Sustainable Consumption, Climate Change and Future Generations

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1. Introduction

What makes climate change such a difficult problem to solve is that it is so pervasive: it is global but with very different effects on regions and nations. It stretches through time to many future generations. Its causes are ultimately the growth of population, the structure of production and growing consumption: greater numbers require ever more to make them happy.

The pervasiveness of the problem has been matched by the plurality of 'solutions'. One response with a long pedigree is essentially anti-growth and anti-consumption. 'Deep greens' argue that climate change is but one manifestation of the destruction wrought by humans on the planet, and that we should radically reduce consumption (and population), so that we can live in greater harmony with our environment. Variants on this position add cultural and spiritual dimensions arguing that we should 'get back to nature'. The Enlightenment idea of progress is rejected, along with capitalism as an economic system.[2]

An alternative view has been presented, primarily by mainstream economists. It is argued that climate change is a problem that arises because of 'market failures', and it can be 'solved' by correcting these market failures.[3] The challenge is to create a market in which carbon is priced (or taxed), and to intervene to support the technical progress to provide for new low carbon energy sources. The spirit of

[1] I have greatly benefitted from comments and discussions with David Wiggins and Cameron Hepburn. The views and errors here remain mine alone.

[2] There are of course numerous shades of green, depending on the view taken of the hardness of the constraints on economic growth. Here a simplified and stylised 'straw man' is used for exposition purposes.

[3] The concept of market failure begs the question: failure in respect of what? In mainstream neo-classical economics, the answer is: the Walrasian general equilibrium model of perfect competition, which is also Pareto optimal.

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the Enlightenment – the expansion of ideas and inventions in the context of free and democratic societies – is embedded within the capitalist system and, suitably regulated, the problem can (and will) be overcome. Climate change is just another challenge for capitalism to overcome.

The gap between these two broad views is enormous: ultimately they are grounded in fundamentally different views of human nature. One attempt to bridge the gap has been provided by marrying up the economists' view with a particular ethical position that owes much to the environmentalists' position. This attempt has been best exemplified in the Brundtland report[4] and subsequently the Stern Review.[5] Brundtland – in a north/south developmental context – promoted the idea of an ethical constraint on consumption: that people in the future should be no worse off that those now. Utility should be non-decreasing over time for all future generations. Stern borrowed an earlier and more radical concept from Ramsey[6]: that utility should not be discounted over time. Stern quotes with approval Ramsey's famous remark that pure time discounting is 'ethically indefensible' arising 'from the weakness of the imagination'.[7]

This paper is very much focussed on the attempt to marry up an ethical position with the conventional economists' view. It will be argued that whilst policy problems always entail some ethical content, the position arrived at by Stern is so radical as to undermine any notion that the usual economics toolbox of correcting for market failures could meet the challenge. Stern's position is extreme: far from 'lacking imagination', the time discounting of utility is fundamental to human nature. That does not of course render Stern 'wrong', but his position to time discount at zero is so divorced from human nature as to render it a hopeless base for the design of climate change policy. Indeed it is likely to be counterproductive. The breakdown of the Copenhagen climate talks in December 2009 and the subsequent slow progress at Cancùn was in part a consequence of far too demanding an ethical claim.

[4] Brundtland Commission, *Our common future: Report of the World Commission on Environment and Development* (Oxford: Oxford University Press, 1987).

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

[6] F.P. Ramsey, 'A Mathematical Theory of Saving', *Economic Journal*, **38** (1928), 543–59.

[7] Op. cit., 543.

An alternative approach is to ground the ethics of climate change more securely on human nature, and whilst Stern is swift to dismiss a more Humean naturalistic approach, it is more likely to provide a guide to policy. It may not in consequence 'solve' climate change – but this is, under almost any scenario, going to be a matter of mitigation, technical progress and adaptation. Climate change is inevitable. The questions are: how much ought we to mitigate? and: how should we design climate change policy most efficiently?

