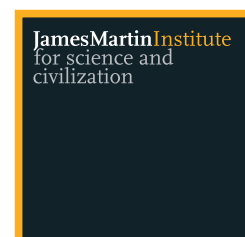


The Wrong Trousers: Radically Rethinking Climate Policy

Gwyn Prins & Steve Rayner

A Joint Discussion Paper of the James Martin Institute for Science and Civilization, University of Oxford and the MacKinder Centre for the Study of Long-Wave Events, London School of Economics



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The Wrong Trousers: Radically Rethinking Climate Policy is a Joint Discussion Paper of the James Martin Institute for Science and Civilization, University of Oxford and the MacKinder Centre for the Study of Long-Wave Events, London School of Economics.

First published in 2007 by the James Martin Institute for Science and Civilization, Saïd Business School, Park End Street, Oxford OX1 1HP.

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Frontispiece: Wallace, watched by his resourceful dog Gromit is taken places he does not intend to go by the "Wrong Trousers"
Picture ©1993 Aardman/Wallace & Gromit Ltd.

Executive Summary

We face a problem of anthropogenic climate change, but the Kyoto Protocol of 1997 has failed to tackle it. A child of summits, it was doomed from the beginning, because of the way that it came into being, Kyoto has given only an illusion of action. It has become the sole focus of our efforts, and, as a result, we have wasted fifteen years.

We have called this essay “The Wrong Trousers” evoking the Oscar-winning animated film of that name. In that film, the hapless hero, Wallace, becomes trapped in a pair of automated ‘Techno Trousers’. Whereas he thought they would make his life easier, in fact, they take control and carry him off in directions he does not wish to go.

We evoke this image to suggest how the Kyoto Protocol has also marched us involuntarily to unintended and unwelcome places. Just as the enticingly electro-mechanical “Techno Trousers” offered the prospect of hugely increasing the wearer’s power and stride, so successful international treaties leverage the power of signatory states in a similar way, making possible together what cannot be achieved alone. The Kyoto Wrong Trousers have done something similar to those who fashioned and subscribed to the agreement. To set a new course, we need to understand how we have gone wrong so far. Accordingly, the essay proceeds in three sections, as follows:

I. Kyoto: From Treaty to Creed

Recognition is growing of the many and serious shortcomings of the Kyoto Protocol and these are explained in this section. Some are technical; but others come because Kyoto has become a surrogate for other fights, as well as a dogma. Before the next meeting in Bali, Indonesia, locks down the post-2012 phase of climate change policy, there is a slim window of opportunity to implement a more productive approach.

II. Why Did the Kyoto Protocol Fail?

The Kyoto Protocol was doomed from the beginning because it was modelled on plausible but inappropriate precedents. We explain the failure of the Kyoto Protocol and discover what we can learn from its history in order to better design future policy.

We can discard the usual reasons given for the failure of the Kyoto protocol: that there is no problem of climate change; that certain key states have not signed up; or that political will was lacking. As the IPCC shows, there is a problem. Certain states, notably the USA and Australia, may have refused to sign up, but Kyoto has failed even in Europe and Japan, both of which enthusiastically adopted it and have paid huge sums to meet targets via “carbon offset” credits. There is plenty of political will, but it is driving a defective political process.

The Kyoto Protocol failed because it is the wrong type of instrument (a universal intergovernmental treaty) relying too heavily on the wrong agents exercising the wrong sort of power to create, from the top down, a carbon market. It relies on establishing a global market by government fiat, which has never been done successfully for any commodity. Such fabricated markets invite sharp and corrupt practices-and these are now occurring on a large scale in the European Emissions Trading Scheme and through Kyoto Clean Development Mechanism scams such as HFC combustion. This accounts for two-thirds of all CDM payments to 2012. On false premises, it dodged increasing challenges that result from industrialisation in China and India, in particular the growing use of coal in both countries.

Kyoto was constructed by quick borrowing from past practice with other treaty regimes dealing with ozone, sulphur emissions and nuclear bombs which, while superficially plausible, are not applicable in the ways that the drafters assumed because these were "tame" problems (complicated, but with defined and achievable end-states), whereas climate change is "wicked" (comprising open, complex and imperfectly understood systems). Technical knowledge was taken as sufficient basis from which to derive Kyoto's policy, whereas "wicked" problems demand profound understanding of their integration in social systems, and their ongoing development.

The presentation of Kyoto as the only course of action has raised the political price of admitting its defects, not least because it would mean admitting that the non-signatories may have been right in practice, whatever their motives. Its advocates invested emotional as well as political capital in the process, making it difficult to contemplate the idea that it is fatally flawed. Its narrow focus on mitigating the emission of greenhouse gases (in which it has failed) has created a taboo on discussing other approaches, in particular, adaptation to climate change. Failure to adapt will cost the poor and vulnerable the most.

For the past fifteen years, it has given the concerned public an illusion of effective action, tranquillising political concern. This has been, perhaps, its most damaging legacy.

III. The Right Trousers

The final section sets down the principles that should underpin a viable engagement with climate security. In it, we take a radically different approach from the top-down command and regulatory regime of output targets that is Kyoto. Our approach is both older and simpler. It sets out to harness enlightened self-interest to drive a process designed to generate a range of possible solutions, which can be compared and assessed, mixed and matched, changed and refined as we pursue the goal of climate security.

In this essay, the reader will not find a detailed critique of the Kyoto mechanisms. Nor will the reader find a proposal for a different single solution in place of Kyoto. We have refrained from this because climate change is not a discrete problem amenable to any single shot solution, be it

Kyoto or any other. Climate change is the result of a particular development path and its globally interlaced supply system of fossil energy. No single intervention can change such a complex nexus (although as the earlier sections have shown, the attempt to do so has produced unintended and unwelcome effects). There is no simple silver bullet.

Instead, we suggest that in cases like this, the best line of attack is not head-on. We suggest that the policy response to climate change should assemble instead a portfolio of approaches—silver buckshot, rather than silver bullet—that would move us in the right direction, even though it is impossible to predict which of these approaches might stimulate the necessary fundamental change. This is a process of social learning in which we must be always alert to maintain our trajectory towards the goal by constant course corrections and improvements which, by definition, cannot be prescribed precisely beforehand.

In the third section we elaborate the following seven basic principles of such a radically re-thought approach: 1. Use silver buckshot; 2. Abandon universalism; 3. Devise trading schemes from the bottom up; 4. Deal with problems at the lowest possible levels of decision-making; 5. Invest in technology R&D; 6. Increase spending on adaptation; 7. Understand that successful climate policy does not necessarily focus instrumentally on the climate.

Throughout we emphasise the urgency of re-framing climate policy in this way because whereas today there is strong public support for climate action, continued policy failure on the Kyoto principles spun as a story of success could lead to public withdrawal of trust and consent for action, whatever form it takes.

I. Kyoto: From Treaty to Creed

A Window of Opportunity

The Kyoto Protocol regime expires in 2012. In December 2007, on the Indonesian island of Bali, the next phase of climate change policy will be locked up. This gives us a slender window of opportunity to radically rethink our objectives and operations.

The many and serious shortcomings of the protocol's regime are at last beginning to be publicly recognised, and new approaches are being discussed. But new approaches will be structurally compromised from the outset if they repeat past mistakes—and, as things are going now, that is all too likely.

The conventional wisdom currently framing the opening assumptions for the Indonesian Summit holds that the successor to Kyoto must somehow be much more stringent and more inclusive. The view is held that the USA, China and India must certainly be drawn into a UN mediated process.

With these thoughts in mind, the "20/20" target, agreed by the European Union at its March 2007 environment summit, is ambitious. It invites a 20% reduction in CO₂ emissions by 2020—much applauded by European politicians at that summit as a sign of serious intent. Indeed, the Commission wanted the 20% cut to be achieved through existing methods, without need for new agreements. A fresh global agreement, the Commission believed, should aim to be *more* demanding still: 30% by 2020. The British Government intends to legislate a national Climate Change Act premised upon a 60% cut by 2050. As will become evident, we have no more idea how the British Government thinks it can achieve this target than how the EU can attain its lesser target.

From Alarm to Euphoria

The economist Antony Downs has identified an issue/attention cycle that comprises five stages: *pre-publicity*; *alarmed discovery*; *euphoric reaction*; *counting the cost*; and *quiescence*.¹ In the cycle of the politics of the environment, we are moving once more from alarmed discovery to euphoric reaction.

This is at least the second trip round the "Downs' Cycle" for the problem of global climate change. The first began in the late 1980s. We can sum up political attitudes before this with a personal anecdote. In 1986, a senior American official rejected the proposal for a research programme on the policy implications of climate change on the grounds that it would never become a major public concern. This was, apparently, because it lacked the three essential prerequisites: "It is too far in the future. The science is too

¹ A. Downs, "Up and Down with Ecology: The 'Issue Attention Cycle'", *The Public Interest*, 28 (1972) 38-50.

uncertain. And there is no readily identifiable villain upon which to focus the blame.”²

The first phase of Downs’ Cycle, *pre-publicity*, began with the 1988 drought and heat wave in North America. This provided a vivid background for the report of the first IPCC Working Group on the Science of the Climate (WGI)³, chaired by John Houghton, to the UN’s Rio summit on environment and development, usually called the “Earth Summit”. The influence of Houghton’s WGI report at the summit was widely attributed to the careful and scientifically responsible division of the report into “things certain”, “things probable” and “things possible”.⁴ But, however deft or persuasive any report may be, timing is the essential pivot in politics. With the collapse of the USSR and the ending of the Cold War, the moment was ripe for another crusade.

The second phase in this first trip around Downs’ Cycle, “alarmed discovery”, followed at the Rio Earth Summit of 1992. The “euphoric reaction” was the political shaping and negotiation of the Kyoto Protocol of 1997. Even so, as we will explore in more detail, doubts were being voiced from the outset. In the later 1990s, some business people, as well as the non-signatory states, were questioning the costs involved. The phase of “quiescence” came at the turn of the century. This was partly because constituencies concerned with climate change in the West were focused on other problems, such as African poverty reduction, development aid advocacy and nuclear disarmament.

But in 2006-7, climate change rocketed to the top of the international political agenda with a velocity that demands explanation. We can point to the coverage given to the ineptitude of the Bush Administration’s response to the flooding of New Orleans by Hurricane Katrina, and the sense of political momentum among activists was reinforced by Al Gore’s visually compelling and widely screened advocacy film, *An Inconvenient Truth*. Significant milestones on the way include: i) the California Global Warming Solutions Act (August, 2006), which sets the goal of stabilising the world’s fifth largest economy at its 2000 CO₂ emissions by 2010 (this pioneers investment guarantees to encourage private investors into “blue skies” de-carbonised energy research; ii) the Stern Report⁵ (November, 2006), which suggested that the costs of inaction would exceed those of action in the medium term; and iii) the publication of the Summary for Policymakers of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (March, 2007).

² S. Rayner, “What Drives Environmental Policy?”, (Editorial) *Global Environmental Change*, 16 (2006) 4.

³ J. T. Houghton, G. J. Jenkins, and J. J. Ephraums, (eds.) *Climate Change: The IPCC Scientific Assessment*, (Cambridge University Press, Cambridge, 1990).

⁴ WMO/UNEP, *Climate Change: The IPCC 1990 and 1992 Assessments*, (IPCC, 1992) 52-3.

⁵ N. Stern, *The Economics of Climate Change: The Stern Review*, (Cambridge University Press, Cambridge, 2007).

Concern has now culminated in a consensus view, based in and originally emanating from Europe, and now uncontested by major western news media, which holds that the science debate about climate change is over. It demands that radical, far-reaching, deeply penetrating forms of directive policy and governmental action are now required to follow from the Kyoto Protocol, after it expires in 2012.

Yet, it is a fact that, if the formal aim was to reduce the worldwide emission—or even the increase in rate of emission—of anthropogenic CO₂, then Kyoto turned out to be the Wrong Trousers in the sense that gullible Wallace discovered and his wise but silent dog Gromit feared, in the eponymous film. Wallace's Wrong Trousers were enticingly electro-mechanical and seductively modern. They offered the promise of greatly increasing the wearer's power and stride (or in Wallace and Gromit's case, making dog-walking easier). But when they were switched on, their undoubted power actually produced quite unexpected and unwelcome results. If the aim was to effect real material change in human impact upon the atmosphere, then Kyoto might have achieved three things: to make any meaningful practical progress *at all* towards mitigation of anthropogenic greenhouse gas emissions; to begin effective adaptation to climate change, which is the quickest way to protect people now living from adverse impacts; to challenge the refusal of climate puritans to entertain the idea of adaptation alongside their narrow preoccupation with mitigating emissions.

The fact is, Kyoto has achieved none of these things. In the case of adaptation, it may be that activists feared that the presentation of such an alternative would dilute the political will to follow their prescription: in fact, Al Gore described adaptation in millenarian language as "...a kind of laziness, an arrogant faith in our ability to react in time to save our skins."⁶ Whatever the cause, until very recently, adaptation was kept off the table, and some continue to resist it.

