

## TANNER LECTURE

### **Environmental challenges in a warming world: consumption, costs and responsibilities**

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Mainstream politicians would have us believe that climate change can be tackled at relatively low cost and without major implications for our lifestyles and standards of living. Tackling climate change might even enhance economic growth, and there is much political talk about greening the economy being a way out of the current severe economic recession. Mitigating and adapting to climate change are, it is claimed, less a threat and more an opportunity.

This new conventional wisdom was given a powerful foundation by the immensely influential Stern Report.<sup>1</sup> At its core is an old conventional view about economic growth and Keynesian economics, and it had the (politically) satisfying conclusion that climate change could be tackled at around 1% GDP, whilst in the background GDP could go on going up forever at around 2–3%. Not surprisingly politicians around the world jumped on the 1% - repeated in speech after speech by most of the world's leaders.

To many environmentalists, the message in the Stern Report was hard to handle. On the one hand, if politicians could be convinced that climate change could be solved at such a low cost, they were more likely to 'go green'. On the other hand, many environmentalists were imbued with a very different view—that economic growth and consumption-driven economies were likely to bring environmental disaster, because they were not

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<sup>1</sup> Stern, N, HM Treasury and Cabinet Office (2006), "The Economics of Climate Change, The Stern Review", Cambridge University Press, November.

sustainable. A world with 9 billion people by 2050, with ever greater demands being placed on what many took to be finite resources, would lead to the destruction of the rain forests, the pollution of the oceans and ever greater emissions into the atmosphere.

In this lecture, these two conflicting views will be explored. At stake are the sustainability of the world economy and the prospects of future generations. The starting point is necessarily conceptual: how to think about economic growth and sustainability, and the relationship between consumption and the environment. This clears the ground to consider what needs to be done to address the global environmental destruction which is the hallmark of our age, and whether this can be done whilst expanding consumption along current lines. Once the sustainable path is identified, we then have a benchmark to consider how well current policy is addressing these environmental problems—whether the Kyoto Protocol framework has had much impact, and whether the proposals for a post-2012 regime are likely to make much difference. We can then see how sustainable or otherwise is the path we appear to be on.

### **The conceptual framework**

In conventional economic growth theory, inputs (like labour and capital) are efficiently translated into outputs through a production function. Inputs can be substituted for each other, and there are various combinations of inputs which can produce the same output. By improving the quality and quantity of the inputs, output can be increased. For labour, improvements in education and health improve the quality, and greater population increases the quantity of labour. For capital, technical progress is what matters. Since all these dimensions of labour and capital are increasing, and are likely to go on increasing for the foreseeable future, we can expect economic growth to continue at around 2–3% per annum. And since there is no reason to think that technical progress (and probably human capital) will not go on ever upwards, we can anticipate that future generations will always go on being better off, aside from the odd recession and even depression from time to time interrupting the path to nirvana.

This is indeed what the Stern Report assumes as the context within which to consider climate change. Once we reflect on the power of compound interest, we can see, to borrow the title of one of Keynes' essays, that the economic prospects for our grandchildren are truly awesome. By 2100, China and India will have surpassed the current standards of living of most developed countries, and even in these developed countries people will be many times wealthier than now. Just reflect for a moment on how each of us would spend, say, four to six times as much money as we have today. Perhaps another car, more foreign holidays, air conditioning, and a couple of spare houses? If we consider what very wealthy individuals now spend their fortunes on, the implications for this level of consumption for the many are awesome.

Is this really likely? Or even possible? Or, to use the modern and much-abused term, is it sustainable? Sustainability is about the ability to endure and carry on: it is about the capacity of all this extra consumption to be absorbed by our environment without serious negative feedbacks. In the conventional growth theory, even environmental damage does not *per se* undermine consumption possibilities, provided the pace of adding human and man-made capital outpaces the environmental damage. As long as the inputs in aggregate keep going up, then so too can economic growth and the consumption that goes with it. In other words, we can compensate for the loss of our climate and biodiversity with new ideas, inventions, houses, roads, cars and air conditioning. The loss of the swallow and the tiger are traded off against the gains in buildings and iPods. There is a one-for-one substitution between the inputs, of which the biodiversity and the climate are but examples. There is, on this view, nothing *special* about the environment.