The structure of the paper is as follows. Section two grounds the climate change problem in consumption, and sets out a framework for considering what level of consumption would be sustainable over time. This loosely accords with the Brundtland approach, though it makes no claim about the distribution of that consumption. Section three turns to Stern's more radical proposal and the concept of equality that is embedded in it. It contrasts this rationalistic approach with one loosely derived from Hume. Section four sets out the case for basing policy on pragmatism rather than idealism, howbeit one grounded on moral sentiments. Section five draws out some of the implications for climate change policy. Section six concludes.

2. Sustainable consumption: assigning responsibility

The proximate cause of climate change is a change in the composition of the atmosphere. Increased emissions of greenhouse gases (here, for simplicity, all lumped together as 'carbon') as a result of human activities are claimed to be the main culprit. Hence the 'solution' is to reduce these emissions. It is assumed that climate change is a 'bad thing', and that it is especially bad if average temperatures increase above 2 degrees centigrade in this century, and catastrophic if they rise much more.

Packed into the above paragraph is an enormous amount of science and scientific uncertainty about climate change, and a lot of economics in the estimation of the consequences. For the moment we leave aside that uncertainty – returning to it when we come to policy at the end of the paper.

What causes the increase in emissions? An obvious answer is the burning of fossil fuels, to which can be added the destruction of the great carbon sinks – the rain forests, oceans and soils. But what causes these? The answer is greater human consumption – based upon the continuous process of economic growth and population

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increases. To set the context for the period to 2050, over which the requirement indicated by scientists to stay within the two degrees warming is effective decarbonisation, these trends in growth and population need to be extrapolated. On economic growth, it is assumed that the developed economies continue their trend GDP growth rates of about 2–3% GDP per annum. Europe plus the US currently equate to about 25% each of world GDP, and at these rates, they will double by 2050 (and quadruple by the end of the century). Translating growth into consumption, Europeans and Americans can expect to have twice their current standard of living by 2050.

But it is in the developing countries where the effects are most dramatic. China and India are both currently growing at about 7–10% GDP per annum, and with the economic crisis making a mere dent in the trend line. If these rates continue, both will roughly quadruple their GDP by 2050 and roughly quadruple their consumption too. Brazil may also follow the same path.

This growth will be accompanied by a further expansion of world population – from around 6 billion now to around 9 billion by 2050. The increase represents an addition equal to the entire world population in 1950. These extra 3 billion will be distributed largely in China, India and Africa – roughly one billion each. There will be large increases in the Middle East too, relative to their current populations, but China and India dwarf the others.

Translating this economic growth and population increases into future consumption using current evidence of preferences indicates hundreds of millions of new cars, a major shift towards meat-based diets, massive expansion of aviation and shipping, and the conversion of much land into housing. To support this consumption, energy demand will rise sharply, as will agricultural demand. It is not hard to envisage as a result very considerable destruction of the remaining rainforests, significant freshwater constraints (with large scale, energy intensive desalination), acidification and large scale pollution of the oceans, and a major deterioration of soils, as marginal lands are brought under cultivation and existing agricultural land witnesses a major (agri-chemical based) intensification of production.

This enormous wall of consumption lies at the heart of the climate change problem – and indeed more general environmental destruction. The question is whether it can be sustained. Deep greens await confirmation of their claim that it cannot, and wait for the expiry of the global resources that will be needed to support it. They start with a model of the world's ecological systems and economy in which resources are in *fixed* supply. As they are used

up, we run out of them. It is claimed by some in this camp that we have already passed the peak of oil production, and that we will run out soon, and that we will face acute shortages before 2050. As the oil runs out (and the other core minerals), the capitalist economies will face crises and, some argue, ultimately collapse. Armageddon awaits, unless we rapidly switch to lower consumption, renewables and radically reduce our energy consumption.