Relentless Rhetoric and Awkward Spaces

And so, the EU, and Great Britain, are continuing to set ambitious targets for reductions in CO₂ emissions, and presenting them to the public with resolute vigour. But look more closely and the discovery of mixed motives is hardly surprising. Politicians hope that some of the green lustre may rub off onto themselves and their other projects. In 2006, the then Environment Minister (now the British Foreign Secretary) almost said as much. Warming to his repeated theme that the EU should be seen as an "Environment Union", he argued: "Europe needs a new *raison d'être*.... The needs of the environment are coming together with the needs of the EU: one is a cause looking for a champion; the other a champion in search of a cause."⁷ Meanwhile, the British Opposition leader has swapped the previous

⁶ A. Gore, *Earth in the Balance: Ecology and the Human Spirit*, (Houghton Mifflin, New York, 1992) 240.

⁷ D. Miliband, "Towards an Environmental Union", *Centre for European Reform Bulletin*, 50, (October/November 2006).

Conservative logo for an oak tree—another green reference? And yet, behind this rhetoric and these gestures, the mixture of agents and mechanisms proposed to achieve the targets set is not greatly changed from the original Kyoto conception. As its first order task, it still seeks to reduce anthropogenic carbon dioxide and other greenhouse gas emissions.⁸

The politically charged rhetoric within which the climate change question is discussed means that anyone who questions the levels of the percentage reduction goals, or expresses doubt about their feasibility or the structures and methods offered to achieve them is regarded with suspicion. Unquestioning support for massive and immediate reductions of emissions under the Kyoto type of approach has become a litmus test for determining who takes the threat of climate change seriously. In a new Manichaeian Heresy, individuals, institutions and nations who promote Kyoto are blessed. But those who doubt it, for whatever reason, are damned and lumped together as heretics.⁹

Both in moral as well as in operational terms, Kyoto is predicated upon changing the world first in order to meet its goals, rather than taking the world as it is and seeking ways to build on possibilities and dynamics already present. This is a profound philosophical difference of approach between the Kyoto supporters and the one that we advocate in Part Three of this essay.

As we will discuss, the consequences of turning treaty into creed have obstructed effective action on anthropogenic aspects of climate change, stifling questions and sedating political demands. Failures and defects are excused or ignored in such ways that any lessons they might carry cannot be learned, questions cannot even be raised. Instead, relentless optimism is the order of the day. For example, we have been told by a senior European Commission official involved in “20/20”, that he has in fact confronted his colleagues in private: observing that 2020 is only five thousand days from now, and that the record of the last five years has been of a 3.4% net increase in global CO₂ emissions. He asked them, what on earth would turn that past track record into their future target? The first phase of the European Union Emissions Trading Scheme (EU ETS) has crashed and burned.¹⁰ So, he suggested, the satisfaction expressed by high EU officials at simply having agreed a target number is badly misplaced, and some better

⁸ EU Commission Communication “Limiting Global Climate Change to 2° Celsius: The Way Ahead for 2020 and Beyond”, (10 January 2007); adopted by EU Heads of State at spring summit, 8-9 March 2007.

⁹ For example, see R. Collier, “Why Get So Heated About Global Warming?” a review of *Break Through: From the Death of Environmentalism to the Politics of Possibility*, by Ted Nordhaus and Michael Shellenberger, and *Cool It: The Skeptical Environmentalist's Guide to Global Warming*, by Bjørn Lomborg, *San Francisco Chronicle*, (7 October 2007).

¹⁰ The anonymous EU official is supported in that opinion by the House of Commons Environmental Audit Committee (in Second Report “The EU Emissions Trading Scheme: Lessons for the Future” (HC Paper (2006-7) no. 70, 1 March 2007), which concluded that the first phase of EU ETS could not be shown to have produced any real-world reduction in CO₂ at all.

way of acting will be required. But what that might be is not yet apparent to him. As things stand, whatever follows will remain an inter-governmental negotiated instrument, generating a regime of targets projected through international agencies like the UN.

The elevation of the Kyoto Protocol to the status of a litmus test for humanitarian and environmental responsibility has created an awkward space. As Rayner has pointed out in evidence to a House of Commons Committee in 2004, "...between Kyoto's supporters and those who scoff at the dangers of leaving greenhouse gas emissions unchecked, there has been a tiny minority of commentators and analysts convinced of the urgency of the problem while remaining profoundly sceptical of the proposed solution. Their voices have gone largely unheard."¹¹ We belong to that small group standing in that awkward space; and this essay seeks to help correct that imbalance.

The Emperor Has No Clothes

It is not scepticism, but the strength of our concern about human-induced climatic perturbation that compels us to expose these uncomfortable arguments. There is a serious climate change problem to address—and we have been aware of this for a long time. Not only have the basic physics of the greenhouse effect been understood for more than a century, since Arrhenius first described it,¹² so has the general magnitude of the effect. The role of human agency within the global climate system has been progressively refined since then. Leading voices in the scientific community agree that the climate will continue to change due to human influences, among others, and such changes include the possibility of the abrupt and disruptive.¹³

We have to act effectively, but there are no good reasons to think that instruments like Phase II of the EU ETS, the British Climate Bill, or the Kyoto successor will be successful in their formal aims. Across the world, targets bear little relation to reality. Democratic victories in the 2006 US Congressional elections were swiftly followed by an odd "auction of promises" in which members of Congress vied to outbid each other with proposed emissions targets that were simply not achievable. In Britain, early 2007 found the Environment Secretary announcing his enthusiasm for personal carbon allowances. Not only is there scant evidence for the

¹¹ S. Rayner, "The International Challenge of Climate Change: UK Leadership in the G8 and EU", Memorandum to the House of Commons Environmental Audit Committee, (24 November 2004) 5.

¹² S. Arrhenius, "On the Influence of Carbonic Acid in the Air upon the Temperature on the Ground", *The London, Edinburgh & Dublin Philosophical Magazine & Journal of Science (fifth series)*, 41 (1896) 237-75; IPCC Working Group 1 (Physical science basis), Fourth Assessment Report (June 2007).

¹³ As a statement of principles, we think that the summary statement that prefaces the first IPCC scientific assessment is exemplary, and continues to be a prudent guide. See J. T. Houghton, G. J. Jenkins & J. J. Ephraums, *Climate Change: the IPCC Scientific Assessment*, (above, n. 6), xxvii.

efficacy of this approach, but this is a policy which, viewed cynically, may reflect a desire to off-load onto individuals, under an inappropriate guise of “choice”, the responsibility for awkward decisions. It is an easy step from there to blaming individuals for future failures. Whether or not this is the case, it is certainly a necessarily intrusive policy with ramifications that should trouble anyone concerned about privacy and civil liberty. It has been followed by an escalating competition between the three main British political parties over which could propose the most stringent curbs on carbon emission. No other options have been discussed.

In Britain, this policy debate is being conducted alongside other governmental priorities that have a quite different focus. The government is raising the marginal costs of train travel, making plans to expand airports, widen motorways, build roads, and build large numbers of new houses in flood-plains. This reveals how the uncompromising framing of the climate change issue and its potential solution in the Kyoto formulation, was always destined to be in jarring contradiction with the trajectories of most other governmental initiatives in democratic politics. Perhaps this explains why responsibility for change is now being off-loaded onto individuals (e.g., “We build the airport/road etc, we tax you not to use it but you do anyway, so we did our best and it’s your fault”).¹⁴

Solutions for the Future

Both writers of this essay began to be engaged with the issue of climate change in the mid-1980s when the task was to gain any audience at all for the discussion. In 1990, we each, independently, argued that the evidence for some kind of policy action on climate was at least as strong, if not stronger, than the evidence upon which governments, firms, and communities routinely rely to make economic or foreign policy, make takeover bids or investments in new products, or manage local infrastructure and resources respectively.¹⁵ Today, we find that we are like coachmen on a runaway stage-coach, trying to rein back bolting horses, crying “Whoa! Whoa!” before an accident happens.

The idea that the Kyoto Protocol approach to climate change mitigation is the only solution compounds the problem of finding viable responses for real problems. Another solution must be found—or rather other solutions.

¹⁴ Opinion polls reveal that these same contrasts (between public and individual responsibility) in policy are also found in public attitudes: while huge majorities believe that global warming is occurring (85%) and will continue (79%), and a considerable number (48%) think their children’s lives will be worse as a consequence, a substantial majority (65%) nevertheless oppose raising fuel duty and only a quarter would be prepared to fly less, http://www.yougov.com/archives/pdf/TEL060101021_1.pdf (accessed October 2006).

¹⁵ G. Prins, “Politics and the Environment”, *International Affairs*, 66/4, (1990) 711-730; W. Fulkerson, R. Cushman, G. Marland, S. Rayner, *International Impacts of Global Climate Change: Testimony to House Subcommittee on Foreign Operations, Export Financing, and Related Programs* (Oak Ridge National Laboratory, ORNL/TM-11184, 1989); S. Rayner, “Human Choice and Climatic Change: Managing the Global Environment”, *Global Environmental Lecture Series*, Cornell Law School (27 March 1989).

This is not a delaying tactic. On the contrary, it is because of the waste of time and opportunity over the last fifteen years that a switch to climate policy based on different principles is urgently needed.

Among these solutions we include adaptation—and we will suggest below that current hostility to adaptation is predicated upon a misunderstanding of the operation of the greenhouse effect. Far from impeding progress on mitigation, under a different philosophy of climate policy, early adaptation efforts could have had exactly the opposite effect.¹⁶ In fact, had that different philosophy been adopted instead of the Kyoto approach, wartime levels of targeted and accountable public and private investment in the energy production and use cycle, for example, might have already begun.

In the rest of this paper, we address two tasks. The first is to establish the reasons for the failure of the Kyoto Protocol, and discover what we can learn from the history of this failure in order better to design future policy. The second is to describe the principles that should drive a process designed to generate a range of possible solutions, which can then be compared and assessed, mixed and matched to the task in hand.

At the moment when the issue is again to the fore and not yet quite locked into the form of its next iteration, it is vital to understand why Kyoto was The Wrong Trousers as an essential preparative to radically rethinking climate policy. We insist on recognising the failure of Kyoto not because of a desire to stand in judgement, but because, without this frank recognition, the climate policy community will continue to demand more of the same as the remedy to present setbacks, as witnessed in the published draft agenda for the Bali Conference.

¹⁶ S. Rayner & E. L. Malone, "Ten Suggestions for Policymakers", in S. Rayner & E. L. Malone (eds.) *Human Choice and Climate Change, Vol. 4, What Have We Learned* (Battelle Press, Columbus, Ohio, 1998).

II. Why Did the Kyoto Protocol Fail?

The Wrong Framing

The Kyoto Protocol of 1997 was an important symbolic expression of public anxiety about possible human impacts on the natural world; but it was fundamentally flawed as an instrumental arrangement for dealing with climate change. In short, it was doomed from birth.

The shortcomings in the Kyoto mechanism were privately acknowledged from very early on, and aired among the expert and professionally engaged community soon thereafter.¹⁷ Only very recently have these concerns surfaced in wider public awareness. But although admitted obliquely in, for example, the 2004 Annan High Level Panel report on reform of the UN ("...We urge member states to reflect on the gap between the promise of the Kyoto protocol and its performance...")¹⁸, it is still not universally admitted to the public, especially in Europe, that Kyoto has failed in its own terms. Instead, it has been turned into a morality play, with castigation of non-signatories, who now receive the blame for any failures.

As the issue has recently risen steeply in political salience, the presentation of the issue has become permeated with a sort of moral panic and associated hyperbole. It has become dogma that climate change is now the greatest challenge facing humanity, and that we have only a very short time in which to save the planet.¹⁹ The Kyoto Protocol is a manifestation of a particular framing of the climate change issue. In this section of the paper, we are not principally concerned with the detailed substance of the Protocol or its affines, like the EU ETS, but with the three sets of assumptions—about command and control, targets and transfers, and the right treaty models to adopt—that lie beneath and within its framing.

i) Command and Control

The Kyoto Protocol seeks to square a circle. It seeks to articulate a market-driven trading mechanism, with a top-down detailed specification of how it will work. Although it attempts to go beyond classic command and control approaches, in the last resort it still rests on the pre-eminence of those planning tools. It is an example of a form of output target-setting that seeks to prevail by institutional fiat, based on over-confident assertion of fragile

¹⁷ D. Victor, *The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming*, (Princeton University Press, Princeton, 2001); R. Benedick, "Striking a New Deal on Climate Change", *Issues in Science and Technology*, 18/11 (2001) 71-76; F. Laird, "Just Say No to Greenhouse Gas Emissions", *Issues in Science and Technology*, 17/2 (2000) 45-52; D. Sarewitz and R. A. Pielke, Jr., "Breaking the Global Warming Gridlock", *The Atlantic Monthly*, 286/1 (2000) 55-64.

