

Cap-and-trade – why it is the wrong approach

There is strong support in certain circles for relying on the European Union Emissions Trading Scheme (EU-ETS) to internalise the social cost of carbon. It is often acknowledged that the scheme has not so far worked, but argued that it can be broadened and strengthened to make it work. There are many reasons to think that this is a mistake.

1. **The reasons why Phase 1 failed have not gone away.** The disingenuous *UK Manifesto on EU-ETS*, which David Miliband was hawking recently to the big companies and trade associations, argued that what was mainly needed to make it work was increased clarity and transparency. It was clarity that caused the market to collapse. For as long as it was not clear that every country bar the UK had cheated in its Phase 1 allocations, the market was able to exist in a fool's paradise that yielded prices of €15-30/tonne (forward prices for Phase 2 currently exist in a similar fool's paradise, hope springing eternal amongst over-capitalised speculators). As soon as the mendacity of our neighbours became clear, the market collapsed to less than €1/tonne.¹

What would be needed, if it were worth trying to resurrect this badly-designed and failed mechanism, is not increased clarity, but increased honesty and selflessness from the national participants. Yet the National Allocation Plans (NAPs) for Phase 2 submitted in November last year demonstrated that our “partners” intend to continue to game the process as much as they have ever done. The Association of Electricity Producer's (AEP's) European representative reported shortly after the NAPs had been submitted that “*a senior DG Tren official noted that only the UK appeared to have taken the process seriously and there were considerable problems of over-allocation.*” If the NAPs were approved as submitted, the cap for 2008-12 would be around 8% higher than the level of emissions in 2005.

The Commission has responded by reducing the allowed emissions of most countries relative to what they applied for, but the reductions that will be achieved, even if all countries accept the revised allowances and go on to achieve their targets, are pitiful – a saving of 50m tonnes out of 1,900m tonnes for the covered sectors in those countries whose allowances have so far been approved (see table below). In other words, EU-ETS will, by 2012, be responsible for at best a reduction of less than 1.5% of total CO₂ emissions relative to 2005 levels if all countries comply fully. This seems like a lot of bureaucracy and interference in the market for very little benefit in terms of carbon reductions. In practice, given the cynical attitude demonstrated by the submitted NAPs, compromise, gaming and non-compliance is likely to result in emissions exceeding those of 2005.

No wonder Europe's emissions are not even close to being on track to meet its modest Kyoto obligations; and, in fact, are being reduced less effectively than in the USA, which was widely castigated for rejecting the cap-and-trade approach, for reasons that have been borne out by experience.² ***The EU-ETS is failing to deliver sufficient savings from the sectors and countries covered by it to make their contribution to a target which, if achieved, might reduce temperatures by 0.06°C relative to what it would otherwise have been in 2050.***

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- 1 Presenting evidence to the House of Commons Environmental Audit Committee in November 2006, representatives of the Environment Agency observed that, to that point, they were not aware of any “*documented cases where a particular business has reduced its emissions because it has been in the scheme*”, that where businesses had made preparatory investments to save carbon, “*that has actually almost stopped because there is little incentive to burn fuels other than coal*”, and, in fact, that it is not “*clear whether we are really seeing any environmental benefits just yet*”. They concluded that Phase 1 had to be written-off as experimental, and that it was possible that the same would happen to Phase 2. <http://www.publications.parliament.uk/pa/cm200607/cmselect/cmenvaud/70/6112103.htm>
 - 2 Lawrence Summers, “We need to bring climate idealism down to earth”, Financial Times (FT), April 30, http://blogs.ft.com/wolfforum/2007/04/we_need_to_brin.html

2. **Is it anyway possible to devise a rational basis for allocating emissions-rights?** France obtains a little under one-third of its energy from nuclear power, but is this any reason why France should be entitled to emit less than forty percent of Germany's *per-capita* entitlement? If there is a carbon-benefit to nuclear power, shouldn't France be entitled to that benefit? Germany produces more goods for export than most European countries. To what extent should Germany's entitlement be increased to take account of this? Latvia is one of the greenest countries in Europe, in the sense that it produces more of its energy from renewable sources than most other nations, resulting in the lowest carbon emissions *per capita* in the EU. However, most of this renewable energy is in the form of biomass for heating and therefore falls mostly outside the sectors covered by EU-ETS. Should Latvia be punished for achieving its carbon-savings in this way, by being allocated just over half the *per-capita* entitlement of Lithuania, and less than one-sixth of the *per-capita* entitlement of Estonia? On the other hand, Estonia has been more successful than its neighbours in growing its economy. To what extent should it therefore be allowed to emit more than those neighbours?