Fortunately or unfortunately according to one's starting point, on fossil fuels at least, this is in large measure nonsense.[8] It is not only a very static view, with implicitly an assumption of fixed technologies, but it also relies on the empirical forecast expiry of resources in the given time period. Both assumptions are suspect. Technological change is encouraged as the price of a resource rises. Thus despite warnings of a crisis as the coal 'ran out' in the late nineteenth century (famously by Jevons in 1865),[9] in fact oil-based engines came along, and oil displaced coal especially for transportation. Coal remained (extremely) abundant and for the subsequent century provided the main fuel for electricity generation. Indeed there is probably at least around 200 years left of coal burning should it be needed and should we be foolish enough to burn it. Technological progress leads to substitution, and there are lots of substitutes available. In the electricity sector, nuclear has displaced some coal, and gas has made major inroads.

Turning to oil, the marginal demand is from transport. Yet there are rapidly developing technologies that electrify transport. And electricity can be produced from nuclear, hydro, solar, wind and, importantly, gas. Contrary to the view up to the end of the 1980s that natural gas was so scarce that it should be preserved for the petrochemical industry, recent developments in unconventional gases (shales, coal-based methane and tight gas) indicate that we are, and may remain, awash with gas reserves for at least the rest of the century.

Thus, contrary to the deep greens, the problem is not scarcity of fossil fuels (the burning of which is a key cause of climate change), but rather their abundance, and if we were to use these resources, the science predicts that we will end up with a serious risk of catastrophic climate change. The case is less clear cut when it comes to land use, water and soils, but here again it is foolhardy to

[8] Helm, D.R. (2011), 'Peak Oil and Energy Policy – a critique', Forthcoming in *Oxford Review of Economic Policy*, Vol 26, Issue 4.

[9] W. Jevons, *The Coal Question: An Inquiry Concerning the Progress of the Nation, and the Probable Exhaustion of Our Coal-Mines* (London: Macmillan and Co. 1865).

underestimate the ability to continue the consumption expansion for a very considerable time. The rainforests could be felled, providing a lot more agricultural land. There is no shortage of (salt) water, and desalination opens up almost infinite fresh-water supplies. Chemicals will almost certainly stretch out the yields from soils. Again, resources are unlikely to run out (thereby stopping consumption) within the time period that climate change needs to be tackled. On the contrary, the destruction of the environment can probably run on well beyond the relevant time period for action.

Yet beyond fossil fuels the deep greens have a point in the long run. The environment is not infinite: the processes that lie behind the increase in consumption come with great destruction, and eventually the impacts will probably constrain human expansion in both numbers and consumption. In this century, the destruction of biodiversity – perhaps half of all species – will have inevitable feedbacks. Renewable resources are being so rapidly depleted that they may become non-renewable. A feature of the economists' approach is to take account of this destruction by trading it off against the growth in 'man-made capital'. So we might lose the swallows and the tigers, but we can compensate for this loss with more houses, cars and iPods. Substitution between environmental and man-made capital is assumed.

A further twist is to argue that in any event future people will probably not miss the swallows and the tigers: if they have never seen them, how can they experience a sense of loss – other than as we do now for the dodo? Compared with the sense of loss from taking a pay-cut, or not being able to take a holiday, it is for most consumers, irrelevant.

This substitution assumption goes to the core of the concept of sustainability and sustainable consumption. If environmental and man-made capital are perfect substitutes, then consumption for future generations goes up as long as we compensate for the environmental damage to the climate and biodiversity with enough man-made stuff. Deep greens would want to deny there is a trade off. Conventional economists might want to claim that the substitution is close to unity. Neither is likely to be right: to deny any substitution is to deny that there has been any progress in human history in a material sense; to claim complete substitution is to deny that there is anything special about the environment.[10]

[10] The range of views between the two extremes is represented by different green positions.

