6 July 2009

INSTITUTE FOR SCIENCE, INNOVATION AND SOCIETY
UNIVERSITY OF OXFORD

LSE Mackinder programme
for the Study of Long Wave Events

How to get climate policy back on course

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INTRODUCTION

In the economic crisis of 2008-09 there have been sharp reductions in industrial production. Germany and Japan, the leading exporters of high-quality industrial goods, have experienced particularly sharp falls: in the Japanese case, a 34% drop in output in 2009. One unintended contingent consequence of the recession has been to reduce emissions including CO2 emissions. But the operative word is 'unintended'. It is uncontroversial that governments in many (but not all) major economies seek to cut their carbon emissions by large percentages. The question is how to do so *deliberately*. Efforts over nearly two decades to reduce emissions have thus far borne no fruit.

Between 1990 and 2000 the carbon intensity of the global economy was 0.27 tonnes for every additional $1,000 of GDP. In the period 2001 to 2006, that intensity *rose* to 0.53 tonnes for every additional $1,000 GDP. So, during the period in which the most concern has been expressed about the need to reduce emissions, the world has become *more* carbon intensive. If countries really aspire to cut emissions, we suggest that the motor of an effective mechanism is a direct approach to the *decarbonization* of the global energy system, rather than an indirect approach via manipulation of the economy. The logic behind this direct approach is explained by the Kaya Identity[1].

The Kaya Identity shows that there are four – and four only – macro-scale policy levers in pursuit of emissions reductions. These are, respectively, **population, wealth, energy intensity** (meaning units of energy per unit of GDP) and **carbon intensity** (meaning the amount of carbon produced per unit of energy). Each of these factors is amenable to the action of a particular lever and each lever prescribes a particular approach to policy.

[1] See discussion in R.A. Pielke Jr, 'The British Climate Change Act: A Critical Evaluation and Proposed Alternative Approach', *Environmental Research Letters*, 18 June 2009, doi: 10.1088/1748-9326/4/2/024010.

In the case of population, the lever is population management. In the case of wealth, the lever is to reduce the size of the economy. In the case of energy intensity, the lever is to increase energy efficiency. And for carbon intensity, a switch to energy sources that generate fewer emissions is the primary lever.

The relationship between the four factors in the Kaya Identity can be expressed mathematically as follows:

$$\text{carbon emissions} = C = P \times \frac{GDP}{P} \times \frac{TE}{GDP} \times \frac{C}{TE}$$

(where TE is total energy)

This paper is about the record of, the prospects for and the implications of decarbonisation as a focus of climate policy. In deference to Professor Kaya's insight, we call it the Kaya Direct Approach. The Kaya Direct Approach means focussing on those factors that articulate with emissions and economic growth explicitly, rather than through an indirect and perhaps non-existent chain of causation. We do know something about how to improve efficiency: we've learned that from Japan. We do know something about decarbonising energy supply: we've been doing so for 200 years. So focusing upon incremental progress based on what we know, will begin to move us in the right direction.