The following is a table showing the EU-ETS allocations of the 21 countries whose Phase 2 NAPs have so far been “approved” (i.e. heavily modified) by the Commission.

Member State	1st period cap	2005 verified emissions	Proposed Phase 2 cap	Allowed Phase 2 cap	Population	1 st period cap per capita	2005 emissions per capita	Proposed P2 cap per capita	Approved P2 cap per capita	P2 cap p.c. relative to Germany	P2 cap p.c. relative to Estonia	P2 cap p.c. relative to Latvia
Austria	33	33.4	32.8	30.7	8,361,000	3.95	3.99	3.92	3.67	66.78%	38.54%	253.35%
Belgium	62.1	55.58	63.3	58.5	10,392,226	5.98	5.35	6.09	5.63	102.37%	59.08%	388.42%
Czech Rep.	97.6	82.5	101.9	86.8	10,228,744	9.54	8.07	9.96	8.49	154.32%	89.06%	585.53%
Estonia	19	12.62	24.38	12.72	1,335,000	14.23	9.45	18.26	9.53	173.28%	100.00%	657.44%
France	156.5	131.3	132.8	132.8	63,713,926	2.46	2.06	2.08	2.08	37.91%	21.88%	143.82%
Hungary	31.3	26	30.7	26.9	9,956,108	3.14	2.61	3.08	2.70	49.14%	28.36%	186.43%
Germany	499	474	482	453.1	82,400,996	6.06	5.75	5.85	5.50	100.00%	57.71%	379.41%
Greece	74.4	71.3	75.5	69.1	10,706,290	6.95	6.66	7.05	6.45	117.38%	67.74%	445.34%
Ireland	22.3	22.4	22.6	21.15	4,234,925	5.27	5.29	5.34	4.99	90.82%	52.42%	344.60%
Italy	223.1	225.5	209	195.8	58,147,733	3.84	3.88	3.59	3.37	61.24%	35.34%	232.34%
Latvia	4.6	2.9	7.7	3.3	2,277,000	2.02	1.27	3.38	1.45	26.36%	15.21%	100.00%
Lithuania	12.3	6.6	16.6	8.8	3,390,000	3.63	1.95	4.90	2.60	47.21%	27.24%	179.12%
Luxembourg	3.4	2.6	3.95	2.7	467,000	7.28	5.57	8.46	5.78	105.14%	60.68%	398.93%
Malta	2.9	1.98	2.96	2.1	407,000	7.13	4.86	7.27	5.16	93.83%	54.15%	356.02%
Netherlands	95.3	80.35	90.4	85.8	16,570,613	5.75	4.85	5.46	5.18	94.16%	54.34%	357.27%
Poland	239.1	203.1	284.6	208.5	38,518,241	6.21	5.27	7.39	5.41	98.44%	56.81%	373.50%
Slovakia	30.5	25.2	41.3	30.9	5,390,000	5.66	4.68	7.66	5.73	104.26%	60.17%	395.57%
Slovenia	8.8	8.7	8.3	8.3	2,020,000	4.36	4.31	4.11	4.11	74.72%	43.12%	283.51%
Spain	174.4	182.9	152.7	152.3	40,448,191	4.31	4.52	3.78	3.77	68.48%	39.52%	259.81%
Sweden	22.9	19.3	25.2	22.8	9,150,000	2.50	2.11	2.75	2.49	45.32%	26.15%	171.93%
UK	245.3	242.4	246.2	246.2	60,776,238	4.04	3.99	4.05	4.05	73.67%	42.52%	279.51%

There is (presumably) method to these allocations, but not logic. ***This is a central-planner's wet-dream, and a libertarian's worst nightmare.***

3. **One of the problems with the EU-ETS is its failure to deliver long-term price signals.** It is this that the *UK Manifesto on EU-ETS* has in mind when calling for greater clarity. It is optimistic to imagine that a reliable, efficient and long-term market will result from a system that relies on 27 democracies to set themselves targets, and to self-administer honestly and carefully a scheme that requires them to inflict pain on their own economies while trusting that their neighbours will be equally rigorous. Is there anything in the history of the EU to suggest that such selflessness will be ubiquitous and sustained? Even if present governments commit to future reductions beyond the usual 5-10-year timescale, how will they bind their successors under democratic systems? If a means could be found to bind them, how will future recidivist governments be prevented from fudging a system that depends on all participants acting in good faith?