Thus to establish what is 'sustainable consumption' requires an empirical estimate of this substitution. Such estimates are complicated by the fact that there is a lot of variance between cases. Indeed in extreme cases, like some viruses, the substitution is more than unity – we want to eradicate them. Many resources are renewable; many are renewable up to a particular depletion rate. There is also the problem of uncertainty: we often do not know what is a safe rate to exploit a resource, and we know little about future possible uses. Hence it might be sensible to apply a precautionary approach to identifying safe depletion rates.

In theory then, the sustainable consumption path could be defined by sorting out the substitution assumptions, and there will be a debate between environmentalists and others about how much risk we can take whilst giving future generations consumption at least as high as our own. What however is clear is that Gross Domestic Product (GDP) does not measure sustainable consumption, and indeed it takes little or no account of these limits to substitution. It follows that the GDP growth predicted for the period to 2050 is likely to be unsustainable.

GDP measures gross not net output. It takes no account of changes in asset values (natural or otherwise), and most of the pollution caused in realising GDP (including carbon emissions and biodiversity loss) is not taken into account. In order to measure sustainable consumption, pollution needs to be priced, and the increase or decrease in asset values needs to be incorporated.[11] It is immediately obvious that, were these aspects of economic growth to be incorporated into the calculation, the sustainable level would be much lower. China's growth rate in particular, based upon the depletion of fossil fuels, growing carbon emissions, and the destruction of its agricultural land and water, would probably be much lower.

None of the above indicates that people in the future cannot be better off – that growth cannot continue. The causes of growth, once the above adjustments have been made, arise from finding more productive ways of producing the things people want to consume. The main source is technological progress – science and its application. In addition, the quality of the labour force can be enhanced through better education and health provision. Governments and other institutions can be improved too. All these improvements come through the processes of discovery, learning and experimentation. They do not come from simply depleting resources faster.

[11] Helm, D.R. (2010), 'Rethinking the Economic Borders of the State', London, *Social Market Foundation*, November.

Growth is about getting more out of existing resources, having proper regard to making good their depreciation. The internet, mobile phones, and widespread computing are examples of enormous technical progress which in themselves are not necessarily more resource intensive. Smart grids, active power systems, and electric cars have the potential to transform the energy sector.

There is no evidence that the human history of ever-expanding knowledge is about to stop. Hence there is in principle no limit to growth. However, given we have done considerable damage in our pursuit of GDP and hence not taken account of the depreciation of natural (and other) assets, there is much reparation to be done. Recent debt-financed consumption has almost certainly been in excess of the sustainable level, and hence living standards may have to adjust down to the sustainable level, before resuming an upward path.

Once it is accepted that (over) consumption and a failure to take proper account of natural capital in the development of man-made capital are the ultimate causes of climate change and biodiversity, it is a relatively straightforward step to argue that responsibility for the past excess emissions of carbon lies with those who have been doing the consumption and over-exploiting the natural capital of the climate. This simple step has radical consequences: to date almost all carbon policy has been based upon the reduction of carbon *production* rather than consumption.

The assignment of responsibility is an important step in reaching any international agreement about climate change policy. It is not just about who caused the past emissions – now part of the stock of carbon in the atmosphere – but who is the ultimate cause of additional marginal emissions going forward. If China produces goods for export to the US and Europe, then the carbon produced in China is *on behalf of* consumers in the US and Europe. Indeed, it may be that the goods would have been produced in countries like Britain had not carbon production in Britain been the policy target. Rather than produce steel, chemicals and cement in Britain (and pay the price of carbon), the companies locate oversees and then export back to Britain.

The effects are dramatic. The 'carbon footprint' of the British is much higher than reported under Kyoto-based carbon production measures. Between 1990 and 2005, carbon emissions *production* fell by an impressive 15%. But on a *consumption* base, emissions went up around 19%.[12] Now consider the sustainability criterion described

[12] D. R. Helm, R. Smale, and J. Phillips, *Too Good to be True? The UK's Climate Change Record* (2007, December).

above: if GDP is adjusted to take account of the pollution (the carbon emissions) and the depreciation of the atmospheric assets (measured by increases in the carbon stock), then the measured carbon performance of the British economy looks a lot worse. The corollary is that our standard of living is considerably above the sustainable level.