This substitutability assumption looks suspect. The environment is hardly just another input: it is foundational to all the other factor inputs and it is also an output. Some substitutability is possible—indeed, that is what humans have been doing for thousands of years. Nature has been tamed for the purposes of agriculture. Cities have been built. Land has been reclaimed. Sewerage and rubbish have polluted rivers and seas to allow the current level of consumption to take place. In the process, human populations have multiplied, tripling in the twentieth century, and projected to rise by another 3 billion

from the current 6 billion by 2050—adding more extra people than the entire world population in 1950. We have been doing a lot of substituting for nature.

Can this go on *ad infinitum*? It looks doubtful. The climate itself is changing as the concentrations of greenhouse gases in the atmosphere rise—at an increasing rate. We are well on the way to doubling CO<sub>2</sub> concentrations in the atmosphere from a pre-industrial 275ppm to 550ppm. Already we are at 400ppm, increasing at about 2ppm per annum. As we shall see, nothing has yet been done to slow this down, and 750ppm is not just business-as-usual but also probable. On biodiversity, we are on course to eliminate perhaps half the species on earth by 2100, along with almost all the rainforests. Critical thresholds get crossed on this process of degradation: labour will be impaired, and capital will be damaged. At the limit, people may starve and there may be considerable conflict over basic resources.

The implication is that we are living beyond our environmental means: that our current consumption does not pay due allowance to the environmental costs. Depending on the view taken about the thresholds and the impact of all these extra people on resources, this gap is likely to widen, and at an accelerating rate. So the question arises: can we do something about this gap, and design our economies in a way that increases consumption without causing so much damage? Can we decarbonise? Can we stop destroying biodiversity? These are the key policy questions of our age.

### **How much will it cost?**

Surprisingly on climate change—given the sheer scale of the damage at present and projected forward by scientists—the conventional answer given for example in the Stern Report is: not very much. Indeed, decarbonisation might even make growth and consumption even higher. It is that beguiling and politically seductive answer so beloved and quoted by our political leaders. Perhaps as little as 1% GDP, perhaps even positive. Why? How could this be?

To see why this is probably too good to be true, we need to examine both the conceptual context and the empirical assumptions that lie behind this policy optimism. Part of the justification is macroeconomic. The conceptual bit relates to the way spending—any spending—feeds through into growth. If, for example, the government spends money on wind farms—or subsidizes the private sector to do so—this creates aggregate demand. It increases investment, and through the multiplier it increases consumption. Income is just consumption plus investment, adjusted for imports and exports. And income equals expenditure equals output at the aggregate level. Therefore, by spending on low carbon technologies, we increase growth and therefore future consumption. This is a kind of crude or ‘crass’ Keynesianism which now grips our political leaders as they grapple with the recession. Spend more on virtually anything and growth will go up.

Keynes himself never of course advocated anything so simplistic, and he would no doubt have been appalled by the current spending plans, as he was critical of the New Deal in the US in the 1930s. For many resources are—even when there is unemployment and excess capacity—scarce. In the general macroeconomic context, financial capital is scarce now, and the corollary of all the proposed spending is borrowing—creating a mortgage on the future. We got into this credit crunch and recession through excess borrowing, and the proposed solution is yet more borrowing. This was not just financial—we have borrowed the atmosphere and the biodiversity too from the future—we have been writing a large environmental mortgage on the consumption possibilities of future generations. They—of course—have not been consulted. If we assume they will be so much better off than we are, then it is argued that this is precisely what we should do. But, as argued above, the climate and biodiversity damage may well reduce their prospects. Indeed, it may even reverse them.

So closing the gap may have real costs to our—and future generations—standards of living. We may have to preserve more now, lowering our standards of living, not only to make good all the financial borrowing, but the environmental borrowing too. That is bound to be painful. And when we look at the costs in detail—at the micro level—it is also far from obvious that they are small. Perhaps the weakest chapter in the whole of the

Stern Report is the one on costs. It is largely an argument by assumption, and the assumptions in the supporting paper are subject to appraisal bias and to appraisal optimism. Low carbon technologies are *assumed* not only to be not much more expensive than conventional ones, but are going to get relatively cheaper over time.