There are, in any case, practical obstacles to fixing a scheme beyond 2012. The EU-ETS is an offshoot of the Kyoto process, and integrates with other Kyoto mechanisms, such as the Common Development Mechanism (CDM) and Joint Implementation (JI). The Kyoto Treaty covers the period to 2012. Beyond that, it is not clear what global mechanisms will be available for the EU-ETS to link to. As Carbon Emission Reduction (CER) Certificates from CDM/JI represent a safety-valve for the EU-ETS (a way of balancing the carbon books at low cost), the uncertainty about their prospects beyond 2012 will make forecasting the EU-ETS market after that date very difficult, even if market-players are confident about the long-term reliability of the internal European mechanism.

Markets will emerge where rational values can be derived. The absence of long-term prices is a sign that future uncertainty is sufficient to make prediction foolhardy. It is typical hubris of politicians to imagine that they can reduce this uncertainty by declaring their intentions for a time when they will almost certainly not be in power, and for a market over which they have only partial control. ***It is likely that not even increased federalism would be sufficient to deliver greater certainty, and only a Napoleonic solution would suffice.***

4. **Even if the EU-ETS could be made to work efficiently, fairly and on a long-term basis, it would disadvantage European nations for as long as other nations did not impose similar costs of carbon on themselves.** Some argue for a 'Son of Kyoto' to resolve this problem, by extending emissions targets to rapidly-developing countries, and bringing America back into the process. Others suggest the weakness can be reduced by negotiating the interoperability of EU-ETS with other emissions trading schemes springing up around the world in New Zealand, Australia, Japan, Canada and various US states, aiming perhaps for a single global cap-and-trade carbon market. This is not just optimistic, but positively panglossian.
- a) Even as the White House finally agreed (31 May 2007) to commit to action on climate change, it *“ruled out carbon trading as the way to cut emissions”*.³
 - b) The Lieberman-McCain Climate Stewardship Bill of 2003, which would have implemented a cap-and-trade mechanism, was voted down by the Senate. It has been amended and reintroduced in 2007, with sponsorship or support from many of the leading presidential candidates. But in order to make it acceptable, the constraints have been loosened, to the extent that McCain himself acknowledges that *“significant reductions in greenhouse gases - well beyond those required by this bill - are feasible over the next 15-20 years using technologies available today”*.⁴ As we have seen in the first phase of the EU-ETS, a cap-and-trade scheme with caps set so loosely that they are easily achievable is worse than no scheme at all. There is little prospect that, whoever follows George W Bush in the White House, they will be able to push through a cap-and-trade scheme with caps set at a comparable level to those proposed for Phase 2 of the EU-ETS. In the absence of tough American caps, any attempt to integrate EU-ETS with any American cap-and-trade scheme will result simply in Europe paying America for notional savings, while America's *per-capita* (and per-unit-of-GDP) carbon emissions remain well above ours.
 - c) The same applies to other first-world Kyoto refuseniks, such as Canada and Australia.
 - d) India has recently reiterated its refusal to consider a cap on its greenhouse-gas emissions,⁵ let alone agreeing to enter a trading mechanism, other than taking incidental gains from the largely spurious Common Development Mechanism (CDM) of the Kyoto Treaty (see below). The fact that India can profit from supposed “carbon reductions” whilst expanding rapidly and without constraint its overall carbon emissions demonstrate what a charade that mechanism is.
 - e) China and several other major developing nations are said to share India's view.⁶
 - f) Russia and much of the old Soviet Bloc are still mainly interested in selling “hot air” – the source of many Joint Implementation (JI) carbon credits. “Hot air” is the notion that, because emissions in Soviet Bloc countries collapsed along with their economies, they should be entitled to count the reduction as a contribution towards tackling climate change. Never mind that this simply changed them from being disgustingly filthy and inefficient to merely dirty and wasteful. The *per-capita* CO₂ emissions of Russia and its satellites (e.g. Ukraine and Belarus) are higher than those of every country in the EU listed above, except Estonia, the Czech Republic, Luxembourg and (just) Ireland. If measured relative to GDP rather than population, Russia is the dirtiest major nation on earth (closely followed by China and India, and then the other Soviet Bloc countries, a long way “ahead” of the developed nations). Thanks to strongly-subsidised energy-pricing, the developing nations, and Russia and its