¹⁸ United Nations, *A More Secure World: Our Shared Responsibility: Report of the Secretary General's High-level Panel on Threats, Challenges and Change*, UN (2004) 30.

¹⁹ For example: "The entire scientific community is telling the world that it's the biggest threat to human civilisation." Mark Lynas, quoted by M. McCarthy, "Global Warming: Too Hot to Handle for the BBC", *The Independent*, (6 September 2007).

knowledge, through the sanction of tax and associated punishment. It has been applied to an entirely novel, indeed, a fabricated market.

The emissions targets set by Kyoto were only distantly related to mitigating the causes of climate change, and not at all to adapting to its effects. They were also far too low. Even so, they were further watered down in intergovernmental negotiation that was attempting to gain signatories, notably at The Hague COP-6 review conference in 2000. As Richard Cooper spelt out immediately after Kyoto was negotiated and opened for subscription, the two essentials of any successful agreement were always missing: there was no common agreement on means or on objectives.²⁰ Goals are related to, but are different from, targets. Kyoto has been shaped around output targets. Input targets such as a renewable energy commitment, are a different matter and fit well with the approach that we advocate below. But the widespread opinion that no political progress is possible without the vision of output targets to drive them is widely disproved by experience, including, but not exclusive to, the failure of central planning in the now vanishing communist world.

The top-down creation of a market in emissions was an integral part of the Kyoto approach. But it has hardly been successful. In fact, the boom and bust career of carbon trading so far and especially of the carbon offset business within it, has manic and fantastical qualities reminiscent of the South Sea Bubble of 1720, or the Dutch tulip investment mania of the seventeenth century.

The relation of state power to climate policy has paradoxical qualities. Modern states are of course uniquely powerful. They usually have the monopoly of legitimate violence; they always have bureaucratic power, and sometimes have elements of both of the other Weberian ideal types of *traditional* and *charismatic* power as well.²¹ Their power mesmerises, especially those who exercise power within them. So it seems only common sense, especially to such practitioners of power when confronted with an immense problem, to reach reflexively for such levers. But state power in all its grandeur has little leverage here. It is simply not the right agent in this case. It has little purchase upon the process of CO₂ emission, and such as it has is inappropriate in its effect.

After the collapse of communism in most of the world, the state and inter-governmental associations of states cannot claim control of the means of production of CO₂, only privileged guardianship of the process and of measurements, translated into regulations. This is a "top down" command approach, which is perhaps why the Kyoto mechanism is so entwined with metrics and targets. In fact, an efficient grip on carbon emission must necessarily mesh with real material processes, and arise from the "bottom

²⁰ R. Cooper, "Toward a Real Global Warming Treaty", *Foreign Affairs*, 77/2 (March/April 1998) 66-79.

²¹ M. Weber, *Theory of Social and Economic Organization*, trans. by A. R. Anderson and T. Parsons, (1966 [1947] Free Press).

up". That is done by different agents with different powers and different decision processes that mostly reside in and are mediated by market forces.

Very little of the money now flowing through the highly constrained Kyoto credit carbon offset market has gone to new non-carbon technologies and very few of those offset credits will benefit the world's poor, as we document below.

The Kyoto Protocol called for states to behave as they scarcely ever do. It called for them to exercise self-restraint for altruistic motives. Since it goes against the grain of their natures, while it may appear noble and courageous, that course is rarely a wise—or pursued—course in diplomacy. Adam Smith's advice in *The Wealth of Nations* (1776) is to be heeded here: "We address ourselves not to their humanity but to their self-love and never talk to them of our own necessities but of their advantages". Ordering people what to do is rarely as successful a strategy as one that they undertake willingly. Moreover, willing actions possess commensurately higher degrees of political—and moral²²—legitimacy precisely because of the absence of coercion.

Rather than the current top-down, command and control approach, the engagement with climate change should capitalise in novel ways upon the only driver of voluntary political action that has demonstrated reliability, namely self-propelled, enlightened self interest. As it is, within the framing of the Kyoto Protocol, states have simply pursued *raison d'état*, as they almost always do.

ii) Targets and Transfers

Deft self-interested diplomacy in the mid-1990s by Russia, Ukraine and re-united Germany set the base-line for measuring their "improvement", and hence their case for transfer funding, at a date *before* the collapse of their highly inefficient and polluting communist-era industries. As David Victor documented in 2001, all these states had to do to claim free money for selling notional "credits" was what they were doing anyway: demolishing communist-era plants and rebuilding their industries and infrastructure as they entered the global market economy.²³

The market that has developed rewards countries and enterprises with low growth by allowing them to sell unused pollution permits, and punishes the economically successful by making them buy such permits. Unsurprisingly, the USA has not been prepared to give cold cash for "hot air". But the pattern continues: in 2007, Russian hot air is again for sale and this time is being bought in volume by Europeans, as they attempt to prop up the European Union Emissions Trading System, preventing a repeat of its 2006 collapse. The scale of offset purchases by Europeans has created rich

²² Discussed by Adam Smith in Section IV, "Practical rules of morality", of *The Theory of Moral Sentiments* (Harvard University Press, Boston, 1853).

²³ Victor, *The Collapse of the Kyoto Protocol*.

pickings not only for Gazprom, but also for entrepreneurs and governments, notably in Asia, who get money for nothing by selling “surplus” credits.

It is becoming evident that there will be little or no structural change to meet CO₂ reduction targets in Europe. As a result, it is becoming increasingly important for governments to obtain extra-European offset credits. The more widespread this strategy becomes, the less incentive there is for governments to tackle the structural issues at source, because they can always spin a tricky story of compliance along these lines.

As an example, consider what is happening in Germany, a country with a large and vociferous green political constituency. The Chancellor is carefully polishing her green credentials. What is happening in practice? Germany has a large domestic Kyoto credit surplus entitlement as a windfall from the destruction of East German industry. It has also negotiated with the European Commission an increase in the number of Kyoto credits per year that it may buy from elsewhere (from 57.8 million to 90.6 million). Now, Germany can meet its emissions target without making any serious structural changes at home. Its Kyoto credit surpluses are effectively subsidising the continued operation of its lignite-fuelled power stations. Even more bizarre, in some nifty arbitrage, Germany is doing this while selling its higher value “surplus” domestic credits to the British.²⁴

For a second example, we can turn our attention to the UK. The much-trumpeted British reduction in CO₂ emissions was also not the result of a decision to reduce emissions for climate change reasons. It was a by-product of a quite different battle. Mrs Thatcher broke the coal unions by destroying their industry. The so-called “dash for gas” in power generation which followed the large reduction in coal mining was responsible for most of that CO₂ abatement. It became possible as British North Sea gas came on-stream.

There were therefore quite respectable reasons why the USA, Australia and, initially, Russia did not sign the Kyoto Protocol, as well as other motives on all sides (including ignoble reasons for Russia’s eventual subscription). Furthermore, the regime did not include the rising industrial powers. India and China did not join the treaty, claiming the special exemption of the need to escape from poverty, alongside lack of responsibility for emissions to date—although the carbon emissions of the Indian middle classes can be shown already to exceed those of Australia²⁵, while China’s quick and dirty industrialisation is well known, generating greenhouse gas emissions that now exceed even those of the United States.

²⁴ “Europe’s Dirty Secret: Why the EU Emissions Trading Scheme Isn’t Working”, Open Europe Research Paper, (August 2007), cited in PointCarbon.com, “Carbon Market Europe”, (23 February 2007) 48, (German domestic credit entitlements are given in the table at 37); Carbon Trust, “EU ETS Phase II Allocation: Implications and Lessons”, *cit. ibid.* (May 2007), 46, details how Germany gives special subsidy to the most polluting power stations.

²⁵ S. Rayner, “Governance and the Global Commons”, in M. Desai & P. Redfern (eds.), *Global Governance: Ethics and Economics of the World Order* (Pinter, London, 1995) 80.

It looks as if there are few incentives for this to change. The 2007 BP *Statistical Review of World Energy* documents how one consequence of the rising absolute price of oil and, more significantly, of the exploration viability price of difficult oil will be, ironically, to make use of coal much more attractive.²⁶ On present trend, the world faces the consequences of a massive upsurge of coal use in China and India in coming decades. China increased coal consumption by 8.7% in 2006 over 2005, producing 70% of the global total of increased use of coal. The Chinese Communist Party's planned level of coal utilisation for 2020 was actually reached last year.²⁷ Yet it has been Australia, not China or India, which was vilified for not signing; and the fact of America staying out of Kyoto has resulted in its widespread public demonization. Speaking in Sydney after the General Election campaign had begun, Al Gore described Australia and the USA as the "Bonnie and Clyde" (i.e., desperate outlaws) of international climate policy, and urged Australians to sign Kyoto, thereby forcing the USA to follow suit.²⁸ But this sort of talk has also been recently joined by a dawning recognition among a few that the "bad guys" might actually have been doing the right thing, albeit for the wrong reasons.

The failure of Kyoto in its own terms is most eloquently attested by the finding that the (working) Montreal Protocol on CFC reductions may have had a larger net physical impact on the greenhouse effect *as an incidental consequence*, than Kyoto would have had if it had been fully implemented.²⁹ Perhaps even more startling is that the Bush Administration's "Methane to markets" programme, launched before the Kyoto Protocol was activated, may have done more to reduce emissions than all of Kyoto.³⁰ This prompts the hard question: is there any evidence that through its formal operation the Kyoto Protocol has been a brake on the emission of greenhouse gases at all? Or, as we have mentioned, has it made the situation even worse, by giving the impression that something was indeed being done, and so soothing concern and hence political demand? We can add the charge of being a political sedative to the finding of technical irrelevance.

²⁶ The exploration viability price is the price at which it makes economic sense for oil companies to invest, i.e., the price at which an oil field is profitable. This figure is not published and is much more stable than the headline price: it has been around \$28/bbl for many years, until it rose to current levels in the mid \$30s/bbl in the last two years. At this price so-called "difficult" oils become viable. For example, the Canadian province of Alberta now posts proven reserves in oil shale that exceed the reserves of either Iraq or Iran. Current estimates are that upwards of 1 trillion barrels of "difficult" oil remain to be extracted when the EVP is right.

²⁷ BP Statistical Review of World Energy 2007, www.bp.com/statisticalreview; E. Economy, "The Great Leap Backward? The Cost of China's Environmental Crisis", *Foreign Affairs*, 86/5 (September-October) Sept/Oct 2007) 38-60.

²⁸ P. Goodenough, "Kyoto Takes Centre Stage in Australian Election Campaign", (November 2007), CNSNews.com, <http://www.crosswalk.com/news/11557996> (accessed 11 November 2007).

²⁹ G. J. M. Velders, *et al.*, "The Importance of the Montreal Protocol in Protecting Climate", *ProcNatAcadSci*, 104/12 (20 March 2007), 4814-4819.

³⁰ G. Easterbrook, "Red and Green", *The New Republic*, (14 February 2005), <https://ssl.tnr.com/p/docsub.mhtml?i=w050214&s=easterbrook021405> (accessed 4 November, 2007).

iii) Misguided Models

Kyoto was a child of summits; and its successor promises to be so also, judging by present expectations.³¹ The case for summitry is serious and weighty. The build-up of expectations around a key event, the presence of state leaders, and the pressure of time can work together to produce decisive outcomes that would not be achieved by any other means.

The model for most of the post-war period was the Yalta and Potsdam summits, which shaped the post-World-War II world. During the Cold War, notably during the Reagan presidency, summitry was refined by the superpowers as an instrument for achieving nuclear arms control. Moreover, it got results; indeed, sometimes it threatened to work too well.³² The personal chemistry of Gorbachev and Reagan at the Reykjavik mini-summit of 1984 propelled the two leaders beyond most expectations. Gorbachev and his team wanted to bounce the arms control process into arms abolition and Gorbachev relied on his personal chemistry with Reagan to try to achieve this. As a result, they nearly agreed to a regime to abolish nuclear weapons altogether, which was not the Western plan at all.³³

The classic model of summitry therefore developed with concentric circles of experts who supplied the decision-makers at the centre with the formulae and positions to negotiate. "Sherpas"—civil servant experts—paved the way towards summits and the expert advisers whirled around the vortex of power during the event, feeding in their knowledge. Such a model works when the knowledge is secure and the problems under discussion are "tame" in the technical sense. However, a summit is much less likely to produce a predictable, but accelerated agreement, if the subject matter is, not tame, but, to use another technical term, "wicked".

Tame and Wicked Problems

The difference between tame and wicked problems is central to understanding why Kyoto has failed.³⁴ It was a process designed from components that had worked for tame problems, but which could not work when applied to a wicked one.

³¹ The draft agenda for COP-13 and CMP-3 published on 22 August 2007 gives chapter and verse for that fear.
http://unfccc.int/files/meetings/cop_13/agendas/application/pdf/cmp3_prov_agenda.pdf
(accessed 3 November 2007)

³² D. Reynolds, *Summits: Six Meetings That Changed the Twentieth Century*, (Allan Lane/Penguin, 2007).

