)'s adipic acid plant in South Korea.[56] Keen to benefit from the Kyoto market, Rhodia invested US$15 million in equipment that destroys nitrous oxide. Because N_2O is a greenhouse gas stipulated to be 310 times more dangerous than carbon dioxide, and because Rhodia owns a plant located in the global South, it can generate 310 tons of carbon credits just by burning one tonne of the compound, thus enabling production of $1 billion in UN-approved carbon credits for sale to polluting industries in industrialized countries. The trade does not reduce overall greenhouse gases, because customers buy Rhodia's credits only so that they can continue to invest in fossil fuels. Nor does it help Korea

decarbonize: at best, it is irrelevant; at worst, it encourages the country to build more dirty industries so that it can make money cleaning up later, as has already happened with the HFC-23 trade,[57] or to fail to promulgate or enforce environmental laws, on the reasoning that if their countries are allowed to remain "dirty" today, they will be able to make money by cleaning up tomorrow. A Joint Committee of the UK Parliament concluded that "the economic incentives offered by the CDM [Clean Development Mechanism of the Kyoto Protocol] appear actually to be encouraging the building of refrigerant plants in the developing world, simply in order that the HFC by-products from the plant can be incinerated, and the credits generated from this sold at a large profit."[58] Rhodia already makes 35 times more money selling carbon credits than it does from the adipic acid market. Nor does the trade incentivize green technological innovation. The technology Rhodia uses dates from the 1970s.

36. The Rhodia example helps reveal further the extent of the parallel between the problems of asset valuation and pricing in the carbon markets and the problems of asset valuation and pricing in the financial derivatives markets that have had such an impact on the world economy. Baseline accounting procedures set up perverse incentives for credit seekers (including host governments, credit buyers and consultant validators seeking future contracts) not only to postulate but also to bring about business-as-usual scenarios which are the highest-emitting possible, in order to make the proposed projects appear to be saving as much carbon as possible.[59] The blurring of the distinction between price incentives and prohibitions enshrined in legal codes, for instance, entails incessant recalculation of project baselines and continual alteration in the number of credits calculated. Carbon market accounting, like certain aspects of financial engineering, undermines its own stability.

37. Another example is provided by the activities the Indian company SRF and its international carbon trading partners. SRF invested around US$3 million in machinery enabling its refrigerant factory to capture and destroy HFC-23, an extremely powerful greenhouse gas. In order to provide "flexibility" to polluting corporations, the Kyoto Protocol's carbon market architects had decided to value one molecule of HFC-23 as "equivalent" to 11,700 molecules of carbon dioxide. That allowed SRF, merely by destroying a very small quantity of HFC-23, to make US$117 million in sales of Kyoto carbon pollution licenses in 2006-07 alone to companies such as Shell International Trading, Barclays Capital and Icecap, a London-based emissions trading company. SRF then invested the profits in a new plant that produces another potent greenhouse gas known as HFC-134a, whose designated "global warming potential" is 1,300 times that of carbon dioxide.

38. In addition to allowing industrialized countries to delay addressing their fossil fuel dependence, multiplying climate dangers and long-term mitigation costs, SRF's carbon deal again does nothing to decarbonize India's own industrial pathway, and has even subsidized additional greenhouse gas releases. Ashish Bharat Ram, managing director of SRF, noted that "strong income from carbon trading strengthened us financially, and now we are expanding into areas related to our core strength of chemical and technical textiles business."

39. Furthermore, the market-driven stipulation of "equivalences" that allow HFC-23 reductions to be traded for CO2 reductions are known to be gross oversimplifications, increasing the probability that the trade is actually worsening climate change. The

effects and lifetimes of different greenhouse gases in different parts of the atmosphere are so complex and multiple that any straightforward equation is impossible; the original carbon dioxide equivalence figure for HFC-23 of 11,700 originally put forward by the Intergovernmental Panel on Climate Change in 1995-1996 was revised in 2007 to 14,800, and the error band of this estimate is still a huge plus or minus 5,000.[60]

40. The local effects of the SRF scheme highlight the fact that carbon offsets, like cap and trade, are causes of environmental injustice. Residents of the area near the firm's installation have complained about chemical leaks which they claim have affected crops and water. Suresh Yadav, a local landowner, said: "Fifty per cent of my crops are damaged by the chemicals. Our eyes are pouring, we can't breathe, and when the gas comes, the effects last for several days".[61] Such negative impacts can be found associated with hundreds of other offset projects.