3 Financial Times (FT), June 1, frontpage: “Bush in U-turn on global warming”, <http://www.ft.com/cms/s/32856c56-0f84-11dc-a66f-000b5df10621.html>

4 http://mccain.senate.gov/press_office/view_article.cfm?id=803

5 Daily Telegraph (DT), May 30, “India to shun G8 demands on gas emissions”, <http://www.telegraph.co.uk/earth/main.jhtml?xml=/earth/2007/05/30/eagas30.xml>

6 DT, June 1, “Leave global warming to market forces”, <http://www.telegraph.co.uk/opinion/main.jhtml?xml=/opinion/2007/06/01/dl0101.xml>

satellites in particular, remain some of the most energy-profligate nations on earth. Subsidising their continued inefficiency, by paying them for improvements that were in any case inevitable once economic reality bit and they stopped producing for production's sake and started producing in order to meet market demand, is our money for their old rope.

- g) A significant proportion of carbon credits from projects developed under the CDM are bogus. The FT identified in February that “billions of dollars are being wasted in the international carbon trading system as a result of a loophole in the Kyoto protocol....by exploiting the regulations in the protocol surrounding a potent greenhouse gas, HFC-23”.⁷ HFC-23 is a by-product of the production of HFC-22 for refrigeration units, and third-world countries such as China were ramping up production in order to increase the amount of HFC-23 they could destroy and obtain credits for. The Guardian reports a litany of problems, including that a “senior figure” estimates “there may be faults with up to 20% of the [CDM] carbon credits”, that another “one of the CDM's experts calculates that as many as one third of the projects registered in India....do not produce any additional cut in greenhouse gases and were wrongly approved”, that Ernst & Young were complicit in some of the fraudulent auditing reports, and that 53% of existing CERs come from six projects to reduce HFCs from refrigerant-manufacture.⁸ Not surprisingly, given the low cost of these bogus savings, in a recent survey of companies involved in the EU-ETS, most were planning to buy these bogus credits rather than reduce their own emissions.⁹

There is no merit in cooperating for cooperation's sake. If the cooperation is with countries whose mechanisms are less tight and rigorous than the EU-ETS, as the above demonstrates is the best that could be expected, inter-mechanism trading will simply result in transfer of funds from Europe to countries that take a more relaxed view of their environmental obligations, without a proportionate environmental benefit. ***We will be suckers in a rigged global market for hot air.*** The “we” in that previous statement refers to European consumers/taxpayers, not the European businesses (such as Ernst & Young) that can exploit the market every bit as profitably as their foreign competitors.

7 FT, Feb 8, “Billions lost in Kyoto carbon trade loophole”, <http://search.ft.com/iab?id=070208000416>

8 The Guardian, June 2, “Abuse and incompetence in fight against global warming” (<http://environment.guardian.co.uk/climatechange/story/0,,2093835,00.html>) and “Truth about Kyoto: huge profits, little carbon saved” (<http://environment.guardian.co.uk/climatechange/story/0,,2093815,00.html>)

9 The Economist, May 31, “Trading thin air”, http://www.economist.com/surveys/displaystory.cfm?story_id=9217960

5. **The allocation of emissions rights to existing players rewards dirty incumbents and disadvantages their cleaner and newer competitors.** For instance, the Irish cement-producer Ecocem pioneered the use of blast-furnace slag in its production process. The result was emissions reduced to one-sixteenth that of its competitors – too low to qualify for the allocation of permits. Its dirtier competitors, on the other hand, did qualify for permits, and could profit from them by introducing the techniques that Ecocem had pioneered, putting Ecocem at a competitive disadvantage.

This perverse incentive, to avoid unnecessary reductions in emissions to ensure maximum future allocations, can be avoided by auctioning rather than allocating the carbon-credits. However, the companies currently receiving free allocations have so far fought a successful campaign to hang on to their market advantage. If it is not politically possible to move to full auctioning of credits, the EU-ETS will continue to embed the market power of incumbents (who, perhaps not coincidentally, are notably enthusiastic about the mechanism). A mechanism that embeds the advantage of incumbents by presenting powerful barriers to new entrants, who must purchase at auction what the incumbents are allocated for free, undermines the very rationale of free markets. ***The role of government, almost the only real role in the anti-trust/competition area, should be to prevent incumbents from erecting barriers to entry, not to institute those barriers for them.***