³³ A case study examination of the Reykjavik climax of this form of summitry may be found in G. Prins, "The Role of Superpower Summitry: Recessional", *Political Quarterly*, 61 (July-September 1990) 263-77.

³⁴ S. Rayner, *Wicked Problems: Clumsy Solutions*, First Jack Beale Memorial Lecture, University of New South Wales, Sydney, Australia, 25 July 2006

“Wickedness” in a global problem like climate change, has specific meanings.³⁵ What makes a problem “wicked” is the impossibility of giving it a definitive formulation: the information needed to understand the problem is dependent upon one’s idea for solving it. Furthermore, there is no stopping rule: we cannot know whether we have a sufficient understanding to stop searching for more understanding. There is no end to causal chains in interacting open systems of which the climate is the world’s prime example. So every wicked problem can be considered as a symptom of another problem: the relationships are therefore *complex* (multi-faceted) in contrast to *complicated* (multiple, but mono-faceted). If there is premature foreclosure, we may become prisoners of our own assumptions.

Because of the social implications of this sort of knowledge, technically wicked problems inhabit a special analysis/decision loop. The higher the perceived public anxiety, the greater the uncertainty; the greater the uncertainty, the greater the desire for direct involvement; the greater the involvement, the lower the willingness to trust expert decision-making. As this loop develops, it is likely that emotional commitments will play a greater role in policy decisions than objective knowledge. At this point, scientists must be especially wary of the temptation to gain popular applause.³⁶

Superpower summitry from the time of the Cold War was the model of politics that was adopted for use in the multilateral arena of the United Nations. It was applied to a number of discussions for problems (e.g., of development, or racism) that reached far beyond, the “tame world” of states and arms-control. These included the Earth Summit, held at Rio in 1992, which was in many ways the most important of this series.

The Earth Summit was large, both in scope and expectations. Political leaders were under great media pressure to deliver results (as happens in summits by their very nature), and the civil service that supported them was under pressure to offer mechanisms that would lead to those results. What happened in that pressure cooker? The civil servants did what common sense and human nature suggest. Under pressure, we frequently analyse new experiences by analogy and that is neither lazy nor foolish in many circumstances. In short, the experts at Rio sought to bring their past experience to bear. But sometimes—and the climate change issue is one such—experience can carry fatal baggage.

³⁵ First defined in these terms in H. Rittel & M. Webber, “Dilemmas in the General Theory of Planning”, *Policy Sciences*, 4 (1973) 154-59.

³⁶ The manner in which an apparently pure science (“linear”) framing of a science problem can actually lead to covert political advocacy is illustrated and discussed in R. Pielke Jr, *The Honest Broker: Making Sense of Science in Policy & Politics*, (Cambridge University Press, Cambridge, 2007) 80-87 & 125-34.

Three Key Analogies

With hindsight, and a forensic eye, the design of the climate change regime during those years of alarmed discovery and euphoric reaction may be seen to bear the marks of conscious and unconscious influences from three major policy initiatives of the 1980s. While the influence of the first two of these is known to have informed the design of the climate regime, the influence of the last is less well or widely recognised. They are the international stratospheric ozone regime, which responded to the discovery that chlorofluorocarbons (CFCs) were damaging the capacity of the upper atmosphere to filter harmful ultraviolet radiation; the US EPA Acid Rain Programme, which allowed American electricity generators to trade SO₂ emissions rights; and the Strategic Arms Reduction Treaty (START), designed to reduce the number of nuclear warheads deployed by the Cold War superpowers, the USA and the USSR.

The three regimes had features that *prima facie* seemed to parallel the climate change issue, so it is hardly surprising that they helped to frame policy makers' thinking about the problem. But because the problems presented by climate change are wicked problems, there were many ways in which these models did not fit at all.

i) The International Stratospheric Ozone Regime

The stratospheric ozone regime was developed because of scientific concerns about damage to the earth's protective ozone layer from CFCs used in a wide variety of mundane applications, including aerosol cans, refrigeration and air conditioning equipment.³⁷ The most obvious parallel between the challenge of ozone depletion and that of climate change is that both result from the emission of gases resulting from ubiquitous human activity.

The ozone regime was established, under UN auspices, through a framework convention, agreed in Vienna in 1985, and a subsequent protocol for implementation was opened for signature at Montreal in 1987. The Montreal Protocol established targets and a timetable for limiting the production of the offending gases and paved the way for subsequent amendments that eventually banned their production altogether.

Negotiation of these treaties was informed by a scientific advisory body, the Ozone Trends Panel. All of the main features of the ozone regime were subsequently imported into the architecture of the climate change regime. These included: the UN Framework Convention on Climate Change (opened for signature at the Rio Earth Summit in 1992); the Kyoto Protocol of 1997, agreeing to the adoption of emissions reduction targets for developed countries; and the establishment of the Intergovernmental Panel on Climate

³⁷ E. A. Parson, *Protecting the Ozone Layer: Science and Strategy* (Oxford University Press, Oxford, 2003).

Change to advise the negotiating parties about the science and policy options.

ii) The US EPA Acid Rain Programme

In 1993, the US EPA Acid Rain Programme established a cap-and-trade programme to enable electric utilities to trade sulphur dioxide emissions permits as part of a national policy to reduce acid precipitation. The immediate goal of the policy was to allow generators on the eastern seaboard to continue to burn high-sulphur coal rather than go to the expense of transporting low-sulphur coal from the west.³⁸ The idea was to optimise the efficiency of the overall acid rain reduction effort by allowing cuts in sulphur emissions to be made where they were cheapest.

The USA brought this experience to bear, against strong initial resistance from European countries, in negotiating the Kyoto Protocol, which explicitly set out to establish an international greenhouse gas-trading framework. In addition to establishing the principle of economic efficiency at the centre of the climate regime, this approach to greenhouse gas emissions reinforced the leading necessity of monitoring and verification suggested by the analogy with the elimination of CFCs.

iii) The Strategic Arms Reduction Treaty (START)

The third available precedent for the climate regime was the Strategic Arms Reduction Treaty (START), negotiated between the USA and the USSR between 1982 and 1991.³⁹ The influence of these negotiations on the design of the climate regime came through the professional and cultural experiences of key players, including Al Gore (who, as a senator, was at least as well known for his engagement in national security issues as his commitment to environmental causes) and his principal security policy advisor, Leon Fuerth, who went on to advise Senator and Vice-President Gore on environmental matters.

In addition to these two, many of the diplomats in senior executive positions at the time of Rio had professional experience in superpower relations, in which nuclear and latterly conventional arms control had been central and, seen from the perspective of 1992, successful. Furthermore, the habit of "worst case analysis" employed in the military strategic assessment of risks was a formed instrument that seemed well suited to other kinds of low probability/high impact risks.⁴⁰

³⁸ D. Burtraw & K. Palmer, "The Paparazzi Take a Look at a Living Legend: The SO₂ Cap and Trade Programme for Power Plants in the USA", Resource for the Future discussion paper, (15 March 2003).

³⁹ G. Prins, *The Heart of War: On Power, Conflict & Obligation in the 21st Century*, (Routledge, London, 2001) 22-23.

⁴⁰ See G. Prins with R. Stamp, *Top Guns and Toxic Whales: The Environment and Global Security*, (Earthscan/Chelsea Green, London & New York, 1991); "Top Guns and Toxic Whales", (Producer: R. Stamp), Central TV/The Better World Society/The Carter Center/Television for the Environment co-production, Viewpoint 91 (30 April 1991), ITV.

The START precedent was a strong incentive for the use of the idea of targets and timetables in the cause of mutually verifiable reductions. After all, against all expectations, it had worked in the deep freeze of the later Cold War. Of course, it presumed technically competent and politically motivated actors. But it offered an inviting template: nuclear warheads as the metric in the case of START, and units of greenhouse gases in the climate regime. Make that substitution and perhaps a repertoire of proven summit-based diplomacy could be tapped?

However, the analogy stops there. Although it may have been tough to negotiate, nuclear arms reduction was a relatively simple problem in comparison with that presented by climate change. There were only two countries involved in START. Their focus was a single technology, directly under government control. There was no obvious conflict between arms reduction and broader economic and development goals; and finally, use of the technology was basically unthinkable. Nuclear arms reduction was tame; but climate change is wicked.

Superficial Similarities and Serious Differences

Alerted by the alarmed discovery of climate change as a central political issue at Rio, a response was constructed mainly from approximate analogies and under the deliberate pressures of summitry. Together, the stratospheric ozone regime, US EPA Acid Rain Program and START provided elements from which the architecture of the climate regime was constructed. The regime's foundation, analogous to the Vienna Convention in the ozone regime, is the UN Framework Convention on Climate Change (FCCC) agreed at the 1992 Rio Earth Summit. The Kyoto Protocol was intended to be the counterpart of the Montreal Protocol on Substances that Deplete the Ozone Layer.

But the design of the FCCC and Kyoto has locked the world into a framing of the climate change challenge based on plausible analogies that have the painful dual characteristics of being superficially proximate but structurally misleading on deeper inspection. Ozone depletion, acid rain and nuclear arms control were all complicated problems, but compared to climate change they were relatively simple to solve. We can examine these differences in more detail, by listing, and then examining, the beliefs that these analogies produced:

Emissions mitigation is a global commons problem, requiring consensus among 168 countries: This is a belief influenced by the ozone regime analogy. At the time, a few dissenting voices pointed out that as few as ten political units (counting the European states as a single entity) really mattered in determining the future of the climate, and that these included India and China, who were to be exempted under the proposed regime.⁴¹ However, these voices went unheard in the diplomatic enthusiasm to

⁴¹ See for example, *Global Environmental Change, Special Issue on National Case Studies of Institutional Capabilities to Implement Greenhouse Gas Reductions*, 3/2 (March 1993).

establish a universal treaty engaging all the world's governments, which had the ring of idealistic symmetry too, matching global threat with universal response.

International emissions trading should be the main policy vehicle to deal with climate change: This is consistent with the focus on emissions and the inclusion of both large and small emitters. For trading to occur, some parties must have "spare" emissions to trade. We have already begun to illustrate the weird and wasteful ways in which notional credits have been fabricated and traded and give more examples below. On the other hand, as any decision theorist knows, the more parties to any negotiation, the lower the common denominator for agreement will fall.

In the climate regime, this has been demonstrated by the continual process of watering down even the very modest commitments of the Kyoto Protocol (for "Annex B" countries, i.e., the OECD members and some others, to reduce their 1990 levels of CO₂ by 5.2% between 2008-2012), such that even those of developed countries are now only in the region of 2% and are unlikely to be met in any case.⁴²

Climate change is a discrete problem that can be solved independently of broader development imperatives: This seems peculiarly ironic given the fact that the FCCC was promulgated at the Rio Summit on Environment and Development. However, powerful governments have consistently acted to keep the issues of climate and development apart. So too, for different reasons, have the environmental and development-focussed NGOs.

Despite the inclusion of chapters on sustainable development in the Third and Fourth Assessment Reports of IPCC Working Group III, both China and the USA resisted calls for an IPCC Special Report on climate and development. China seems to have been motivated by concerns that its current development trajectory might be altered by such a linkage. The USA has also been concerned about possible adverse impacts on its economic competitiveness. While these concerns are understandable, it seems unrealistic that climate change can be dealt with as a stand-alone issue. Furthermore, as others have pointed out, the relationship between climate and sustainable development is asymmetrical. In principle, it may be possible to deal with climate change in ways that prove unsustainable for other reasons. However, achieving a sustainable development trajectory, by definition, must include a sustainable solution to the challenge of climate change.

Climate change policy is a problem of international co-operation and co-ordination: Of course co-operation was a necessary feature of the ozone regime and of START, both of which involved specific changes in a limited range of technologies that could be achieved through government command and control. However, it is unlikely that the range and scale of technological

⁴² E. Pianin, "Emissions Treaty Softens Kyoto Targets", *Washington Post*, (29 July, 2001).

changes required to achieve climate stabilization can be achieved by governments setting comparable targets and timetables for greenhouse gas emissions reductions.

Historically, there simply is no precedent for the co-operative, top-down creation of an international market of the sort that is envisaged for carbon by the architects of the climate regime. On past performance, it is more likely that radical technological change will be achieved by genuine international competition once there is a firm consensus that national security is at stake. After all, competition led to the stockpile of American and Soviet warheads in the first place. The competition will come not only from nations trying to protect themselves against climate impacts, but also from pursuit of profit deriving from more efficient energy production. It will also be greatly to the West's geostrategic advantage when it can reduce dependence on oil and gas supplies held by autocratic regimes. But there this analogy ends too.

Increasing scientific consensus will drive actors to converge on a single policy pathway: We have already argued that, from the very beginning, climate policy-making has been made more difficult by the idea that the science points to only one possible course of policy action, which prioritises radical emissions reductions by the developed countries. Refusal to study alternative policy pathways in response to climate change has seriously, in our view, contributed to the attractiveness of the conspiracy theorists and scientific naysayers to decision makers who reflexively resist being told that they have only one course of action available to them.