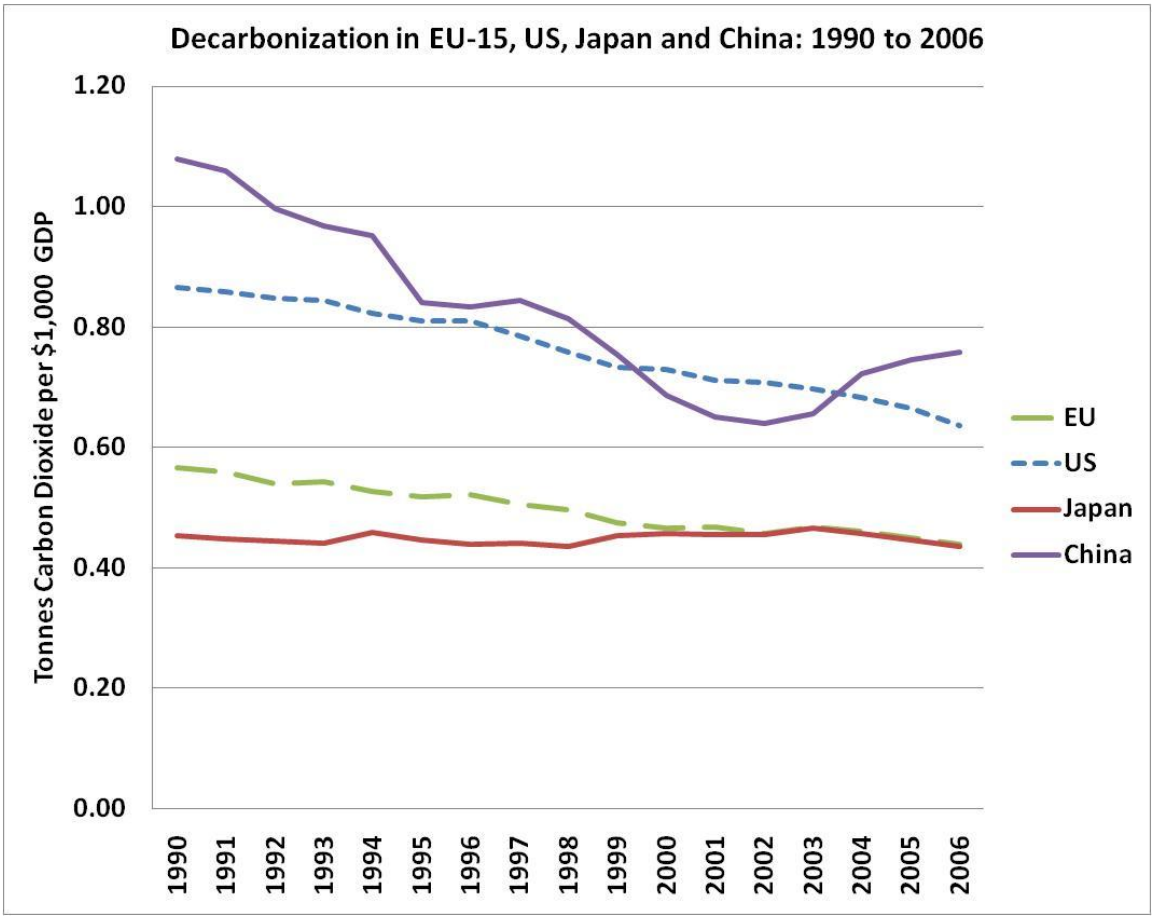
PART I

The abject failure of existing policy

The rate of global decarbonization can be broken down by region (see figure):

The historical record shows quite clearly that global and regional rates of decarbonization have seen no acceleration during the recent decade, and in some cases, show evidence of re-carbonization. Why is this so?

Figure 1. Decarbonization in the EU-15, US, Japan and China, 1990 to 2006. The EU-15 and Japan participated in the Kyoto Protocol whereas China and the US did not. GDP values expressed as PPP-adjusted 1990 Gheary-Khamis dollars.[2]



The axiomatic reason is to do with the nature of knowledge. It is a characteristic of open systems of high complexity and with many ill-understood feed-back effects, such as the global climate classically is, that there are no self-declaring indicators which tell the policy maker when enough knowledge has been accumulated to make it sensible to move into prescriptive action. Nor, it might be argued, can a policy-maker ever possess the type of knowledge – distributed, fragmented, private; and certainly not in

[2] For data sources see R.A. Pielke Jr, 'The British Climate Change Act ...'

sufficient coherence or quantity – to make accurate 'top down' directives. Hence, the frequency of failure and of unintended consequences.[3]

Under the Kyoto Protocol, policy makers have been presented with frequent lessons about the unintended consequences of policy action. For instance, setting huge targets for renewable energy in a short time frame (from 8.5% to 20% by 2020) may unintentionally drive the whole of Europe into large-scale *wood* burning. This decision will almost double the wood demand for biomass energy in the EU-15 from 55% of harvested wood in 2001 to 100% in 2020 at current harvest levels, or it may increase harvest above 1950 levels – the peak moment when the harvested proportion of net primary production was 1.5 times today's levels – and shorten forest rotation lengths. It has been calculated that wood consumption will be 453 million cubic metres in 2020 due to bio energy targets. There will be a huge demand-supply gap.[4] There will be different sorts of hazard also. Decentralized wood burning may increase the already considerable number of deaths caused by fine-particle emissions in Europe. Furthermore, it will increase the atmospheric black carbon load, which is thought to have powerful climate forcing effect: the opposite result of what policy intends.[5]

Likewise, the decision to increase the proportion of bio-fuels in transportation by 5.7% by 2010 and 10% by 2020 is a decision with undesired environmental consequences. Europe intends to fulfil this particular directive by the increased use of 1st generation bio-fuels, the production of which will, according to many academic studies, increase deforestation, world market prices of many basic foods, water consumption, erosion and land degradation, the use of fertilizers (e.g. highly emitting N2O) and pesticides, as well as decrease biodiversity. Recent analysis calculates that it would take 400 years