6. **All carbon emissions have an equal impact and should be valued accordingly.** Yet the EU-ETS applies only to a subset of those emissions and cannot practically be extended to cover all emissions. Below the size of installation currently covered, the transaction costs of this bureaucratic system exceed the benefits of its extension. This means, at best, that alternative mechanisms are required to price carbon from smaller installations, and in reality, that improvements in areas that cannot practically be covered by cap-and-trade are encouraged (ineffectively) by means of cajoling, grants and regulation, rather than pricing. The result is differential pricing of identical goods (greenhouse-gas emissions), and a skewed market that encourages favoured solutions rather than the most efficient means of delivering carbon-reductions.

It was noted above that Latvia has achieved the lowest rate of CO₂-emissions *per capita* in the EU through use of biomass heating. This is not an accidental benefit of its communist impoverishment – most of the other former Soviet-Bloc countries have high *per-capita* emissions. Other countries with low levels of emissions, such as Lithuania, Denmark, Austria and Sweden, have also strongly encouraged renewable heating (ground-source heat-pumps, as well as wood-fired boilers).

Typical biomass-heating installations are too small to integrate into EU-ETS. Reliance on EU-ETS for large installations and a hodge-podge of dirigiste interventions at the lower end of the market explains why the UK has so far failed to make any meaningful progress on renewable heat, despite the fact that the sector offers more efficient and significant savings than the electricity and transport sectors that have received most of the attention.

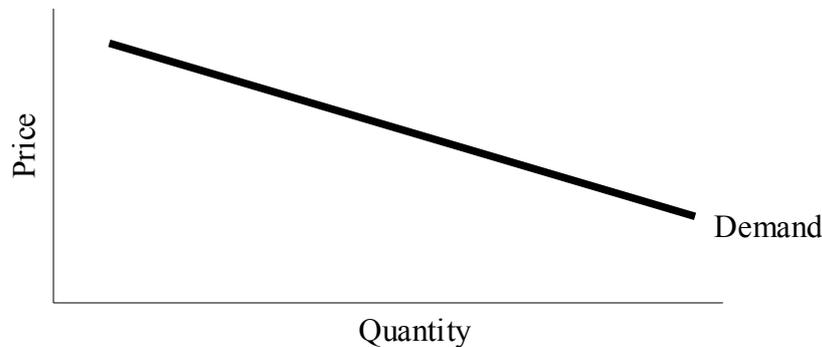
Burning biomass to produce electricity is strongly encouraged under the Renewables Obligation. Burning biomass to produce heat receives very little encouragement. Yet biomass can be converted to electricity at 33% efficiency at best (most installations will be less than 30%), whereas it can be converted to heat at over 90% efficiency. As most of our heat is produced using gas-boilers, and conversely most of our gas is used for heating rather than the production of electricity (at a ratio of around two to one), increased use of renewable heating would have a bigger impact on our gas-import dependency than efforts to further diversify our electricity supply, which is already significantly diversified compared to the heating market. And some of the displaced gas can be used to produce electricity at 60% efficiency without increasing our import dependency. In what way does it meet our carbon and security-of-supply objectives to encourage production of electricity from biomass at 30% efficiency and of heat from gas at 90% efficiency, when we could be encouraging production of heat from biomass at 90% efficiency and of electricity from gas at 60% efficiency.

Our incentives are upside down, and they are largely so because there is not a single carbon-price applying equally to large and small installations and to the fuelling of electricity, heat and transport. And the reason that we do not have such a simple, integrated pricing mechanism is largely because we fetishize a discredited cap-and-trade system that is not only wrong in principle and practice, but cannot practically be expanded to cover all sectors.