Missed Lessons

What is perhaps even more disappointing is that not only can we see the limitations of the lessons that were drawn for tackling climate change, but, with hindsight, we may also note the lessons that *could* have been drawn but were not.

Acid rain was caused by a single activity in a single industrial sector and emissions' trading was limited to a single gas in a single legal system. Sulphur dioxide trading was a response to a highly specific issue of coal transportation costs. Like the US Acid Rain Programme, the stratospheric ozone regime dealt with a very much more limited range of gases than is included in the climate regime. Ozone depletion could be prevented by controlling emissions of a small suite of artificial gases, for which technical substitutes could be found.

Furthermore, CFCs were produced by only a few multinational corporations in a handful of countries, making their regulation by governments much less problematic. Vitally different too was the fact that manufacturers were confident of being able to produce substitutes by the time the regime came into being. It is quite the opposite of the logic of the climate regime. The conclusive visual evidence of the Antarctic ozone hole—those annual sequences of images that showed the hole growing year by year like a

malignant growth in an X-ray cross-section of someone's spine—soon cemented public support for strengthening the reduction and subsequent phase-out of CFC production.

In the US Acid Rain Program, the initial allocation of SO₂ permits was limited in number and they were allocated by auction. In contrast, the EU ETS permitted participating governments to issue unlimited free permits. European governments did what governments seeking popular approval always do, namely look after their own national interests. They therefore issued permits to European industry to the value of more than the then estimated total European carbon emission. The market unsurprisingly blew out. There were many guilty parties. But the worst culprit was the Italian government, which showered this free subsidy onto Italian industry on a heroic scale (close to the total estimate for all of Europe). The carbon price crashed from over 30 Euros/ton to 20 cents in the spring of 2006.

The Acid Rain Programme was based on legally enforceable contracts under a single national authority. Parties could not walk away from obligations with impunity, whereas legal threats, especially to state parties, in international contexts (including the EU) are not enforceable effectively or at all, as Dutch voters bitterly noticed in French and German flouting of the Stability and Growth Pact that was supposed to underlie the single currency. The relationships of institutions with property rights are always a sensitive issue, deeply woven into the nature of the social contract, and in his 2001 critique, David Victor argued that the inability of international law to provide adequate certainty in a common trading regime is a central reason for Kyoto's failure.⁴³

In particular, the ozone regime is interesting for another reason. There was a concerted effort by several countries including the USA and the Scandinavians to enact a protocol banning the use of CFC propellants in aerosol spray cans at the same time as the Vienna Convention. The move was defeated by opposition from the European Community. As a result there was a two-year period of cross-national activity at the sub-governmental level by environmental, scientific, business, and other groups to build a popular consensus around the dangers of CFCs.

Many participants and observers became subsequently convinced that the ensuing protocol agreed at Montreal was much more rigorous than would have been agreed in the same time frame had the aerosol ban been achieved at Vienna. So by this reasoning, might we be further along with controlling climate change had the Kyoto Protocol *not* been rescued at the last minute by the intervention of Vice-President Gore?

It is our view that the climate policy track that governments have been pursuing for the past fifteen years is a case of negative learning. Negative learning is in some ways worse than an admission of ignorance, because it

⁴³ Victor, *The Collapse of the Kyoto Protocol*, xii-xiii.

means that—often because of premature foreclosure, adopted in the ways earlier described—political capital and practical energy is expended trying to map the solution of a wicked problem onto an inappropriate or unworkable template. In this light, we read what one of the principal architects of carbon trading wrote of the collapse of European emissions trading with a heavy heart: ETS was “...always intended as a precursor to the real thing—the first official commitment period, under Kyoto, of 2008-2012. Getting that right is what really matters.”⁴⁴ But how hopeful can we be?

Learning from Failure

“The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”

Article 2 of the Kyoto Protocol

Initial mis-stating of any complex problem is not a reason for criticism. It is the failure to change when the evidence changes that deserves condemnation. At the time of the Earth Summit, CO₂ was named as the problem and reducing fossil fuel use was seen to be the answer. Now we know from evolving evidence that this was a seriously inadequate formulation. In some ways, notably the suppression of discussion of adaptation to climate change, it has been positively perverse. But the regime has not been revised in line with that developing and changing insight. Indeed, by its nature and because of the politics of its framing and adoption, it could not be.

In fact, as Article 2 of the Kyoto Protocol, quoted above, demonstrates, the FCCC and Kyoto Protocol have narrowed the perspectives of both policymakers and the media-sensitised public, locking them into a tunnel-vision view of the ramified and imperfectly understood complexities of climate change. The British government’s national Climate Change Bill (which is presented with much pride as a “world first”) repeats the same simple assumption as Kyoto about the primacy of output targets. The overt concentration upon greenhouse gases and their mitigation in the convention

⁴⁴ M. Grubb, “Emissions Impossible: The World’s Carbon Market is About to Collapse, But Never Mind: the Whole Thing Needs Restructuring Anyway”, *Guardian online*, (15 May 2006), http://commentisfree.guardian.co.uk/michael_grubb/2006/05/emissions_impossible.html, (accessed 3 November, 2007).

has obscured other important and potentially potent instruments of climate policy.⁴⁵

Although apparently important information may be amassed—and there is now a vast literature on climate science and endless analyses of emissions reduction policy proposals—an inappropriate framing of the problem can lead science, followed by policy, down a blind alley. In fact, the sheer volume of knowledge production can be self-reinforcing to the point that reassessment of the starting assumptions becomes almost impossible to contemplate. The investment has been too great to feel able to discard it; and there is no incentive to do so because unlike economic theory, where it is rational to walk away from sunk costs, in politics, these represent political capital.

Although the rational thing to do in the face of a bad investment is to cut your losses, get out, and try something different, there are many obstacles that may prevent this, ranging from administrative inconvenience, to psychological and emotional barriers. It is difficult to abandon profound investments not just of capital, but also of effort and conviction, or of reputation and status. Therefore, as well as it being administratively inconvenient, politicians and diplomats who have invested much personal effort and conviction in creating the Kyoto regime may simply find it psychologically and emotionally impossible to walk away from an entrenched community of understanding and action to which they feel that they belong and that belongs to them. Meeting inside the special bubble and breathing the rarefied air of international summitry reinforces both sorts of feelings.

The anthropologist Mary Douglas reminded us that one of the ways in which institutions help to confer identity on participating individuals is through granting them membership of “thought communities”. That is, as well as the one well-known transactional strand, that binds members of institutions together (e.g., individual utility maximisation), there is another: “...the under-represented case, is the role of cognition in forming the social bond...the individual demand for order and coherence and control of uncertainty.”⁴⁶ She gave the helpful insight that in understanding the tenacity of an institutional group (such as the Kyoto proponents), we require this “double stranded” view of social behaviour. The force of belonging to a “thought community”, one that helps us make sense of the world around us, is one to be reckoned with. It helps to explain how we find ourselves

⁴⁵ House of Commons Environmental Audit Committee Seventh Report, “Beyond Stern: From the Climate Change Programme Review to the Draft Climate Change Bill”, (HC Paper (2006-7) no. 460) 2007, warns the government (§ 38) more generally against the dangers of “optimism bias” which, the Committee suggests, consistently underestimates the task and overestimates the efficacy of legislation’s potential.

⁴⁶ M. Douglas, *How Institutions Think*, (Syracuse University Press, NY, 1986) 19. If Adam Smith’s *Theory of Moral Sentiments* is read alongside the more famous *Wealth of Nations*, it can be seen that he was aware of the same interplay between material and cognitive needs.

wearing the Wrong Trousers and marching to destinations not of our conscious choosing.

This insight helps to explain why we refuse to learn. If the imprisoning powers of the cognitive ties that bind a thought community are as strong as Douglas suggested, then it helps to explain why institutional responses to failure are notorious for demanding more of what is not working. The solution to its failure proposed by those who have promoted and defended Kyoto so far is an expanded regime with more demanding targets and stricter enforcement. This saves face because it avoids admitting to structure and design flaws or—more deeply embedded—the anguish of doubt in the face of uncertainty.

These are formidable forces that keep us wearing the Wrong Trousers. How can they be discarded? One familiar way is to wait for irrefutable evidence of failure, thereby letting circumstance take decisions. That was the position of the Federal Reserve Board, the Federal Reserve Bank of New York and other bankers in 1929. They realised the effects of the heady atmosphere of speculation; they saw the approaching prospect of the Great Crash written in the mechanism of allowing investors to purchase stock on margin (i.e., on the security of the assumption of a future rise in value and yield of the very stock being bought, with little or no independent collateral).

“The real choice was between an immediate and deliberately engineered collapse and a more serious disaster later on,” wrote John Kenneth Galbraith of the situation. The bankers themselves knew this. Yet they did not want to take the rap, and the Federal Reserve dared not curb the overextension of the many local banks who were engaged in this crazy lending, for fear of bringing on the crisis. Gradual deflation of expectation is hard to do. So the Fed stared at the approaching slump poised and motionless, like a mongoose facing a cobra, while right until the last moment, the public fiction that all was well was maintained.⁴⁷

Galbraith tartly observed that gradual deflation of the speculative bubble might have been achieved with a little skill and some moral courage, neither of which was present in sufficient quality, in his low opinion of the bankers of the day. The current volatile dynamics in the politics of climate change suggest to us that an historical analogy with the period just before the Great Crash is not misplaced—but does it help us understand how to resolve it?

Another example suggests a way. The kind of behaviour we have been describing in situations of stress has been most fully studied in trying to understand why military commanders facing disaster refuse to accept advice that could save them. During World War II, Lt. Gen. Percival led the armies of the British Empire during the Battle of Malaya and the subsequent Battle

⁴⁷ J. K. Galbraith, *The Great Crash 1929*, (Penguin 1987 [Hamish Hamilton, London 1955]) 49, 52.

of Singapore, surrendering to the Imperial Japanese Army on 15 February 1942. Percival had refused to prepare Singapore's northern defences against the approaching Japanese on the grounds that to do so "might damage morale" by implying that defeat was possible. He was not moved by his despairing Chief Engineer Brigadier Simson telling him that being over-run might be even more damaging to morale than preparing a defence in time. He did not even respond to a directive from Churchill to prepare the northern defences. If he had been able to accept that he was wrong and had followed the detailed advice of his Chief Engineer in December 1941, Singapore might have resisted long enough to give time for reinforcements from Australia to arrive.

In fact, Professor Dixon suggests, the reasons for Percival's failure was really transferred anxiety about his own morale: to erect defences meant admitting the danger in which he stood by virtue of having grossly misjudged the enemy and having taken the wrong steps to that point.⁴⁸ Therefore he was impervious to unpalatable information and persisted doggedly in his chosen course until it was too late.

These two analogies suggest that in situations like this, rational argument is simply not enough to change people's minds—we are dealing with problems that are profoundly involved with individual and institutional values and emotions. If radical change is to be achieved, we will need a radical approach. In the final section we suggest what the Right Trousers might look like, and how to put them on.

⁴⁸ N. Dixon, *On the Psychology of Military Incompetence*, (Jonathan Cape, London, 1976) 133-44, 152-3.

III. The Right Trousers

Leading with the Wrong Type of Knowledge

Although it has failed to produce its intended impact nevertheless the Kyoto Protocol has performed an important role. That role has been allegorical. Kyoto has permitted different groups to tell different stories about themselves to themselves and to others, often in superficially scientific language. But, as we are increasingly coming to understand, it is often not questions about science that are at stake in these discussions. The culturally potent idiom of the dispassionate scientific narrative is being employed to fight culture wars over competing social and ethical values.⁴⁹ Nor is that to be seen as a defect. Of course choices between competing values are not made by relying upon scientific knowledge alone. What is wrong is to pretend that they are.

A hot debate about contested social and ethical values is thus being cloaked in terms of a systematic assessment of scientific information.⁵⁰ In reality, the climate debate is a contest over what values are going to shape global society into the future. Daniel Sarewitz has written on the perils of "scientizing" debates about values.⁵¹ In such a proxy political debate, if care is not taken, the scientist may trade on the authority which is conferred by the prestige of science in pursuit of political ends. If taken to an extreme, this may threaten the legitimacy of science in the layman's eyes. If the public comes eventually to the view that scientists have lent their status to over-heated statements in support of a political cause no matter how right and proper, it could contribute significantly to a rupture in public trust and hence to a further period of "quiescence" in the Downs' Cycle.

Choosing climate change policy is not a technical optimising problem, but a matter calling for the exercise of strategic judgement. A matter of judgement cannot be settled simply by applying a set of rules. A wicked problem cannot be resolved by amassing and then analysing mountains of data. Something further is required.

We have been arguing that we have made the wrong cognitive choices in our attempts to define the problem of climate change. Although it may comprise some straightforward, tame problems of applied science and

⁴⁹ M. Thompson & S. Rayner, "Cultural Discourses", in S. Rayner & E.L. Malone (eds.), *Human Choice and Climate Change: An International Assessment Volume I, The Societal Framework* (Battelle Press, Columbus, Ohio 1998).