41. Staying with India alone, examples include notorious coal-fired sponge iron factories in Chhatisgarh state, which pump out smoke that dims the sun, blackens trees and damages the health of local residents. In return for documents claiming that they are making part of their operations more energy-efficient, many of the owners are selling carbon pollution licenses to the North through the UN. Local activists are concerned: with or without efficiency improvements, Chhattisgarh's ironworks will continue to spoil farmland and crops, usurp local groundwater and displace villagers. Farmers that are uprooted are rarely hired to work in the factories, which are staffed mostly by labourers brought in from outside. Many displaced women are forced into prostitution. Closure orders were slapped on several of the plants for pollution violations in December 2006. To the activists, the firms' carbon schemes look like little more than opportunism on the part of a dirty and exploitative industry. Twenty kilometers away from the biggest complex of factories, many residents of Chauranga village would agree: they resorted to vigilante action to keep a nearby factory from operating for fear their livelihoods would be lost.

42. In Maharashtra, meanwhile, the Sayadhri Range of the Western Ghats has been profoundly affected by wind energy development at the hands of Suzlon, Bharat Forge and other companies. As the plateau has become cluttered with wind energy generators, power lines and fences, the villages below have found themselves barred from the common lands they once used for grazing and gathering, and much wildlife has disappeared. As investigations by Nishant Mate of the National Forum of Forest Peoples and Forest Workers have revealed, when one village, Kadve Kurd, where villagers hold documents dating back to colonial times attesting to their land rights, tried to stop generators from going up on the plateau, they were intimidated by police.[62] The wind power company involved tried to force one villager to sell his land to the project for Rs.50,000, then made death threats, compelling him to leave his village for two months, and also tried to derail his attempts to use the courts to hold on to his land; company agents burned village records he was using as evidence of possession. Several companies involved in the wind developments have requested carbon finance from the UN's Clean Development Mechanism, including Tata Auto, Bajaj Auto, ENERCON and Bharat Forge. One local activist noted that "the windmills protect the polluting companies" by boosting their green credentials. Villagers are not supplied with electricity from the windmills.

43. Another locality negatively affected by UN carbon offset projects is the Bhilangana river valley in Uttaranchal, near the village of Sarona. There, Swasti Power Engineering Ltd. is benefiting from Clean Development Mechanism money in its development of a 22.5 megawatt run-of the-river hydroelectric project that would devastate local farmers' finely-tuned (and extremely low-carbon) customary terraced irrigation system that provides them with rice, wheat, mustard, fruits and vegetables. A survey for the project conducted over ten years ago reported that there were no villages near the project; Sarona residents were never consulted and first learned about the project only in 2003, when construction machines arrived. Older women in the village led the first actions of opposition, and in March 2005, 120 villagers were jailed for four days, and another 79 arrested in July. In November 2006, at least 29 people were arrested and forced to sign a document that they would cease resistance. One village woman told Tamra Gilbertson of Carbon Trade Watch, "The children were at school and they took us all to jail. I was so worried for the children being alone for so long, but the older children cared for the younger ones and they made food together." In police raids since, people have had their clothes torn off and been beaten, and women in the village have been assaulted, dragged by their hair and tortured. Yet the villagers continue to embrace nonviolent tactics. One villager stated, "We did not put sand in the petrol tanks – we are non-violent, and want an honest fight".[63] In the mountainous river valleys of Uttaranchal, some 146 such dam projects are proposed or underway, and hundreds of hydroelectric schemes in India are seeking carbon finance.

44. It is sometimes claimed that once the market has picked this type of "low-hanging fruit" from the offset orchard, it will seek out more difficult, expensive and useful schemes. The idea, again, is that although carbon trading admittedly brings about delays in needed reinvestment, eventually it will direct finance to the right places. However, this is to misunderstand the structure of the incentive that offset trading provides, which is directed not at stimulating innovators to develop climate solutions, but rather to find or invent new "emissions equivalents" that can be used in manufacturing substantial blocks of cheap carbon credits for sale. The last decade has seen proposals for carbon offsets ranging from rearranging traffic signals to seeding the oceans with urea to stimulate algal growth to not cutting forests and not riding elevators; in the words of one carbon banker, "we will not run out of cheap CDM options any time soon."[64] The goals of finding climate solutions and inventing new "emissions equivalents" are not only not the same, but are in many ways opposed. In this, again, carbon markets are parallel to today's derivative markets, which incentivize innovators continuously to seek new ways of pricing an inherently unpredictable future in ways that actually increase the chances of financial crashes rather than improving livelihood and ensuring sustainability.