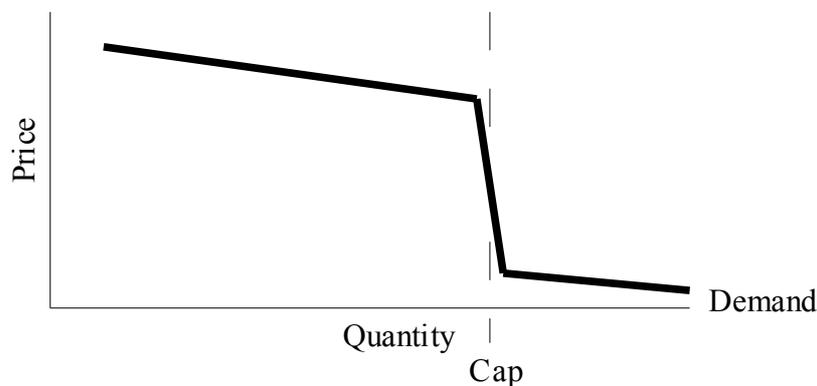
There is little prospect that a cap-and-trade market structure will apply to all carbon emission, irrespective of source, and certainly no indication of how that would be achieved. The only way to achieve it would be to push the communist Personal Carbon Allowances energy-rationing solution. As such a system must be mandatory and rigorously enforced (contrary to Mr Miliband's claims that it is like a carbon credit card) and requires a complete national database recording every citizen's energy-consumption habits, and a vast infrastructure of real-time metering and payment outlets, such a policy would be likely to encounter similar opposition to that encountered by the ID Card proposal, and the many other recent examples of disastrous national database systems.

7. Even if cap-and-trade mechanisms like the EU-ETS could be broadened to cover all emissions sources from all locations and tightened to provide meaningful savings through tight and strongly-enforced targets, they would be the wrong approach. They provide distorted price signals that significantly and negatively affect investment decisions.

- a) *Cap-and-trade produces an irrational, discontinuous demand curve.* For most goods, price falls gradually as supply increases, reflecting the reality that as price falls, marginal consumers will choose to purchase the good who otherwise would not have done so at the higher price.



There is no reason to think that demand for carbon-savings should not behave like this, at least up to the point where atmospheric emissions have stabilised at an acceptable level. The caps in cap-and-trade systems are always set at a level very much above the stable level, close to current emissions-levels, in order to avoid so-called “deadweight costs” (a misapplication of this term). Consequently, the demand curve looks more like:



The consequence of this irrational demand curve is severe. While emissions are above stable levels, each extra tonne of carbon saved is almost as valuable as the previous saving. Yet under a cap-and-trade scheme with a cap set close to current emissions-levels (as is always the case), it does not take very much to save sufficient carbon that the value of additional savings falls to close to zero in the market, even though the utility of those savings is not very different to the utility of the high-priced savings. As it is difficult to predict, in a market with hundreds of players making thousands of investments, the exact point at which one approaches the “cliff-edge” (as this has come to be known to *aficionados* of the Renewables Obligation), businesses are strongly disincentivised from investing in all but the very cheapest carbon savings if they fear that the market is close to the level of the cap. As the cap is deliberately set to be close to the current level of emissions, this is a real fear in most circumstances.

Hence cap-and-trade's failure to incentivise significant investment in its own market, and reliance on cheap (largely artificial) carbon-savings from outside the market, is not an accident of current implementations, but fundamental to the concept. There is no reason why the marginal value of carbon-savings should collapse at the level of an arbitrary cap that bears no relation to the stable emissions-level, and yet that is precisely the signal provided to

participants in a cap-and-trade market.

- b) **All current cap-and-trade schemes focus only on gross emissions, and usually only from particular sources.** The carbon-cycle is very much larger than that part that is usually covered by the mechanism. Not incorporating all sources of emissions and all means of absorption distorts choices very badly.

The classic example is forests. Existing forests absorb carbon each year. Conversely, destruction of existing forests releases large stores of carbon into the atmosphere. Given the complex contribution of existing forests to ecosystems, rainfall patterns, soil-based carbon etc, preserving those forests is at least as important a factor as planting new forests. Yet our carbon markets only value the planting of new forests. The result is small plantations sprouting up to “offset” the carbon emissions from our various activities, while swathes of existing forest are cut down for lack of a value to their preservation. The carbon contribution of the new plantations is over-valued, counting (in a mark-to-market exercise that would have embarrassed even Enron) all absorption for the notional 100-year life of the trees during year one, whilst the carbon contribution of existing forests is under-valued.

What matters is not a nation's gross emissions from combustion of fossil fuels, but its net carbon emissions taking into account all sources of emissions (including agricultural emissions, deforestation, etc) and all absorption in that year by carbon-sinks within the nation's boundaries (arguably, this should include oceanic absorption within national waters as well as forests and mechanical/chemical sequestration). Taking net rather than gross emissions as the basis for trading would result in a very different picture, significantly reducing the contribution of some supposedly polluting nations like America, Canada and Russia, and significantly increasing others' shares. The former are aware of this, which is one reason why they have refused (and will probably continue to refuse) to sign up to a system where they are held to account for their gross emissions. The latter are equally unlikely to accept allocation on the basis of net emissions. Yet without this modification, prices are likely to remain seriously distorted, so that we carry on cutting down our forests while investing heavily in symbolic but wasteful gestures like photovoltaic energy.