⁵⁰ Pielke Jr, *The Honest Broker*, 40-44,; 70-74.

⁵¹ D. Sarewitz, "How Science Makes Environmental Controversies Worse", *Environmental Science and Policy*, 7 (2004) 385-403.

diplomacy, it is essentially a wicked problem. Strategic judgement in such circumstances places a premium upon understanding what we *don't* know.⁵²

This guards us from the over-confidence of premature foreclosure and of premature certainty in asserted knowledge. It thereby protects us from negative learning. It permits us to accept unpalatable information about the failure of the Kyoto experiment with fortitude and to learn from its mistakes so that scientific knowledge does not run amok in the future. By choosing and using the appropriate form of knowledge for the particular aspect of the climate change issue, the territories of scientific forms of knowledge can thereafter be staked more modestly, safely and hence productively.

Seven Principles by Which to Design and Put on the Right Trousers

There can be no silver bullet—in this case the top-down creation of a global carbon market—to bring about the desired climate policy end. But could there be silver buckshot? Could we assemble a portfolio of approaches that would move us in the right direction, even though we cannot predict which specific ones might stimulate the necessary fundamental change? If so, what would such a portfolio look like? We believe that a radical rethink of climate policy should possess at least seven central elements.

1. Use Silver Buckshot

We have argued that the difference between tame and wicked problems is central to understanding why Kyoto has failed. The climate change regime has been, so far, modelled on processes used to resolve tame problems. But climate change is a wicked problem, the result of complex global systems of natural forces interacting with interrelated and interdependent human behaviours that have evolved over centuries.

The challenge of reconfiguring the interactions of these systems is difficult enough. To do it in time to meet the FCCC objective of avoiding dangerous interference with the climate is tremendous. The claim that it can be achieved in a couple of decades, through the top-down creation of an artificial global market in greenhouse gases seems extraordinary. Bear in mind that, as we observed at the outset, since the agreement of the FCCC at Rio, global carbon emissions have continued to rise inexorably, while national emissions targets have been repeatedly watered down, both directly and through “offset” credits (many of a dubious nature). In the case of climate change this would mean adopting a wide variety of climate policies—silver buckshot—and non-climate policies with climate effects. Each would have the potential to tackle some part of the overall problem, although it would not be clear which would be the most successful, let alone the most economically efficient.⁵³

⁵² Anthropologists are especially tuned to the dangers that can come from attempts to over-determine fragile data. See, J. Vansina, in “The Power of Systematic Doubt in Historical Enquiry”, *History in Africa*, 1 (1974) 139-72.

⁵³ *Ibid.*

This approach is based on an analogy with market forces. It is well known that the chance of markets working is increased by chopping up the problem because there needs to be some proximity between cost and benefit for markets to be energised. One reason why the global trading schemes are unattractive is because the costs are borne now and the benefits are in an indeterminate future. Chopped into parts, cost and benefit are brought into closer proximity, allowing the hidden hand of the market to emerge through real price signal fluctuations.

Rather than putting all our eggs into one policy basket made in Kyoto, a more viable climate regime would consist of a series of policies intended to build resilience against climate turbulence into all the day-to-day dimensions of society. These need not be primarily, or even solely, directed at climate stabilisation. Instead they would be intended to achieve that goal through the accumulation of contingent benefits. They would be aimed to work in the world as it is, rather than being predicated upon changing the world first so that it fits the policy.⁵⁴

This oblique and clumsy engagement with climate change is more likely to succeed than renewing the same costly and futile frontal assault. There are three leading reasons why. First, our approach is not a fragile monoculture. It allows a thousand flowers to bloom. It is therefore both more robust and more likely to avoid failure, and it commands legitimacy: it meets Adam Smith's design guidance for viable social change. Secondly, it leverages existing powerful forces. Finally, it offers a different process with which to engage for those who have become institutionally and emotionally wedded to the Kyoto Protocol's flawed assumptions, through their intimate entanglement in the minutiae of its proliferating bureaucratic superstructure. It provides a golden bridge across which to withdraw from Kyoto with dignity.

2. Abandon Universalism

Realism tells us that come what may, there will be a formal political and diplomatic process to do with climate change. The next meeting is scheduled to happen in Indonesia in December. So what shape should it have? The evidence suggests that the assumption that an inclusive global treaty is required to curb the growth in greenhouse gas emissions is questionable. Relying on an international agreement that requires the consent of all national governments inevitably results in the very lowest of common denominators. Since fewer than twenty countries account for 80% of the world's emissions and therefore have the potential to make any serious contribution to their mitigation, it would be better for diplomacy to focus upon them. In these early stages, the other 150 countries only get in the way.

⁵⁴ S. Rayner & E. L. Malone, "Zen and the Art of Climate Maintenance", *Nature*, 390 (27 November 1995) 332-335.

The British presidency of the G8 in 2005 saw some movement in this direction with the launch of the Gleneagles Dialogue on Climate Change, Clean Energy and Sustainable Development at the Gleneagles Summit. The core of The Gleneagles Dialogue is the G8 countries plus China, India, Brazil, Mexico and South Africa, constituting the so-called G8+5. The additional participants are Indonesia, Australia, Spain, Poland, Nigeria, South Korea, the European Commission and key international organisations including the World Bank and the International Energy Agency.

The Dialogue provides a vehicle for participants to discuss innovative ideas and new measures to tackle climate change, outside the formal negotiations of the FCCC. It is due to report back to the G8 during the Japanese Presidency in 2008. However, the Dialogue has yet to emerge as a leading alternative to the universalism of Kyoto. Although President Bush's support may not be the most helpful of assets internationally in the declining months of his presidency, the conference of the main emitting nations that his administration held in September 2007 is a move in the same direction as G8+5, and is therefore also to be welcomed. It was therefore diplomatically unfortunate that John Ashton, the British diplomat overseeing climate policy, appeared to take satisfaction in his public remarks in describing the "isolation" of the USA at the September 2007 Washington discussions. Mr Ashton's assumption that this is eccentric to the main line of advance is, on the evidence of this essay, misguided. America will be, as it always has been, of indispensable centrality to taking real action on climate change.

3. Devise Trading Schemes from the Bottom Up

There are those who object to trading schemes on principle: some regard trading schemes as licences to pollute. Revealingly, Kyoto credits have been likened to the selling of indulgences by the Roman Catholic Church during the sixteenth century, which actually offered their buyers full or partial remission of temporal punishment of sins already forgiven, but has often been misunderstood as a mechanism offering absolution from future sin.

In contrast, we believe that cap and trade schemes, can contribute one useful approach, if, like all genuine markets, they are built from the bottom up. The cap part of cap-and-trade can be a sensible Keynesian corrective to market failure. The cap shapes the market by signalling the social goal as simply as possible: in this case, the priority of reducing anthropogenic impact on the environment. The market does the rest. As with all such arrangements, the danger comes when the regulator or legislator succumbs to the temptation to meddle too much. Picking winners through subsidies for specific technologies, for example in "renewable" energy production, is usually a step too far, failing to produce the desired outcome, and bringing profiteers flocking. One problem with the Kyoto approach is that those involved in its design and operation have succumbed to the temptation to meddle with it, at various different levels, simultaneously. This is not necessarily badly intentioned: but they have tried to make Kyoto do too much, too soon, and without the necessary institutional arrangements to enforce contracts among parties who are not bound by other strong ties.

The current carbon trading arrangements are particularly flawed by their proponents' refusal to learn from their mistakes, and their refusal to acknowledge the structural flaws and practical limitations of the idea as they have elaborated it within highly constrained fabricated markets. Because the commodity is notional and a political artefact, hostage to electoral changes, the price, which is inherently artificial and arbitrary, is too volatile to give investors the confidence necessary to drive material investment decisions.

Secondly, existing schemes like that used for trading SO₂ have all operated within nations, where, as we earlier observed, property rights are enforceable. That gives reality and stability to the price structure, whereas global CO₂ emissions trading creates new property rights of uncertain value that are treated quite differently in liberal and illiberal regimes. Thirdly, compliance is very difficult to monitor. Nations can cheat, as they did in issuing emissions permits in Europe; and nobody has yet, even at national level, implemented emissions trading for mobile sources. David Victor and colleagues have correctly observed that global institutions are simply too weak to monitor and enforce what is, in effect, a new monetary system.⁵⁵ Even within a single jurisdiction, despite some brave words about the lessons learned, the British national pilot experiment in carbon trading was hardly deemed a success by the National Audit Office.⁵⁶

There is a recurrent theme in understanding the technical failure of the Kyoto mechanism: that is, the failure to articulate power properly with property via enforceable legal regimes. Under Kyoto, the signatories would have little recourse if a nation, having sold its surplus emissions allocations, subsequently exceeded its emissions, (probably claiming development imperatives). This necessarily undermines the trading basis of Kyoto, since markets develop dependably only where there is a stable expectation that deals will be kept and property rights respected. There is no reason to suppose that emissions markets are any different. We are therefore sympathetic to David Victor's so-called "Madisonian" approach, because, as he and his colleagues write in reply to criticism from those who believe in more strongly defined caps than they or we do, "For Madison, coordination through a relatively weak center was a matter of constitutional design; for the international system it is a necessity."⁵⁷

Building national or regional emissions markets from the bottom up would also provide opportunities for learning from different approaches. Eventually such fragmented markets could, and would, become linked until such time as global trading is achieved. This is how all real and enduring markets have developed historically. There simply is no precedent for

⁵⁵ D. Victor, J. House & S. Joy, "A Madisonian Approach to Climate Policy", *Science*, 309/5742, (16 September 2005) 1820-21.

⁵⁶ National Audit Office, "The UK Emissions Trading Scheme: A New Way to Combat Climate Change", (HC 517 Session 2003-2—4: 21 April 2004).

⁵⁷ Victor *et al.*, "Letters", *Science*, 311/5759, (20 January 2006) 335-6.

successful imposition of an international market by fiat from the top down. The failure of the EU ETS gives the force of the market a bad name.

Moreover, the current structure and scope of the Kyoto Protocol make it ripe for abuse and exploitation. Although its targets were not ambitious enough to be meaningful, the creators of Kyoto were over-ambitious when they included all sources and sinks of carbon, as well as of a basket of diverse gases including, in addition to CO₂, methane, CFCs, and HFCs. The extraordinary case of HFCs will serve to illustrate this as a cautionary tale about how not to proceed.⁵⁸

A kilogram of trifluoromethane (HFC-23) is equivalent to about 12,000 kilos of CO₂ in greenhouse effect. It occurs mainly as a by-product of the production of the refrigerant HCFC-22, which is being phased out under the Montreal Protocol. It can be destroyed by combustion of the flue gases of HCFC plants in a scrubber. As a by-product of Teflon production, DuPont has done so for no charge for many years. It is a well understood and relatively cheap process. But the manufacturers of the refrigerant HCFC 22 can claim credits (and money) for doing this under the Kyoto Protocol's Clean Development Mechanism. They have done so with a vengeance.

They show that far from paying for clean development in the Poor World, as intended, the Kyoto CDM mechanism has become a money machine, especially in Asia and especially for HFC capture, which accounts for almost two-thirds of all CDM payments for the period to 2012. Brazil, China, India and South Korea receive 80% of all payments under the CDM. China alone receives half of the total, especially from a huge HCFC plant at Quzhou. Carbon-trading lawyer Michael Wara has calculated that HCFC manufacturers can earn almost twice as much from Kyoto CDM credits for scrubbing HFC-23 as they can from selling refrigerants. Wara further estimates that the actual annual cost of HFC abatement is \$31m for which producers would be paid \$800m under the CDM, which is a tempting margin for any entrepreneur.⁵⁹ Most of this production is located in China, which then taxes such enterprises at 65%. So western purchasers pay through the nose to producers and also pay the Chinese state up to \$1.5bn per year in Bradsher's estimate. That revenue is not hypothecated to carbon-reducing activities. It goes into Chinese general revenues.

Not only does it seem perverse (not to say grotesque) that polluters can make a handsome profit merely from producing and then cleaning up their own pollution, but Michael Wara warns that the scale of profits to be gained from eliminating HFC-23 has actually helped expand HCFC production in developing countries. So Kyoto CDM could slow the phase-out of HCFCs under the terms of the stratospheric ozone regime.

⁵⁸ The story is told in detail in K. Bradsher, "Outsize Profits, and Questions, in Effort to Cut Warming Gases", *New York Times*, (21 December 2006), <http://www.nytimes.com/2006/12/21/business/21pollute.html?ex=1324357200&en=3cc7d8f20bf8a449&ei=5088&partner=rssnyt&emc=rss> (accessed 3 November, 2007).

⁵⁹ M. Wara, "Is the Global Carbon Market Working?", *Nature*, 445 (8 February 2007) 595.