45. The offset market's structural bias in favour of fossil fuels is reinforced by the reality that the companies best equipped to gain regulatory permission to sell carbon credits are well-capitalized, often fossil-dependent corporations with government connections and the ability to hire carbon consultants and accountants. In many ways, in fact, their profile is similar to that of industrial credit buyers. While industrial buyers include, unsurprisingly, such large-scale corporate greenhouse gas producers as Shell, BHP-Billiton, EDF, Endesa, Mitsubishi, Cargill, Nippon Steel, ABN Amro and Chevron, major carbon credit sellers include corporations that share the same fossil orientation, such as South Africa's Sasol, India's Tata Group, ITC,

Birla, Reliance and Jindal, Korea's Hu-Chems Fine Chemical and so forth.[65] Such well-financed companies use the carbon offset market not as a way of propelling their countries away from fossil dependence, but generally as a means for topping up finance for environmentally-damaging projects to which they are already committed. As a top official at the Asian Development Bank, which itself has attempted to use the carbon market as a slush fund to prop up its portfolio[66] admits,

"When the CDM was introduced 10 years ago, there was much expectation from the developing countries that it would provide the necessary upfront financial and technical support for new sustainable development projects that would reduce greenhouse gas emissions. Today . . . it is mostly functioning to provide additional cash flow to projects that are already able to move forward with its [sic] own financing."[67]

46. Carbon credit investors in the financial sector, who today dominate the buyers' side (see Tables 1 and 2), have also repeatedly been explicit that offset economics does not select for a transition away from fossil fuels. Historically, such buyers have focused on large blocks of low-cost, easy-to-obtain pollution licenses, being reluctant to involve themselves in projects involving sustainability considerations and local sensitivities. "We look at the market price. We don't look at any particular technology," explains Louis Redshaw of the Emissions Trading Department of Barclays Capital.[68] "The carbon market doesn't care about sustainable development," confirms Jack Cogen of Natsource. "All it cares about is the carbon price."[69] Richard Sandor, the derivatives trader who set up the Chicago Climate Exchange, told the *Wall Street Journal* in October 2008 that whether it is carbon finance or some other factor that results in his contractors making the emissions cuts that they use to claim carbon credits is "not my business. I'm running a for-profit company."[70]

47. Unsurprisingly, community-based carbon-saving or renewable energy projects have found it difficult to tap into the carbon market while maintaining the quality of their work.[71] As one veteran renewables activist and specialist in Africa put it, "When the company for which I worked for 10 years got into carbon trading, I became increasingly distraught. It was no longer about 'sustainable development', it was about tonnes of CO_2 on make-believe spread sheets".[72] Various green energy developers in the industrialized world are also concerned about the way carbon markets are blocking the spread of renewables.[73]

48. One last reason why carbon markets will continue to be ineffective in encouraging a transition to a post-fossil fuel society centres on the effects on pricing and on the economy of the financialization of carbon trading and the parallels between carbon trading and financial derivatives trading.

49. The carbon markets set up under the Kyoto Protocol, the European Union Emissions Trading Scheme (EU ETS), the Chicago Climate Exchange and many other initiatives form part of a 35-year-old era of growing and extreme financialization that is now ending for obvious reasons. In 1997, the Clinton Administration, under which Wall Street derivatives trading exploded, successfully pressed for the Kyoto Protocol to become a set of derivatives trading instruments (Al Gore, who carried the US ultimatum to Kyoto, later became a carbon market actor himself), and in the 2000s Europe picked up the initiative to become the host of what is today the world's largest

carbon market, the EU Emissions Trading Scheme (EU ETS). After roughly doubling in size each year from 2005 through 2008, to a current volume of over US$100 billion, the carbon markets cannot yet compare to the half-quadrillion dollar-plus nominal value that the overall financial derivatives markets reached in 2007, but are nonetheless still heralded as the "world's biggest commodity market" and prospectively "the world's biggest market overall," with "volumes comparable to credit derivatives inside of a decade."[74] As a new "asset class", carbon has proved a magnet for hedge funds, energy traders, private equity funds and large global investment banks such as Barclays, Citigroup, Goldman Sachs, Credit Suisse, BNP Paribas and Merrill Lynch as well as index providers and European exchange-traded commodity sponsors.