3. Future Generations

The sustainability criterion gets us a long way from our current polluting consumption. To meet it would indeed be radical. No mainstream political party considers it wise to explain this to their electorates. None advocate a carbon-driven (or biodiversity-driven) reduction in current standards of living. Indeed, political debate in Britain (and most developed countries) is framed to a considerable extent on how much extra consumption now can be financed by borrowing from the future. Yet curiously some economists – notably Stern – argue we should go much further. He argues, following Ramsey, that we should be impartial between the times that people live. We should not discount utility over time. 'We take a simple approach in this Review: if a future generation will be present, we suppose that it has the same claim on our ethical attention as the current one'.[13]

Zero time preference discounting is a radical idea – and indeed it is far from clear what it means. It is based on a rationalistic application of the idea of impartiality, itself based on a concept of justice. In turn, it derives from social contract theory: that rational individuals abstracted from their places in society (and their initial endowments) would select such a principle.

This is not the place to review theories of justice. Rather we consider two objections to this sort of approach to climate change: that it is so radically different from what people actually choose as to have little chance of guiding policy; and that abstracting individuals out of their social context is in conflict with human nature and hence cannot form the basis for a moral principle.

The first objection is a relatively easy empirical claim to make. Zero discounting treats people equally through time – and, by implication, at a point of time too. Yet, as the advocates at Copenhagen found, politicians not only could not resolve the prisoners' dilemma problem, but also did not think they could sell even the weak proposals for a post-Kyoto framework to their voters in democracies, and

[13] N. Stern, op. cit, 35.

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dictatorships were even less inclined to follow this line. The Copenhagen proposals were not remotely close to the sustainable criterion discussed above, let alone approximating zero time discounting.

A cursory inspection of preferences indicates that David Hume was right to point out that our concerns are greater for our immediate family and neighbours.[14] As we move away from our close circles, we do not display much propensity to treat the utility of people equally at a point in time. Move beyond our borders and immigration becomes a common cause for discriminating between people according to where they were born and currently live. Getting richer countries to transfer even 1% GDP for development is an uphill struggle. Indeed it is interesting that one of the core arguments in favour of emissions trading is that voters might not notice that transfers are being made by mechanisms like the Clean Development Mechanism to poorer countries.

The idea that we should weight people through time equally when we so patently do not at a point in time displays a concern for describing one possible moral ideal, rather than trying to craft an agreement now about climate change. It is an interesting intellectual exercise, but is open to the challenge that it is not itself of moral merit. By shifting the emphasis to ideal states, and the advocating policies based upon the ideal, the risk is that nothing much is achieved. The failure at Copenhagen is a good example of the moral consequences. To seek in a Humean spirit to ground moral judgements in human nature, rather than externally from human nature, points towards a broadening of our concerns, including our concern for justice, but not so far as to encompass an ideal which is unreachable given the

[14] 'We sympathise more with persons contiguous to us, than with persons remote from us: With our acquaintance, than with strangers: With our countrymen, than with foreigners… The approbation of moral qualities most certainly is not deriv'd from reason, or any comparison of ideas; but proceeds entirely from a moral taste, and from certain sentiments of pleasure of disgust, which arise upon the contemplation and view of particular qualities or characters. Now 'tis evident, that those sentiments, whence-ever they are deriv'd must vary according to the distance or contiguity of the objects; nor can I feel the same lively pleasure from the virtues of a person, who liv'd in *Greece* two thousand years ago, that I feel from the virtues of a familiar friend and acquaintance.' D. Hume, *A Treatise of Human Nature: Being an Attempt to introduce the experimental Method of Reasoning into Moral Subjects*, Volume II: Passions – Morals (A new edition, London: Thomas and Joseph Allman, 1817), 308–309.

constraints of human nature. This was very much Hume's view of the role of government and moral advancement.