The UNFCCC claims that the HFC-23 option will be closed for CDM credits.⁶⁰ But if the scam wasn't being done with HFCs it would be something else. As structured at present, the principal incentive in the Kyoto-type trading regime is for specialist firms of lawyers and traders, working for and with producer countries and entrepreneurs to search out and exploit such dodgy opportunities with huge margins, in order to make money. It does not lead to development, clean or otherwise, in the poorest countries.

4. Deal with Problems at the Lowest Possible Levels of Decision- making

Climate change is a multi-level governance problem. Some commentators recognized early on that it is not just, or even primarily, a matter for negotiation among nation states, but nation states themselves have been slow to recognize this.⁶¹ In 2000, Rayner participated in briefing a European environment minister on US climate policy, and pointed out that while there was little expectation that the federal government would make climate a policy priority, there were many opportunities at the state and local government levels as well as with the philanthropic and private sectors.⁶² However, the minister was clearly not able to relate to the idea of climate policy making at these levels.

A clear object lesson in the actual nature of American democracy was provided by the State of California in 2006, which is that the states do not rely on the federal government to dictate policy, and that citizen initiative really can change policy from the grass-roots. We hope that more European politicians can overcome their condescension about America and understand that even in the absence of federal legislation on issues concerned with product standards, any standard established by California and Massachusetts effectively becomes the *de facto* standard for the whole country.

5) Invest in Technology R&D

The rhetoric about the threat of global climate change is not matched by political or private actions. We stare at stark divergences of trends. On the one hand, the International Energy Agency predicts that in the next twenty-five years, the global demand for energy will double. On the other, since

⁶⁰ See <http://environment.newscientist.com/article/dn1115-kyoto-protocol-loop-hole-has-cost-6-billion.htm> (accessed 3 November 2007).

⁶¹ L. P. Gerlach & S. Rayner, "Culture and the Common Management of Global Risks", *Practicing Anthropology*, 10/3 (1988) 15-18; S. Rayner, "A Cultural Perspective on the Structure and Implementation of Global Environmental Agreements", *Evaluation Review*, 15/1 (1991) 75-102; T. O'Riordan, *et al.* "Institutional Frameworks for Political Action", in Rayner & Malone (eds.), *Human Choice and Climate Change Vol 1* (1998).

⁶² For descriptions of such programmes, see B. Rabe, *Statehouse and Greenhouse: The Emerging Politics of American Climate Policy* (Brookings Institution Press, Washington DC, 2004); H. Bulkley & M. Betsill, *Cities and Climate Change: Urban Sustainability and Global Environmental Governance* (Routledge, Abingdon, 2004).

1980, government budgets for energy R&D have reduced, worldwide, by 40%.⁶³

This disinvestment in R&D could hardly have happened at a less opportune time for the pursuit of climate change goals. Much of the electricity-generating capacity in the industrialized world is nearing the end of its useful life and will need to be replaced in the next three decades. Europe alone will need to replace over 200,000 megawatts of capacity by 2020. “Negawatts”, from improving insulation and end-use, can reduce the total demands, but only fairly slowly, as building stock is renewed. Without significant new investment in energy R&D, the technologies upon which any emissions reduction strategy depends simply will not be available at a competitive cost at the time when they could make a significant difference. It is not a case of having to start from scratch, either: many of these technologies already exist; they just need the investment to take them to the production levels that would make them economically competitive. And that investment is needed soon, because with no alternative base-load generating technology (apart from nuclear), the worn-out electricity-generating plants will simply be replaced by new carbon-intensive generating capacity, with another fifty year life-span.

As well as interrupting this replacement cycle, such an investment could accelerate the move away from fossil fuels more rapidly than all the targets and timetables, if energy use patterns follow the trajectory of the energy intensity index that country after country has demonstrated during the history of industrialisation since the mid-eighteenth century. As each successive country—Britain, Germany, France, America, Japan—passed over the top of the curve from increasing utilisation of energy per unit of production to decreasing utilisation per unit, it did so at a lower absolute peak.

Ironically, given the way that climate activists have sought to demonise air travel, aero-engine and aircraft technology improvements over the last few decades are a leading example of the incremental efficiency gains from technological innovation in response to market demand. The huge increase in air travel over the last twenty years (9% p.a.) has not been tracked by an equivalent rise in fuel use. It has instead seen a far lower rate of increase in the annual CO₂ burden from the sector. The IPCC writes that “...the trend in fuel efficiency of jet aircraft over time has been one of almost continuous improvement; fuel burned per seat in today's new aircraft is 70% less than that of early jets. About 40% of the improvement has come from engine efficiency improvements and 30% from airframe efficiency improvements”.⁶⁴

⁶³ Rayner, “The International Challenge of Climate Change”, 6-7.

⁶⁴ Section 9.2.2, “Developments in Technology”, in Chapter 9, “Aircraft Emissions: Current Inventories and Future Scenarios”, in J. Penner, *et al.*, *Aviation and the Global Atmosphere* (IPCC, 1999). See <http://www.grida.no/climate/ipcc/aviation/133.htm#922> (accessed 3 November, 2007).

In the meantime, for base-load power in the industrial world, which is by its nature far less elastic in response to new priorities than transport sectors, we will be driven to use stop-gaps. Nuclear fission will be pre-eminent. Over 60% of all energy R&D undertaken around the world during the past forty years has been spent on developing nuclear power. That was an opportunity/cost choice against other investments in large scale renewables, notably ocean kinetic (wave power capture; ocean current turbines etc.) and solar sources. But given that these other renewable resources are still not scaled up and mature, nuclear remains part of an interim solution: the alternatives are now brown-outs and power cuts.

The recent experience of Cape Town in this respect is a small-scale object lesson of what we expect to happen more widely in coming years. Rapid increase in demand as electrification was extended into the townships after 1994, and a failure by Eskom, the utility company, to expand base-load power to match, led the previously reliable supply to the city to become vulnerable. It grew increasingly unstable in 2005-6, when the Koeberg nuclear power complex experienced a series of technical failures which caused shut-downs. In response, power was expensively routed across the Karoo from the huge and dirty coal-fired stations of the East Rand. Now, new nuclear capacity from a Pebble Bed Modular reactor will be provided at Koeberg, despite considerable local environmentalist opposition. We expect new nuclear build to occur elsewhere in similar fashion, even in the absence of a permanent solution to the nuclear waste issue.

Another stop-gap technology is carbon capture and storage, which could be used to buy time for an effective transition away from intensive use of fossil carbon for energy. Removing carbon from oil and gas at the well-head is one way of producing hydrogen for use in fuel cells or for burning in engines. CO₂ can also be removed from the flue gases of fossil power plants, enabling continued use of coal and oil. In both cases, the scrubbed CO₂ can be injected in spent oil and gas wells using modified technologies that already exist for oil and gas extraction.

A step further would be to capture CO₂ directly from the air.⁶⁵ So far, the investments in this sector have been meagre, but the insurance value of such investments could be quite substantial. A couple of large demonstration plants—notably one in China being co-funded by Europeans—are in prospect. But if removal of CO₂ from the atmosphere is really regarded as an over-riding requirement, then ultimately research and development on the direct capture of carbon from ambient air could, and should, be scaled up. In fact, currently, discussion of this technology and other forms of so-called geo-engineering is taboo (because it would mean that climate change no longer had force as an argument for changing life-styles and promoting voluntary frugality in many areas of consumption).

⁶⁵ D. W. Keith, M. Ha-Duong, and J. K. Stolaroff, "Climate Strategy with CO₂ Capture from the Air", *Climatic Change*, 74 (2006) 17-45.

These are all areas of “tame” knowledge that will respond reliably to Manhattan Project-style infusions of investment that hitherto have not been made. However, none of these radical new developments can occur in an accelerated time-scale under the price signals that even a well functioning cap-and-trade is likely to send in the foreseeable future. In the final analysis, cap-and-trade cannot deliver the escape velocity required to get investment in technological innovation into orbit, in time. That calls for something else.

So an internationally competitive programme of energy modernization is urgently required. This is a cause that embraces the political spectrum. In his book *Earth in the Balance*, Al Gore called for what he called a “Strategic Environment Initiative” focussed on just such issues, as part of his vision for a “Global Marshall Plan”.⁶⁶ The American Enterprise Institute also supports primary research on sustainable new energy technologies. In 2006, the President of the Royal Society⁶⁷, echoing the suggestions made by US researchers in 1998⁶⁸, argued that it should be kick-started with public funds in public research facilities like NASA or the US National Laboratories by a new Apollo program or new Manhattan Project of research into new and/or highly improved energy technologies. A mere 6% of the world’s energy R&D budget has been used to support renewable energy. Since only ten countries carry out 98% of the world’s energy research, a concerted programme of new investment in renewable energy along the lines proposed in 2006 by Lord Rees is plausible.

The wartime comparison in Lord Rees’s proposal is intentional and welcome. It does not signal the search for a new enemy: it does register the urgency and the priority that this issue should command. It seems reasonable enough to expect the world’s leading economies and emitters to devote as much money to this challenge as they currently spend on military research—in the case of the USA, about \$80 billion per year. That would seem to be a more promising route to decarbonisation of the global energy system than the current approach of 2% co-operative targets that show no prospect of being met, combined with market-distorting and complicated cross subsidies from the successful to the unsuccessful via the sale of notional credits.

In principle, this sort of R&D scale-up could be achieved without any need for international—let alone global—treaties, as the government policies that are needed mainly consist of domestic programmes, ideally yielding open source results, to induce firms to invest in renewable energy.

Some limited forms of international agreement would probably be necessary to help speed the transfer of advanced, low-emitting technologies to less industrialized countries so that they can avoid following the carbon

⁶⁶ A. Gore, *Earth in the Balance*, 319-34.

⁶⁷ M. Rees, “The G8 on Energy: Too Little, Too Late”, *Science*, 313/5787, (4 August 2006) 591.

⁶⁸ M. I. Hoffert, K. Caldera and A. K. Jain, *et al.* “Energy Implications of Future Stability of Atmospheric CO₂ Content”, *Nature* 395 (29 October, 1998) 881-884.

intensive development path. This would be the route to engaging India and China. Such arrangements would be far less problematic than full implementation of the Kyoto architecture and could be accommodated within, for example, existing international development channels. The elaboration of these arrangements would be a useful centrepiece for the agenda of the Indonesian Summit. The Bush Administration's Asia-Pacific initiative on technology transfer has the defect of focusing only upon that aspect of the matter, but its obvious virtue is that it does at least that and is congruent with the wider set of actions that we advocate. So, with political will and a leading focus upon infusing the market with competitive development and application of de-carbonised energy technology, there could be a rapprochement between the American and the UN initiatives.

6. Increase Spending on Adaptation

The particular casualty of the Kyoto approach that we most regret has been the failure to exploit the capacity of anticipatory adaptation to deal with the consequences of climate change.

Adaptation has, until very recently, received little attention beyond the provision for unspecified co-operation in Article 4.1(e).⁶⁹ This is a pity. Adaptation has consistently been the poor and derided cousin of emissions reduction in the history of the climate regime. For the best part of a decade, even discussion of adaptation was regarded by most participants in climate policy making as tantamount to betrayal.⁷⁰ Even though it was widely recognized by the end of the 1980s that the by then existing stock of atmospheric greenhouse gases was likely to have already established a warming commitment, the policy community suppressed discussion of adaptation out of fear that it would blunt the arguments for greenhouse gas mitigation. At the time of writing, the (still unmet) commitment of international resources to the multilateral Adaptation Fund is derived in part from a tax on the Clean Development Mechanism and is \$1.5bn. Funds for mitigation come from many sources and total at least \$19 bn.⁷¹ We believe that global adaptation efforts need to be funded at comparable scales to those we advocate for investment in technology R&D.

⁶⁹ All parties shall "Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods."

⁷⁰ M. Thompson & S. Rayner, "Cultural Discourses".

⁷¹ "An investment framework for clean energy & development: A progress report", V-P for Sustainable Development, The World Bank, 1 September 2006, DC2006-0012(E). For mitigation, the relevant funds include (source: IETA) The BioCarbon Fund; The Community Development Carbon Fund (CDCF); The Danish Carbon Fund; The Italian Carbon Fund; The Multilateral Carbon Credit Fund (MCCF); The Netherlands Carbon Facility (INCaF); The Netherlands CDM Facility (CAF); The Netherlands European Carbon Facility (NECaF); The Prototype Carbon Fund (PCF); The Spanish Carbon Fund; Netherlands EBRD fund; EBRD multilateral carbon credit fund (MCCF).

See <http://carbonfinance.org/Router.cfm?Page=Funds&ItemID=24670> (accessed 3 November, 2007). We are indebted to Dr N Hultman for assistance in assembling these figures.

In June 2007, the Commission of the European Union published as a Green Paper its first policy document on adapting to the impacts of climate change.⁷² In its technical annex the Paper is somewhat predictive in its approach and it is not clear to what extent the authors still visualise adaptation filling gaps left by the inadequacies of mitigation (the line found in the Stern report), given that the European Climate Change Programme gives a central priority to deep cuts in emissions; but the fact of recognition of some salience of adaptation is welcome. It is timely that this occurs in the window of opportunity before the next framework for climate policy is fully locked in.