50. Some of the same trading architects were present at the creation of both the new derivatives markets and the carbon markets. Richard Sandor, for example, is an economist and trader who was one of the originators of interest rate derivatives in the 1970s, later making a fortune during the boom years of the 1980s at Drexel Burnham Lambert, the firm of the junk-bond innovator Michael Milken.[75] Sandor has also collaborated with Howard Sosin,[76] who subsequently helped set up and head the financial products division that ultimately devastated the American International Group (AIG) to the point of having to be bailed out by US taxpayers to the amount of $152 billion.[77] (AIG has used some of the payouts to lobby for a US carbon trading system, hoping to gain from new insurance opportunities thrown up by the market.)[78] Sandor is one of the principal architects of carbon and other pollution markets in the Us and internationally and, in the 2000s, set up the Chicago Climate Exchange. Other derivatives traders have also migrated to the "ecosystems services" financial sector.[79] Ken Newcombe, a former executive at the World Bank, a champion of weather derivatives, helped set up the global carbon offset market at the Bank's Prototype Carbon Fund beginning in the late 1990s, influencing UN regulatory decisions and helping put the Bank into a position to make money from attempts to compensate for the climatic damage caused by, among other things, fossil fuel-intensive developments it itself was underwriting in the global South.[80] As the market began to take off, Newcombe moved on to Climate Change Capital, the City of London boutique merchant bank, then headed up the North American carbon trading desk of Goldman Sachs before becoming CEO at the new carbon trading firm C-Quest Capital.

51. In addition, many institutions active in derivatives are also staking out positions in carbon. Among the financial institutions that have set up desks to speculate in carbon permits are, in addition to Goldman Sachs, Deutsche Bank, Morgan Stanley, Barclays Capital, Fortis, Rabobank, BNP Paribas, Sumitomo, Kommunalkredit, Lehman Brothers, Merrill Lynch and Cantor Fitzgerald (see Tables 1 and 2). JP Morgan Chase has snapped up the carbon offset firm Climate Care, while Credit Suisse has acquired a stake in the troubled carbon consultancy and accumulator EcoSecurities and Goldman Sachs has announced plans to buy Constellation Energy's carbon trading business. As with derivatives, a host of specialized new institutions have also been set up that deal in the commodity, including Sindicatum Carbon Capital, NatSource Asset Management, New Carbon Finance, Carbon Capital Markets, Trading Emissions plc, South Pole Carbon Asset Management, Natixis Environnement & Infrastructures, Noble Carbon, ICECAP, and so forth. By 2008 there were about 80 carbon investment funds set up to finance offset projects or buy carbon credits, managing

nearly US$13 billion. Most are oriented more toward speculation than toward helping companies comply with regulated carbon caps.[81] Trading companies are also active, including Vitol, a major energy-market speculator; ENRON, too, was keen on the Kyoto carbon market before the firm's spectacular collapse, and some ex-ENRON staff have moved over to the carbon business. Furthermore, industrial companies such as ArcelorMittal have opened departments specifically to seek profits in the carbon trade, just as companies such as General Electric opened finance divisions in the 1990s.[82]

52. As "climate benefits" have become abstract and objectified, finance has moved in to dominate particularly that segment of the carbon offset market whose products are easiest to calculate, but which are arguably of least value to climate change mitigation – HFC and N_2O projects, coal mine methane, landfill gas, and so forth. (See Tables 1 and 2 for the prominence of speculators in Clean Development Mechanism offset trading generally.) All are projects with no clear benefits for the type of systemic social and infrastructure transformation associated with the project of phasing out fossil fuels. The parallel with financial engineering is clear. The more the drive to make everything calculable is indulged, the more systemic instability tends to rear its head.