The numbers are not borne out by experience. Take wind for example. It is currently expensive relative even to nuclear power. There is little technical progress. It is intermittent. It needs coordinated networks to cope with this smaller scale decentralised power. The actual costs of wind after a decade of targets have not gone down. Yet it is on wind that the EU climate change package in 2008 relies so heavily for its 20% renewable target by 2020. There may be other low carbon technologies where progress has been more positive. But in aggregate the costs are higher than many have suggested. In particular, there have been two related problems: the policy costs have been high not low (or strictly ignored in the Stern Report's calculation of the 1% number), and the policy interventions have attracted a host of lobby groups and vested interests, chasing after the economic rents. In wind, this has been extreme: lobbyists misleadingly often ignore intermittency and network costs with claims about the number of houses to be served by each turbine and the costs, and in Britain they benefit from one of the most expensive and costly support systems in the developed world. One way of thinking about this is to ask: what is the question to which a wind farm in, for example, the Outer Hebrides is supposed to be the answer? It is easy to conclude that a good part of the answer is the maximisation of income to crofters and developers. It is much harder to see any link with even 1ppm CO<sub>2</sub> in the atmosphere.

It would be nice to think that we could decarbonise and maintain or even increase the growth rate of our standard of living. The reality is very different: we will pay more—potentially much more—for our energy and transport, and this will reduce our projected standard of living.

**How much must we pay?**

An obvious response to this claim about higher costs is to point out that we have the Kyoto Protocol in place, and indeed some European countries might actually meet their individual Kyoto caps (especially now there is a severe recession and economic growth is negative). If we were to ratchet up our targets a bit—as the EU now proposes—surely this would not make that much difference to our standard of living?

This challenge is partly correct: Kyoto has not cost us much, and nor will the 20% target for 2020. But before we relax, let's consider why this is so. Kyoto doesn't cost very much because it does not do very much. Indeed, it might so far even have contributed to *increasing* global emissions. How could this be? Because Kyoto measures carbon production—how much we emit nationally. It does not measure how much carbon we consume—how much carbon is embedded in our consumption. Consider Britain as an example—a country which has already reduced its greenhouse gases by around 15% since 1990. How did it achieve this apparently impressive feat? Two factors dominated: de-industrialisation and the closure of most of the coal industry. Quite a lot of carbon production was simply outsourced abroad. We then imported the carbon intensive goods back to Britain and then consumed that carbon. With colleagues, I have calculated that the impressive 15% reduction in carbon production turns out to be matched by a 19% increase in carbon consumption over the same period.<sup>2</sup> Britain's performance on a production basis is exemplary—as its political leaders have rarely missed the opportunity to trumpet; but on a consumption basis it has been terrible.

This is not some academic debate about concepts. On the contrary, it has been going on on a global basis: put simply China, India and other developing countries have been rapidly expanding their carbon-intensive exports to rich developed countries. It is not the Chinese who are consuming the outputs from its coastal economic boom. The extra two large coal stations per week in China are being built partly for export manufacturers. And since it is likely that the efficiency of coal-fired generation is lower in China than in developed countries, outsourcing carbon intensive industries may be more polluting—

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<sup>2</sup> Helm, D. R., Smale, R. and Phillips, J. (2007), 'Too Good to be True? The UK's Climate Change Record'.

before adding in the pollution from shipping and other transport back to developed countries.

This focus on carbon consumption explains why things have been going so badly whilst Kyoto targets are being achieved. At the global level, coal is the growing fuel source, up from 25% to 28% in the last few years, and on a path towards 35% by 2030. And it translates into an accelerating rate of increase in global emissions. The example of the wind farm in the Outer Hebrides makes little difference to these major and detrimental global trends.