[3] J.C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed,* New Haven: Yale University Press, 1998. For a long time this point has been authoritatively argued from different philosophical standpoints and, as resolutely, it has been ignored by makers of policy, *cf* F.A. Hayek, *The Constitution of Liberty*, Routledge, 1960, p.27; I. Berlin, "The decline of utopian ideals in the West", (1978), *The Crooked Timber of Humanity: Chapters in the History of Ideas,* (ed) H.Hardy, Pimlico, 1990, pp 46-8

[4] In a study by the UN Economic Commission for Europe (ECE), UN Food and Agriculture Organization (FAO) and the University of Hamburg; P. Ciais, M.J. Schelhaas, S. Zaehle *et al.* 'Carbon accumulation in European forests', *Nature Geoscience*, Vol. 1, 2008, pp. 425-429.

[5] J.Tollefson, "Climate's smoky spectre," *Nature*, 460, 2 July 2009, pp. 29-32

to pay off the global 'carbon debt' caused by changes in land use induced by bio-fuel energy production.[6]

A final example: EU policies will set clean energy sources in competition against each other, especially nuclear against the available renewable energy sources (bio and wind). As a result of running down nuclear power, the consumption of fossil fuels is growing everywhere. It is difficult to find adequate alternatives in practice. So Sweden, for example, has tripled its nuclear capacity after deciding to give it up following a 1980s' referendum. Likewise, after a decade of pushing windmills and having come perilously close to grid failure in the cold winter of 2008, the UK now has a policy to build a few new nuclear plants. But it faces grave shortages of trained personnel and, as a Johnny-come-lately to new nuclear build, a global shortage of critical component manufacturing capacity.

The second reason is to do with the nature of institutions and their processes. The Kyoto Protocol focused on targets and timetables which were decreed to be 'binding'. In practice, the targets and timetables have been far from binding. They cannot be made to be so because unlike the US national jurisdiction, which could police the sulphur reduction regime that was in part the model for Kyoto, there is no equivalent enforceable international sanction.[7] As recently as 2008 the European Environment Agency expressed concern that the EU would miss its Kyoto targets – only to be 'rescued' by the global economic slow-down. Global emissions during the time since the promulgation of the Kyoto Protocol appear to have followed a 'business as usual' trajectory, with increasing carbon intensity of the global economy the net result.

The third problem is about countervailing forces within the deeply entrenched logic of the market. While the Kyoto Protocol prescribes binding emissions targets for the industrialised countries for the period 2008-12, these restrictions do not embrace

[6] J. Fargione, J. Hill, D. Tilman *et al*. 'Land Clearing and the Biofuel Carbon Debt', *Science,* Vol. 319, 2008, pp. 1235-1238.

[7] G. Prins & S. Rayner, *The Wrong Trousers: radically re-thinking climate policy*, James Martin Institute/ Mackinder Centre, 2007, p.16

developing countries, including the demographic superpowers – China and India. Yet two thirds of the increase in energy consumption takes place in the developing countries. Furthermore, most developing countries resist future imposition of emissions restrictions. Markets are thus distorted. Finland provides a good example of this: its steel and paper production is the cleanest in the world; but due to strict national targets its manufacturing is penalised – counter-intuitively – because in global markets the polluter gains competitive advantage. That is because the costs of installing clean and efficient equipment raises prices; so 'carbon leakage' occurs. International capital naturally prefers to invest where there are neither emissions restrictions, nor environmental standards. If production is transferred to areas, like China, with looser emission norms, then emissions increase overall. This arrangement threatens to invert the 'polluter pays' principle into 'pay the polluter'. So, perversely, Kyoto has *slowed* the reduction of carbon intensity. It has given the developing countries the moral right to pollute, in the name of solidarity –the argument being that they should have the same right to economic growth as historically the developed countries had. But it is not solidarity with the citizens of the developing countries if growth takes place in a dirty and inefficient manner.

The fourth problem is that climate policy has come to serve many other political and social functions beyond its declared formal objective. Thus, undeclared political, religious, ethical and wider lifestyle and social purposes are being fulfilled which complicate the design and the application of a formal policy process[8].