Table 1

Buyers of Kyoto market carbon credits from large-volume sources

TYPE OF PROJECT	**AVERAGE SIZE**	**FINANCIAL SECTOR BUYERS**	**OTHER BUYERS**
HFCs	3.7 m tonnes	Barclays, Bear Stearns, BHP Billiton Marketing, BNP Paribas, British Gas Trading, Climate Change Capital, Comercio Internacional Proserdi, Deutsche Bank, EcoSecurities, EDF Trading, Fortis, Goldman Sachs, IBRD, ICECAP, Incorporated MIT Carbon Fund, IXIS, JBIC, JMD Greenhouse Gas Reduction, Marubeni, Mitsui, Morgan Stanley, NATIXIS, Natsource, Noble Carbon, Oz Carbon Trading, Rabobank, Sumitomo Bank, Trading Emissions, Zeroemissions Carbon Trust	Aalborg Portland, Azuliber, Carbon Compliance Acquisition 5, Cementerie Aldo Barbetti, Cementos Portland Valderrivas, CEPSA, CER Investments 1, Chubu Electric, Chugoku Electric, Daioh Construction, Danish Ministry of Climate and Energy, DONG, Electrabel, Endesa, ENEL, ERG, Fortum, Gas Natural SDG, Government of Canada, Government of Sweden, Hidroelectrica del Cantabrico, Iberdrola, IFJ Korea, Iride Mercato, Italcementi, Italian Ministry of Environment, Ineos Fluor, JGC, J-Power, KfW, Kyushu Electric, Maersk, Mitsubishi, Nippon Steel, Nordjysk Elhandel, Nuon, Repsol, RWE, Sempra Energy Europe, Shandong Dongyue Chemical, Shell Trading, Shikoku Electric,

			Solvary Fluor, Statkraft, Tohoku Electric, Tokyo Electric, Union Fenosa, VROM
PFCs	1.4 m tonnes	South Pole Carbon Asset Management, 33 Asset Management	–
Wind	0.8 m tonnes	BNP Paribas, BP Gas Marketing CAF, Cambridge Funds Investment, CAMCO, Cantor Fitzgerald Europe, Carbon Asset Management Sweden, Carbon Capital Markets, CarbonNeutral Company, Carbon Resource Management, Climate Change Capital, Climate Change Investment, Credit Suisse, Daiwa Securities, Deutsche Bank, Ecoinvest Carbon, EcoSecurities, EDF Trading, Essent Energy Trading, European Carbon Fund, First Carbon Fund, Fortis, Grey K Environmental, Goldman Sachs, IBRD, ICECAP, IXIS, J. Aron, Japan Carbon Finance, JBIC, Kommunalkredit, Marubeni, Merrill Lynch, MGM Carbon Portfolio, Mitsui, NATIXIS, OneCarbon, Pacific Consultants International, Rabobank, Renaissance Carbon Investment, Spanish Carbon Fund, Standard Bank, Sumitomo Bank, Trading Emissions, Vitol, World Carbon Credit Investment	Cargill, CERUPT, CEZ, Chubu Electric, Chugoku Electric, Converging World, Danish Ministry of Climate and Energy, Econergy, Electrabel, Endesa, ENEL, Enerfin Enervento, Eurus Energy, Finland Ministry for Foreign Affairs, Fortum, Gamesa, Gaz de France, Government of Canada, Iberdrola, Inversiones Celco, BIC, KfW, Kyushu Electric, Lafarge, Mitsubishi, NEDO, Ricoh, RWE, Scottish and Southern Energy, Shell Trading, Shikoku Electric, Sojitz, Statoil, Swedish Energy Agency, Swiss Re, Tohoku Electric, Tokyo Electric, Voestalpine, VROM
N_2O	0.7 m tonnes	Ecoinvest Carbon, EcoSecurities, Fortis, Goldman Sachs, Kommunalkredit, Marubeni, MGM Carbon Portfolio, Mitsui, N.serve, NATIXIS, Natsource, Noble Carbon, ORBEO, Sindicatum Carbon Capital, Vitol	Johnson Matthey, Mitsubishi, Rhodia Energy, RWE, Toyo Engineering,
Coal bed/mine methane	0.45 m tonnes	Arreon Carbon UK, CAMCO, Climate Change Capital, Credit Suisse, Eco-Carbone, EcoSecurities, EDF Trading, Energy Systems International, Equity Environmental Assets, European Carbon Fund, Fortis, IBRD, ICECAP, IXIS, Japan Carbon Finance,	CEZ, Choguku Electric, JGC, MTM Capital Partners, RWE, STEAG, Tokyo Electric, Toyota

		Kommunalkredit, Lehman Brothers, Marubeni, Merrill Lynch, MGM Carbon Portfolio, Mitsui, NATIXIS, Natsource, ORBEO, Renaissance Carbon Investment, Sindicatum Carbon Capital, Trading Emissions, Vitol	