While it may seem obvious to climate activists that preventing growth in greenhouse gas concentrations is a logical priority over adapting to climate impacts, this is not a self-evident truth because of the difference between the *stock* and the *flow* of greenhouse gases. Current emissions reductions (flow) will mainly benefit future generations because of the momentum (stock) already built up in the climate system. So, faced with the effects of present stock, adaptation has a naturally faster response time, a closer coupling with innovation and incentive structures and thereby confers more protection more quickly to more people. It also stimulates new technologies, new services and new markets for them to inhabit as a natural contingent benefit. Nor is it clear to us that the overwhelming priority that the climate regime has accorded to emissions reduction would be shared by the millions of poor people currently dependent on marginal ecosystems, were they to be consulted. For these populations, the early lock-in to narrowly defining climate change as a problem of establishing emissions reduction targets and timetables, and the failure to date to have unlocked the issue from that rigid frame, is likely to be a literally fatal error.⁷³

Adaptation measures avoid climate impacts by changing human behaviours, such as land use, and by taking actions to protect valued resources, communities, and landscapes. Adaptation encompasses a wide range of options that can reduce vulnerability of marginal human and natural populations to the consequences of atmospheric disturbance. Many (although admittedly not all) adaptation measures also offer increased resilience in the face of climatic variability (such as droughts and storms), which makes them potentially attractive policies even in the absence of long-term secular changes in climate. “No regrets” steps are the first to take, since they will be good to have done even if current concerns over climate change turn out to have been exaggerated.⁷⁴ If sea ice will be gone in thirty-five years, as some project, it will be gone; and insofar as that is a consequence of anthropogenic climate change, there is nothing that action

⁷² EU Commission “Adapting to Climate Change in Europe: Options for EU Action”, (2007), COM/2007/0354.

⁷³ R. Pielke, G. Prins, S. Rayner & D. Sarewitz, “Lifting the Taboo on Adaptation”, *Nature*, 445 (8 February 2007) 597-8.

⁷⁴ Verweij, Douglas, *et al.*, “Clumsy Solutions for a Complex World: The Case of Climate Change”, *Public Administration*, 84/4 (2006) 817-843; Pielke, Jr. *The Honest Broker*, 73-4.

between now and then can do to change that. Adaptation to change, alone, has relevance in this time-scale.

From the point of view of public policy implementation, adaptation may have some other useful advantages over policies directed at mitigation. Adaptation engages people with the fate of objects and landscapes that are known to them and valued by them in their daily lives and it offers them ways to preserve them while saving money. The opinion polling data that shows consistent unwillingness to curtail travel and life-style in the interests of emissions reductions supports this as a political strategy. Thus adaptation policies may provide the only realistic opportunities for a wide variety of people to become directly and positively engaged with the climate issue.

Moreover, the basic regulatory and legal concepts and frameworks already exist (e.g., governance of land use) and are broadly accepted; they just need to be adapted. This is not to minimize the political challenge, but we are not starting from scratch. This is in marked contrast with the challenge of mobilising public support and action to cut emissions. Emissions are too abstract and too easily seen as someone else's problem to be a good starting point from which to mobilize support for climate policies. And "green" taxes are widely seen as a cost and a con.⁷⁵ However, once people have mobilized around concrete adaptation goals and experienced positive benefits, they may be more likely to move to support emissions reductions measures that seem implausible at present.⁷⁶

Another considerable advantage of increasing the focus on impacts and adaptation is that action in these areas does not require any kind of global consensus. Indeed, as impacts and the potential for adaptation vary widely on a regional basis, it seems quite likely that such an emphasis would favour regional responses. There would almost certainly be many and varied opportunities for the articulation of climate policies with other policies designed to improve public health and protect populations from natural disasters.

7. Understand That Successful Climate Policy Does Not Necessarily Focus Instrumentally on the Climate

We offer a different lesson from the city of Kyoto. It comes not from a passing caravan of international diplomacy that once visited there but from a more grounded source: from Zen Buddhism. The approach to Kinkakuji, Kyoto's famous Buddhist Golden Temple, in the north-west of the city, deliberately depresses expectations. The visitor is therefore unprepared for the splendour of the temple, and the impact of its shimmering form across

⁷⁵ 63% of those polled in an August 2007 YouGov study of British attitudes to taxation believed that "green" taxes were proposed by politicians as a stealthy way to raise general taxes. See <http://www.yougov.com/archives/pdf/toplines%20tax.xls.pdf> (accessed 3 November, 2007).

⁷⁶ Rayner & Malone, "Zen and the Art of Climate Maintenance", 333.

the water that surrounds it being all the greater. That moment of unexpected discovery means that the memory of the beauty of Kinkakuji will live long in the mind. This is one example of a principle found across Zen architecture which tends to favour restraint—glimpses rather than panoramas—to evoke a more powerful effect: As Christopher Alexander and his colleagues put it, “The view of the distant sea is so restrained that it stays alive forever.”⁷⁷

Sometimes the best line of approach is not head-on, if one seeks long-lasting impact. This is not only a Japanese insight: “Lose the object and draw nigh obliquely” is a dictum attributed to the famous eighteenth century English landscape gardener Lancelot “Capability” Brown.⁷⁸ The landscapes that he created on that principle were a visual reminder of the differences between England and the Continent.

Aristocratic European gardens of the period followed the same architecture of brute power evinced by palaces like Versailles, or its northern and even more intimidating cousin, the Catherine Palace at Tsarske Selo, near St Petersburg. There the travel-stained ambassador approaches the Presence through a hundred yards of formal reception rooms, dripping with Baroque sculpture, shimmering with faience and velvet. Double door after double door swings closed behind him, and the Presence remains constantly in view, along the die-straight sightline. That sort of conditioning experience was designed to awe the visitor, and was also apparent in the design of gardens and grounds. The chateau was framed by the castle gates and then approached directly, along a tree-lined boulevard, ensuring that the visitor was fully aware of the wealth and power of the owner, so literally in your face, before the butler opened the front doors.

In contrast, Brown’s designs framed the stately home at the entrance, but only briefly. After allowing the visitor a glimpse of his destination, the driveway would veer away to pass circuitously and delightfully through woodland vistas, through broad meadows with carefully staged *aperçus* of waterfalls and temples, across imposing bridges spanning dammed streams and lakes, before delivering the visitor in a relaxed and amused frame of mind, unexpectedly, right in front of the house. The message of the design was subtle: no need to rub the wealth of the house and its owner in a visitor’s face when you can use it to engage and entertain. There are

⁷⁷ Pattern no. 134, “Zen view” in C. Alexander, S. Ishikawa & M. Silverstein, *A Pattern Language: Towns, Buildings, Construction* (Oxford University Press, Oxford, 1977) 642-43; Rayner & Malone, “Zen and the Art of Climate Maintenance”.

⁷⁸ Brown (1716-83) left no treatises, only landscapes. But the spirit of the dictum was in common currency in writing on landscape and good taste. In *Epistle IV to the Earl of Burlington* (December 1731), Alexander Pope, wrote: “Let not each beauty ev’rywhere be spied/When half the skill is decently to hide./He gains all points, who pleasingly confounds,/ Surprises, varies, and conceals the bounds.” But the clearest statement of the rationale that Brown translated into his designs comes from Shenstone: “When a building or other object has been once viewed from its proper point, the foot should never travel to it by the same path, which the eye has travelled over before. Lose the object, and draw nigh, obliquely”, William Shenstone, *Unconnected Thoughts on Gardening* (1764).

different ways of expressing power, some of which are more likely to gain the compliance of others. Capability Brown might be a useful mentor for climate policy designers.

At the moment, there is a tendency for politicians and bureaucrats to do just the opposite. They invoke climate protection in raucous support of particular policies and practices, many of which have only a tenuous connection to effective climate change responses. The public is lectured on many aspects of its life and pleasures in censorious tones, and then told to save the planet.

The attempt to develop clumsy solutions does not depend on coordinated action. It focuses on social learning. Individuals and countries alike would pick and choose the policy measures that suit their particular circumstances. Ironically, this was an approach that was being pursued prior to the emergence of the FCCC/Kyoto regime.⁷⁹

The mix of instruments within an oblique approach could range from informational signals, such as labelling, through market instruments, such as emissions trading, to command and control mechanisms, such as technology standards. The benefit of this approach is that it focuses on what governments, firms, and households actually do to reduce their emissions, in marked contrast to the target setting that has characterized international policy making since the Toronto Conference of 1988. Since the exact consequences of any particular package of policy measures would be uncertain, governments would focus less on targets and more on navigation: maintaining course and speed.

In Conclusion

The flexibility of our silver buckshot approach, emphasising technology investment and adaptation, would allow early policy interventions to serve as a series of policy experiments, from which lessons could be drawn about what works, when and where. Cooperation, competition, and control could all be brought to bear on the problem as appropriate. A particular advantage of this approach is that it allows for switching strategy. Policy actors (not just governments) would have the ability to abandon courses of action that are not working, and transfer their efforts to those that might, by responding to price signals in genuine markets for example, and without the ponderous necessity of renegotiating an entire international regime.

For some governments and politicians it may be difficult to admit to their citizens that there are things that they cannot do as well as other agents: at first sight, this hardly seems a compelling claim to leadership. It shrinks their case. For others, the sense of loss of control could be problematic. Monitoring and verifying the actions of other nations would be a

⁷⁹ For example, see US Department of Energy, *A Compendium of Options for Government Policy to Encourage Private Sector Responses to Potential Climate Change. Report to the Congress of the United States* (1989).

considerable challenge, but part of the benefit of this approach is that by spreading responsibility widely, it places less emphasis on the nation state and encourages transnational collaborations among firms, trade associations, local governments, nongovernmental organizations, scientific and technical organizations, and so forth. An approach of learning-by-doing may not be an elegant one. However, among its advantages is the fact that it does not provide perverse incentives for firms or countries to hold back from emissions reductions in the expectation that such reductions may have a future value that will be lost if they actually take action today.

Looking for and promoting climate benefits from actions taken for other reasons may really be a sustainable and fruitful approach. It applies most easily and directly to action that furthers adaptation to climate change; but it is also perfectly applicable to steps that further its mitigation. We have argued above that a virtuous circle of benefit can be initiated from the one to the other. The essential principle which animates that circle, enlightened self-interest, was stated long ago: "We address ourselves not to their humanity but to their self-love and never talk to them of our own necessities but of their advantages."

That principle expresses a fundamental belief that the proper purpose of politics is to do things *for* people, not *to* them. Such politics open doors and liberate energies in ways that build legitimacy through willing consent. They focus upon setting strategic goals; they abjure detailed meddling. We have argued here that if we radically rethink climate policy along these lines, an efficient role for public policy in respect of wicked problems like climate security will therefore be mainly indirect. It is, as we have explained, only a superficial paradox that the oblique approach is more likely to succeed than a frontal attack via summits, treaties and intergovernmental planning processes that try to set output targets, to pick winning strategies without benefit of experiment and to prescribe social behaviour in detail. It is for the reasons that both Zen architecture and Capability Brown help us to understand. In the first two parts of this essay, we explained in detail how and why we have come to be trapped in the Wrong Trousers of the Kyoto Protocol approach to climate security, and with what unwelcome consequences. In the last third, we have therefore set down the handful of well tried guiding principles that have the benefit of a past record of success: the Right Trousers.

Now is the moment to swap trousers. If the Bali Conference can become the occasion when the principles of an oblique and clumsy approach supplant the obsolescent approach which gave us the Kyoto Protocol that has dominated climate policy so fruitlessly for the past fifteen years, we believe that there are then strong grounds for hope. That hope is of two sorts. The first is hope that the Prometheus of humanity's ingenuity and intellectual energy can be swiftly unbound from the rock of Kyoto to begin to break the link between the fossil-fuel energy nexus and world-wide wealth creation, which alone can restore harmony between the twin goals of climate security and human development. The second hope is that we may avoid the otherwise looming possibility of a collapse of public support for any forms of

action on climate policy when the current spinning of the failure of Kyoto as success fractures irrevocably before the eyes of the concerned public. So this essay has been a conscious contribution to a controlled collapse of expectation, since the other alternative is to let events take their course, as bankers did in the Great Crash of 1929. Passivity before such a prospect is neither courageous nor wise.

And the fate of Wallace's Wrong Trousers? The criminal penguin Feathers McGraw attempts to make Wallace, locked into the Techno Trousers, an unwilling accomplice in the theft of a diamond from the local Museum. Thanks largely to Wallace's resourceful dog, Gromit, he does not succeed, and "Feathers" ends up behind bars. After his traumatic experiences, Wallace realises that the Trousers are not the valuable addition to his lifestyle that he had originally expected. They are not a convenient and lazy way for him to exercise the dog. So the last scene of the film shows the Techno Trousers striding off alone into the sunset.