But during the period of the economic crisis, matters have in any case marched rapidly to a different drum. In the case of the European Union Emissions Trading Scheme (EU ETS), the policy process was effectively voided before formal agreement in December 2008 by the provision of exclusions for coal-dependent eastern European economies; for industrial producers subject to international competition and by the requirement imposed by Italy that the whole process should be reviewed root and branch after the forthcoming UNFCCC Copenhagen conference.

[8] M. Hulme, *Why we disagree about climate change*, Cambridge: Cambridge University Press, 2009

In Australia, the Rudd government made great play of 'signing Kyoto' at the Bali conference but has since found itself in increasing domestic difficulty as the implications of applying an emissions reduction policy have come into conflict with the interests of business and organized labour.

The European country which has been most ambitious in its attempt to legislate a top-down emissions policy has been the United Kingdom, with passage of the Climate Change Act in November 2008. Specifically, it requires Britain, by law, to achieve by 2016 a carbon efficiency of its economy equivalent to that of the world-leading major economy, France. That would require, for example, building and putting into operation 30 nuclear power stations in 7 years. Thereafter, assuming a GDP growth of 2% p.a., a year-on-year annual rate of decarbonisation of 5.3% is required to reach the Act's target; whereas there is no record of any economy having achieved greater than 2.0%, and then only for short spells. In sum, this Act requires the UK to achieve the impossible.[9]

In the USA, after election, the Obama administration backed away quickly from campaign promises to move towards top-down regulation and has now attempted to combine improvements in energy efficiency for vehicles with some setting of emissions reduction targets. The Waxman-Markey Bill, currently working its way through Congress, has seen its modest goals softened so considerably at each stage of negotiations that some environmental groups, who demanded it, now oppose it as a subterfuge: simply allowing business as usual to continue unchanged in part by counting on significant amounts of international offsets to claim a result that is in fact froth, not substance.

PART II

So what should be done instead?

[9] R.A. Pielke Jr, 'The British Climate Change Act …'

The lesson of the recent past is clear to us. In the first instance, policy should focus directly on decarbonization rather than on emissions; on causes instead of consequences. Developed countries' emissions targets, which are now under negotiation in the UNFCCC, should be backed by solid calculation of possible efficiency gains and decarbonisation. Among the major economies, only Professor Kaya's homeland, Japan, has set a concrete target (of a 15% in emissions from 2005 levels, representing more than a further 33% reduction in carbon intensity of the Japanese economy below 2005 levels by 2020[10]), to be met by real-world efficiency gains and decarbonization through deployment of efficient and low-carbon technologies. The Japanese target does not depend on the froth of purchased offsets.[11] Announcing this target, Japan's Prime Minister Aso called it 'Mamizu', which is the Japanese word for 'clear water'. This signifies that the target is one of real substance based purely on domestic efforts in energy efficiency and decarbonization. It could also be said that there is clear water in the other common sense of that term, meaning real distance between two objects: for the Japanese 'mamizu' target stands in clear contrast to the targets of the EU and the US which include wide use of offsetting. For doing this, which of course shames the emptiness of the splashy headline targets discussed in Part I, Japan has been attacked by environmental campaigners, and some of the media and criticised by EU Environment Commissioner Costas Dimas. The UNFCCC Chairman declared himself speechless because the target was so much less ambitious than the EU and UNFCCC headline targets– although in the real world the opposite is the case.[12]

For reasons of political feasibility as well as of efficiency, pointed out in the Kaya Identity, the Kaya Direct Approach focuses on energy intensity and carbon intensity and not on population and wealth. Population control policies are always politically explosive and so too would be attempts to reduce general wealth or to curb wealth

[10] R.A. Pielke Jr, Mamizu Climate Policy: An Evaluation of Japanese Carbon Emissions Reduction Targets, Discussion Draft, 3 July, 2009.
[11] While not alone, the most extravagant confidence trick of this type that has been documented was the Chinese CFC-23 scam, described in Prins & Rayner, *The Wrong Trousers* p. 30, citing M. Wara, 'Is the Global Carbon Market Working?', *Nature*, 445, 8 February 2007, p. 595.
[12] R.A. Pielke Jr, 'Mamizu Climate Policy …'

creation. In democracies, there are no votes in making people feel poorer, and we suspect that such policies would be unpopular elsewhere as well, for example in China.