Source: UNEP Risoe Centre, www.cdmpipeline.org

Table 2.
Top 20 Kyoto market carbon credit buyers (number of projects)

Buyers (sector)	No. of projects
EcoSecurities (carbon finance, brokerage and consulting)	296
Carbon Asset Management Sweden (carbon finance)	132
AgCert (carbon finance)	97
EDF Trading (carbon finance)	87
IBRD (banking)	84
RWE (utilities)	80
Cargill International (agribusiness)	78
Mitsubishi (technology)	72
Trading Emissions (carbon finance)	68
ENEL (utilities)	63
Vitol (oil trading)	60
MGM Carbon Portfolio (carbon finance)	59
Agrinergy (carbon finance)	58
Carbon Resource Management (carbon finance)	57
CAMCO (carbon finance)	56
Marubeni (carbon finance)	53
Kommunalkredit (banking)	53
Essent Energy Trading (carbon finance)	51
Climate Change Capital (carbon finance)	44
Energy Systems International (carbon finance)	43

Source: UNEP Risoe Centre, www.cdmpipeline.org

53. The unverifiability of the falsely-labeled emissions "reductions" claimed by offset projects stores up an asset valuation problem that is perhaps even more obvious than the subprime mortgage problem was before the 2007-08 crash,[83] and is as threatening economically as it is climatically. Indeed, the fact that offset projects are having a net negative effect on climate change mitigation is provoking growing unease even among carbon traders mindful of the growing role of speculation in carbon markets and the history of previous market bubbles. As early as 2006, carbon trader Mark Trexler warned that carbon speculators' activities were "getting rather dangerous in contributing (in our view) to a 'carbon dot-com' bubble analogous to the technology 'dot-com' bubble;"[84] too much money chasing too few viable investments encourages the proliferation of toxic assets. As in the financial sector, the danger of breakdown is

exacerbated by the presence of powerful incentives to keep the problem concealed. [85] "I guess in many ways it's akin to subprime," Marc Stuart of EcoSecurities recently confessed to *The Wall Street Journal* in the wake of his firm's first stock crash. "You keep layering on crap until you say, 'We can't do this anymore.'"[86]

54. As in the risk markets, the transformation of global warming into a problem of capital management has been accompanied and reinforced by erosion of the concept of conflict of interest, as criteria used to gauge the effectiveness of climate mitigation policy are increasingly influenced by private carbon consultants, big permit buyers, bankers and fund managers. Barclays Capital, a major investor in the carbon markets, boasts openly that "two of our team are members of the Methodology Panel to the Clean Development Mechanism (CDM) Executive Board", part of the UN carbon market's regulatory body,[87] of which Lex de Jonge, head of the carbon offset purchase programme of the Dutch government, is the vice chair.[88] The head of the Indonesian branch of EcoSecurities, a carbon firm that has helped put together one in ten of all Southern-based offset projects approved so far by the UN, was appointed as a special adviser to the president of the 2007 UN climate conference, whose deliberations would materially affect the profitability of the firm. Like credit ratings firms in the financial markets, private sector carbon auditors approved by the UN have a strong interest in gaining future contracts from the companies that hire them; unsurprisingly, they wave through an overwhelming majority of projects under review.[89]

55. Problematic also are the revolving doors between private carbon trading consultancies, government, the UN, the World Bank, environmental organizations, official panels, trade associations and energy corporations. James Cameron, an environmental lawyer who helped negotiate the Kyoto Protocol, now benefits from the market he helped create in his position as Vice Chairman of Climate Change Capital, the boutique merchant bank. Henry Derwent, a former director of international climate change at the UK's Department for Environment, Food and Rural Affairs, who was responsible for domestic and European climate change policies, is now president and chief executive of the International Emissions Trading Association, a private industry alliance. Sir Nicholas Stern, author of the British government's Stern Report on Climate Change, has championed the initiative of his private firm, IDEACarbon, to set up a carbon credit ratings agency – which will be subject to the same type of conflict of interest that earlier afflicted Moody's and other credit ratings agencies that depended for their income on the companies whose products they are rating.[90]