The focus on carbon consumption has a further implication: it points the finger at those who do the consuming. Our responsibility for carbon emissions is not confined to what we produce. The corollary is that the Chinese too are not wholly responsible for what they produce. The US is roughly 25% of world GDP, and the EU is not far behind. Japan is the second-largest economy in the world. Together their combined populations of less than 1 billion are responsibly for around one half of all consumption, leaving the other 5 billion to do the rest. As a very rough approximation, this suggests that the US, the EU and Japan should pay for around half of *all* the global emissions reductions—a staggeringly higher figure than that suggested by Kyoto.

But, in addition to paying for half the emissions now, China and other developed countries can point to two other reasons for a yet higher cost burden on the developed economies—that they put the existing stock of carbon up there in the atmosphere during their industrialisation, and that they have much higher per capita income and emissions. And for good measure, these costs are before any consideration of their role in causing the deforestation at the global level and the destruction of biodiversity. Some of this is linked directly to climate change—such as the scandal of some of the biofuels like palm oil causing direct rainforest destruction, and other biofuels like corn-based ethanol driving up world food prices and hence causing marginal land to be brought under intensive production. Western consumers have a lot to answer for, and a much higher bill to pay if the sustainability criterion is to be met.

## **So is there any hope?**

The implications of a consumption-based approach to assigning the responsibility (and costs) of tackling climate change and biodiversity loss are immense, and very disruptive of both the status quo and the likely course of post 2012 climate change negotiations. We already know that China will not accept quantitative production targets (and as argued above, for good reasons). We know that 20% EU and US production targets by 2020 will not make much difference to the increase in CO<sub>2</sub> in parts per million.

What the considerations set out here suggest is that a sustainable carbon and biodiversity policy framework would require a very substantial transfer of income from the US, Japan and the EU to developing countries, in order to halt their carbon intensive industrialisations, and in particular to arrest the dash-for-coal (and to a lesser extent other fossil fuels). It is not that we are about to run out of fossil fuels (as the naïve peak oil theorists assume). We have more than enough to fry the planet. The task is to apply (much) more expensive low carbon technologies in countries like China *quickly*. That will, in turn, require the developed countries to transfer considerable sums (considerably more than 1% GDP per annum) to countries like China so that they can increase their competitiveness and be low-carbon. The corollary is that Americans and Europeans will have to correspondingly lower their own consumption considerably – and quickly.

This would be a hard sell in the best of times. Indeed, in the recent boom years, the temptation to tell people they could solve climate change and carry on much as they have done was just too tempting. Indeed quite the contrary: politicians have claimed that we can have new runways, rapidly expand aviation, and across the US and the EU build lots more coal fired power stations long before the emitted gases might be sequestered. Consumers are told they can look forward to more and more holidays overseas as their income rises, and benefit from cheaper and secure coal-generated electricity. And recognising that this transfer to China is to an authoritarian Communist government just

adds another hurdle to the task of persuading people to lower their consumption to a sustainable level.

### **The environmentalists are right**

What then can we conclude? First, the conventional economic growth model is at best highly misleading when applied to the big environmental question of our time. The environment is not just another factor input. Second, our consumption is far too high, and incompatible with sustainability. Third, by focusing on consumption rather than production, the developed countries have a dominant responsibility to reduce carbon emissions and biodiversity destruction – including much of that happening in developing and poor countries. Fourth, the solution to our environmental problems is therefore a significant transfer of wealth, resources and technology to the developing world.

Is there much chance of this happening? It would take a very optimistic person to conclude with a resounding ‘yes’. There is not much in the study of human nature—and indeed human biology—to give support to the optimist. Yet it is not impossible. It is a matter ultimately of human well being and ethics. What will not help is politicians falling over themselves to promise both decarbonisation and no significant costs.

A final—pessimistic—note is added by reflecting on the responses to the current severe recession. It is to borrow yet more to maintain current consumption, writing a very large mortgage on the next generation. They will pay for our debts, our pensions and our health care—and our generation will have had a party, living beyond our means, and risking ruining our planet in the process.

The solution to our environmental problems is not wishful thinking. It is cold, hard realism. That has not been helped by the selective quoting by politicians from the Stern Report. It is time to tell voters some unpleasant facts.

## **References**

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