In contrast, we think the evidence encouraging if policy focuses directly on efficiency/intensity improvement through technology development and deployment. First, direct efficiency gains do translate into real reductions in emissions. IEA's World Energy Outlook 2008 projects that the global CO_2 emissions will rise from 28.0 Gt-CO_2 in 2006 to 38.7 Gt-CO_2 in 2020. If we assume 30% improvement of CO_2 intensities in developed and developing countries respectively – this being the margin of superior efficiency that Japan holds over the generality today - CO_2 emissions in 2020 could be 31.7 Gt-CO_2: that is 7 Gt-CO_2 (18%) lower than the reference scenario. Even in this case, CO_2 intensity in developing countries is still three times higher than that of developed countries. If further improvement is driven by technology cooperation from developed countries, the impact could be bigger still. Evidence from the best studied and most efficient example, namely the Japanese iron and steel industry, shows a 19% reduction in CO_2 1991-2008 as a result of direct efficiency gains.[13] Secondly and related, pursuit of direct efficiency gains prioritises the heavy energy using sectors first and only concerns itself with lower impact sectors much later on. So, on this logic, world-wide there should be a sectoral focus on electricity generation first of all and then on other heavy user industries, such as iron and steel or aluminium production. The IEA estimates that worldwide deployment of best available technologies in fossil fuel power sector would save 1.8-2.5 Gt-CO_2/year, which is equivalent to China's total CO_2 emissions in power generation[14]. Some sectors have had high priority for environmental activists for non-environmental reasons (for example disapproval of flying for pleasure). On performance grounds within the transport sector, aviation should in fact be left until much later, since the

[13] JFE Group, *Environmental Sustainability Report*, 2008, p. 10; for an indication of global potentials, see H. Tezuka (JFE Steel Corp) 'Global Steel Sectoral Approach – Initiatives by JISF, APP & IISI', paper to MEM workshop, Paris, 16 April 2008

[14] IEA *Worldwide Trends in Energy Use and Efficiency* (2008)

costs of marginal improvement are so high and marginal gains of investment are so much lower. And at root, it just isn't a major contributor.[15]

The Kaya Direct Approach would focus on expanding the provision of carbon-free energy. To this end, we support a low *ring-fenced* carbon tax in one form or another to fund innovation policies. The core argument of the Breakthrough Institute is an elementary political truth, namely that clean energy will only advance radically when it is made cheaper than dirty energy at point-of-use by the consumer.[16] Accordingly, a switch to public intervention in this area, where governments are well capable of directing public finance to stimulate research, development and deployment of innovations that work to reduce the costs of alternatives to fossil fuels, is prescribed.

However, should it be the case that future scientific research suggests that acceleration of the automatic decarbonization which has been a two hundred years' trend, is insufficient for the purposes of reducing atmospheric carbon dioxide, then we advocate an insurance investment in research on air capture technology, i.e. technologies that allow CO_2 to be captured directly from ambient air either biologically or chemically; and, as a general background to development aid policy, we believe that attenuation of those present-day exposures to climatic hazards which affect the poor disproportionately, should be given far greater prominence.[17]

The Kaya Direct Approach has another advantage over current methods – an advantage which is potentially of decisive importance, in our view. It is that it is

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[15] In a 40 years perspective, according to modelling studies, aviation causes warming that is 15% of the warming from road transport. See Berntsen and Fugelstvedt. "Global temperature responses to current emissions from the transport sectors". *Proc .Nat. Acad. Sci.,* Vol. 105, 2008, pp. 19, 154-19, 159.

[16] T. Nordhaus & M. Shellenberger, *Break Through: From the death of environmentalism to the politics of possibility*, Houghton Mifflin, 2007

[17] R.A. Pielke Jr, 'An Idealized Assessment of the Economics of Air Capture of Carbon Dioxide in Mitigation Policy', *Environmental Science & Policy,* Vol. 12, Issue 3, 2009, pp. 216-225; R.A. Pielke Jr, G. Prins, S. Rayner, and D. Sarewitz, 'Lifting the taboo on adaptation', *Nature,* Vol. 445, 2007, pp. 597-598; H von Storch, H., und N. Stehr, „Anpassung an den Klimawandel" Aus Politik und Zeitgeschichte 47/2007, 19.11.2007 (english version: http://coast.gkss.de/staff/storch/pdf/Parlament.english.pdf); N. Stehr and H. von Storch, 2005: „Trägheitsfaktor Natur. Anpassung statt Klimapolitik: Was New Orleans lehrt". *Frankfurter Allgemeine Zeitung*, 21. September 2005 (engl. Version: http://sciencepolicy.colorado.edu/prometheus/archives/climate_change/000587stehr_and_von_storch.html); H. von Storch, „Wir werden das wuppen," *Spiegel,* 18. August 2003

incremental which means that progress can be continuously assessed. There are no arbitrary deadlines. It is the rate of decarbonization which is the ultimate arbiter of success. This means that we can avoid what we have just experienced, namely the danger of long periods of unobserved failure of policy.