- c) **There is an even more basic error in the logic of cap-and-trade schemes. They apply a positive price to non-carbon rather than a negative cost to carbon.** The assumption is that one is simply the inverse of the other, but this is incorrect. You can look at this as a binary or ternary system, but neither approach matches the assumptions of our cap-and-trade schemes. Viewed as a binary system, there are “carbon-positive” activities and “carbon-negative” activities. Activities that do not emit carbon are **not** carbon-negative, they are zero on both the carbon-positive and carbon-negative scales. It may be easier to think of it as a ternary system, with carbon-positive, carbon-negative and carbon-neutral options. Carbon-neutral – the zero-carbon option – is worth less than the carbon-negative option. In fact, carbon-neutrality really has no positive value – its value is in the avoidance of the carbon-positive cost. Renewable energy is carbon-neutral, not carbon-negative, yet we treat it as though it has actually reduced our carbon emissions. Renewable energy should not receive a value for carbon-reduction, but should be attributed a value for avoidance of the cost of carbon-emission.

This may sound esoteric, but it has a significant impact on valuations and solutions. At the moment, by treating the installation of renewable-energy projects as effectively carbon-negative, we use them to offset the costs of our continued emissions. But if we do not reduce those emissions, there is no amount of renewable-energy that will reduce the environmental impact. It is possible to envisage, in a *reductio ad absurdum*, a scenario where we have installed so much renewable energy that the whole world is notionally carbon-neutral according to cap-and-trade accounting, and yet our carbon emissions remain as high as they ever were. This situation requires (besides massive engineering and expense) only that we increase our total consumption of energy in proportion to the increasing renewables

contribution. That is precisely what is happening (and more) in many of the countries that are selling us the notional “carbon-savings” from CDM renewable-energy projects.

There is no easy solution to this in a cap-and-trade approach that values non-carbon positively rather than carbon negatively. One has to attribute a notional carbon-saving to renewable-energy projects if they are to be able to trade on the market. And yet that carbon-saving is fictional, and encourages engineering solutions excessively relative to behavioural changes and protection/encouragement of carbon-sinks. Very often, the latter choices, requiring very little investment, will be the cheaper options, and will have additional benefits for the environment, and security of supply. But engineering solutions have been, and will continue to be, the preferred solutions of cap-and-trade market participants.

- d) ***Cap-and-trade assumes that there is any rationale for an arbitrary cap.*** Efforts to calculate these caps have been based on scientists' judgments about what level of emissions will be acceptable, how we should get there, and how the pain of getting there should be divvied up. We have already considered the impracticability of developing a rational basis for allocation of the emissions allowances within an overall cap. But what about that cap itself? It is often assumed that this is just a question of science – what is the level of emissions that presents an acceptable level of risk? But “risk” is the key word there. Risk is subjective. And avoidance of risk carries costs as does incurring that risk. This is about choice and subjective judgment – perhaps more so than in any other market, given the level of uncertainty and the complexity. Where we face uncertainty, risk, different impacts in different circumstances (down to the level of the individual), and subjective choices generally, the market is a more effective tool for discovering the balance of people's preferences than is central calculation.

This is about the balance between adaptation and mitigation. When we set a cap, scientists have decided for us what that balance should be. Reducing emissions to the level of that cap will carry a cost. Some of that cost could have been spent instead on measures to reduce the risk of damage from any global-warming impacts, or indeed simply on investment to improve the current quality-of-life of those who are subject to the risk. The balance between investing in adaptation and mitigation should not be decided for us by scientists, but discovered in markets that establish people's preferences and perceptions of the balance of risks.

There is no way of adapting cap-and-trade mechanisms to satisfy these objections. We should carry through with Phase 2 of EU-ETS, because the market had a reasonable expectation that it would be implemented. But we should agree now to put it out of its misery after that, and to use the period before 2012 to negotiate an alternative system to replace Kyoto – one that provides a more rational price, reflecting all sources and sinks, and taking account of adaptation as well as mitigation, and that is agreeable to all nations, or at least all major emitters. **There are alternatives, if Europeans are prepared to open their minds.**