56. In addition, regulatory capture of the type familiar from recent analyses of the financial crisis is a structural problem with carbon markets. As one principal of a carbon asset management firm who is also a member of the UN's CDM methodology panel noted at an industry meeting in London in October 2008, "I helped set the rules; now my firm plays by those rules."[91] European Commission coordinator for carbon markets and energy policy Peter Zapfel, a disciple of US economist-advocates of pollution trading and an instrumental figure in convincing European bureaucrats and governments to commit themselves to carbon trading,[92] has urged, like many financial derivatives traders and regulators, "cross-fertilization between regulators and regulated".[93] "I don't see us as police," the chair of the CDM Executive Board confirmed in 2007.[94] In the unregulated "voluntary" markets for carbon credits,

where buyers seek credits for reasons other than legal compliance, Alan Greenspan's and Robert Rubin's now-discredited concept of "private regulation" is even more deeply entrenched. Laurent Segalen, formerly a carbon trading manager at the failed Lehman Brothers investment bank, expressed a wide consensus when he affirmed that "traders should be the ones designing and determining the standards."[95] As in the finance sector, however, such phenomena are such that regulation against conflict of interest would, by itself, only begin to touch the underlying issues. When not only buyers, sellers, consultants and brokers, but also many putative market watchdogs, have an interest in maintaining or increasing the number of carbon credits in circulation, the possibility of meaningful checks and balances, already marginal due to the scientific unverifiability of carbon crediting, virtually disappears. That only adds to the likelihood of a carbon bubble, followed by a crash damaging not only to the world economy but also to climatic stability.

57. The stupendous complexity of new financial instruments such as collateralised debt obligations (CDOs) is in some ways matched by that of carbon trading, with its reams of additionality calculations, diversity of carbon credits, daunting monitoring and legal requirements and crowd of acronyms – all functioning politically to hide hazards from the public, from regulators, from government, and even from many market players.[96] In addition, there is a good deal of direct overlap. Carbon options have been used since 2005 and there are now swaps between Clean Development Mechanism credits and EU allowances, allowing more liquidity and larger positions. The Chicago Climate Futures Exchange, a subsidiary of the Chicago Climate Exchange, already offers a futures contract based on emissions allowances under an anticipated US federal cap and trade scheme.[97]

58. Securitization of carbon credits is also under way.[98] EcoSecurities invented a CDO-type instrument for carbon in 2008, and in 2008, Credit Suisse put together a US$200 million deal that bundled together offset projects in different stages of completion before tranching them for sale on the secondary markets. Just as mortgage-backed securities, through a sophisticated technical process of simplification, concealed from distant buyers and sellers the economic realities bearing on lower-income neighbourhoods in Detroit or Memphis, so a carbon securitization package, with its perhaps even longer value chain, hides the heterogeneous climatic and social impacts and conditions scattered through an assemblage of, say, coal-mine methane, fossil fuel-switch and biomass projects in China and energy efficiency projects in Mexico. As policy analyst Michelle Chan noted in recent testimony before the US Congress,[99] in a carbon bubble characterized by increasing pressures to commensurate and commodify, a collapse in value of "subprime carbon credits" could be disastrous.

59. The endemic failure of financial-sector "quants" to come to terms with the potential large impacts of various unknowns on price movements, take account of the on-the-ground realities of mortgage holders in low-income neighbourhoods of US cities, or give weight to well-tried conceptions of "safety first" is mirrored by the inability of carbon-sector quants to achieve or maintain contact either with climatic uncertainties or the social or biophysical realities of specific carbon offset projects. In both cases, second-order ignorance exacerbates the dangers: isolated by background and by their location in financial districts, quants tend not to be aware that they are not aware. In 2008, for example, Richard Sandor of the Chicago Climate Exchange

was quoted approvingly in *The New Yorker* magazine endorsing schemes to commodify native forests in the global South for use as marketable sinks for industrial carbon dioxide. "They are slashing and burning and cutting the forests of the world. It may be a quarter of global warming and we can get the rate to two per cent simply by inventing a preservation credit and making that forest have value in other ways. Who loses when we do that?"[100] The misconceptions about forest destruction and forest politics that this confident statement exemplifies have been thoroughly discredited in thousands of scholarly publications over the last two to three decades,[101] and the implications often drawn for carbon accounting. Yet the statement is characteristic of "quantism" in both financial and carbon markets. Ignorance and destruction of various classes of knowledge has become functional and structural, not accidental, in ways that not even 1920s critics of finance such as Keynes and Tawney might have foreseen.

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