The approach is preferable for other reasons. First of all, it addresses design shortfalls in the conventional approach. That much is already evident from our account above. In particular, it detaches the setting of targets from emissions. Instead, it attaches that valuable diplomatic process to efficiency and carbon intensity standards. The energies and time of the negotiating community currently engaged on the pursuit of a "bigger and better" Kyoto model for the Copenhagen Conference (which has already been shown to be nugatory at the Poznan and Berlin preparatory conferences) can be productively harnessed: for there will be a need for international agreement and review of best practice bench-marks, for example. This would be a much more practical and effective activity than setting aspirational and unachievable emissions reduction targets of which the UK Climate Act is the leading example.

Secondly, the Kaya Direct Approach is compatible with a broader approach to climate change than just via carbon dioxide emissions. This is important because recent research shows that other factors than carbon dioxide may well have significant climate consequences. In particular, black carbon, which is the soot that results from the incomplete combustion of fossil fuels (petroleum, coal), biofuels, and biomass (wood, animal dung, etc.), in the atmosphere suggests that an emphasis on improving air quality and on reducing the emission of black carbon from burning biomass in households and forest fires (hence forest issues) would produce much quicker physical reduction of the human influence on climate, especially in the high polar latitudes; and, in any case, it already has considerable support politically.[18]

[18] N. Keenlyside, 'Clean air policy and Arctic warming', *Nature Geoscience,* Vol. 2, 2009, pp. 243-244; D.Shindell & G. Faluvegi, "Climate response to regional radiative forcing during the twentieth century," *ibid*, pp 294-300.

In conclusion, we make three points. First, we suggest that the Kaya Direct Approach offers the best way forward for decarbonization and the only hope to reduce emissions to levels consistent with desired stabilization targets. We would go so far as to assert that inevitably humanity will pursue this form of approach, whether or not recognized as such, because of the political realities of energy and climate policies around the world.

Secondly, the Kaya Direct Approach is consistent with incorporating new science into policy-making because it preserves an ability to adjust for new knowledge and policy performance. New knowledge does not automatically reduce uncertainties. Thus, at present we experience a deep solar minimum – the quietest sun since 1913 – which in the past has correlated strongly with cooling effects. Some conclude that the aggregate time evolution of major Northern Hemispheric atmospheric and oceanic modes of variability suggests the possibility of near constant temperature lasting a decade or more into the future[19]. Conversely, there is much debate about the recent rapid retreat of polar ice, which seems to suggest opposite trends, having accelerated well beyond the predictions made by the suite of models used by the IPCC. Climate policy must be robust to uncertainties that can break in any direction.

So should the world community do nothing in the face of such a picture, fearful that its policies are more likely to make things worse than better, as has been the case to date? We think not. The Kaya Direct Approach improves efficiency and reduces costs. These are happy outcomes which reliably translate into greater profitability. These will therefore always be policies that will not be regretted, even if the relationship between CO_2 and global warming turns out to be different from that which current politics assume.

[19] N. Keenlyside *et al.*, 'Advancing decadal-scale climate prediction in the N Atlantic', *Nature*, 453, 1 May 2008, pp. 84-8; K.L. Swanson and A.A. Tsonis, 'Has the climate recently shifted?' *Geophys. Res. Letters*, Vol. 36, 2009

Finally, one must not let dogmatism and the argument that there are sunk costs – financial and, even more importantly, political and psychological – drive policy to the exclusion of pragmatism.

Because climate policy performs so many other sorts of political, religious and psychological work, it has tremendous momentum within it.[20] Part of that momentum has been brutally halted by the recession. We should profit from this; and so we argue that we should not only learn the lessons of this surprise. We should switch decisively to a radically different but also very familiar approach to policy which focuses upon actions *that have worked in the past* and which *we know to be politically feasible*. This track stands in contrast to current conventional wisdom which, oddly, is grounded upon policies that *have not worked in the past* and which we know *never to have been politically feasible* except through the application of unacceptable political forces.

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[20] H. von Storch, 'Climate research and policy advice: scientific and cultural constructions of knowledge', *Environ. Sci. & Pol.*, 2009 , http://dx.doi.org/10.1016/j.envsci.2009.04.008 ; M. Hulme, *Why we disagree about climate change, passim*