Our second line of criticism is that the ideal itself may be open to challenge, given its reliance of some sort of social contract theory. This liberal rationalistic approach to ethics reached arguable its climax with Rawls' theory of justice not so much because of the two principles he derived, but from the architecture of choice upon which they are based.[15]

For Rawls, what makes people human is their rational capacity, and their conduct should be driven by the dictates of reason. Therefore all the other bits need to be stripped away. The people in Rawls' original state are behind a 'veil of ignorance', and their ignorance is profound. They do not take account of their endowments. For many this is interpreted in a rather narrow way. But 'endowments' include their human nature, their culture, their parents, their education, religion and so on – all the attributes Hume placed emphasis upon. People are not blank pieces of paper on which rational principles of justice can be written.

The alternative view does indeed owe much to Hume. For him, reason was the slave of the passions. These 'passions' are complex and historically situated, surrounded by institutions, culture and social context. They are core parts of our human nature. Moral sentiments do for Hume extend beyond self-interest – and reason has its part to play. Considerations of justice expand the domain of moral concern and develop our moral sentiments (a point his friend Adam Smith recognised too).[16]

The issue here is not whether people have concerns for others. That concern is the starting point, and the precondition for the evolution of moral sentiments. For Hume, the impressions upon which ideas are grounded have *context*. And amongst the passions are narrow and broad conceptions – of personal improvement and betterment, of concern for one's family, as well as for wider circles. People come together in common action, but their negotiating position starts with this context. Humans are defined by that context: that is what makes us what we are. Governments and institutions evolve gradually to help widen the domain of moral sentiments.

The original position of Rawls is quite alien to the Humean approach that is being advanced in this paper. People are partial – human nature and historical circumstance make them so. They are

[15] J. Rawls, *A Theory of Justice*,(Harvard, Harvard University Press, 1971).

[16] Adam Smith, 'The Theory of Moral Sentiments', 1759.

not impartial judges. Thus whilst it might be said that individuals' entitlements should be independent of the circumstances of their birth and social context, and insisted that we should treat people equally regardless of when they are born, we patently do not do this. Indeed if we were to do so, many of our actions in the specific and partial care we apply to our children and closer friends would dissipate. Why bother to create a loving and supportive home for one's children if not to give them a better chance compared with not doing so? Our domain of concern might (and should) be expanded – in part through moral education – but not to global impartiality now and for all future periods.

A further argument is that people in the original position would not in fact choose Rawls' principles. There is a vast literature on this issue, and in the climate change context it has been generalised to claim that we should maximise the welfare of the worst-off generation. Yet at the core there is a lurking assumption about human nature here too: we should be risk averse, for fear that it will be us that end up worse off. But why would we be so concerned? Risk aversion varies from person to person, but the Rawlsian version is extreme. At the generational level it is far from clear how we could identify which generation might be worse off, since over time we have little idea what technologies will be available and how the path of population might unfold. And at some future date there may be unexpected positive or negative developments. An asteroid could hit us. A disease could hit us. Or we could discover some chemical route to everlasting happiness, or the ability to directly tap into solar radiation. Previous generations had little idea of the internal combustion engine or indeed the Internet. Finally, eventually we may (and probably will) evolve into subsequent species.

Of these options, the obvious one to concentrate on is the very small probability of a very large negative event – say the asteroid or runaway climate change. At the limit there is some positive probability of extinction. In the Stern Report, this extinction risk is addressed by increasing the time discount rate from zero to 0.1%. Yet on a Rawlsian-type argument, we should devote our resources to dealing with this possible worst-off event.[17] Interestingly if we thought that the asteroid was likely to hit in the next few decades, we might well take steps. On a Humean approach, we are connected to the people who would be killed. But suppose it was just some time

[17] M. L. Weitzman, 'Why the Far-Distant Future Should Be Discounted at Its Lowest Possible Rate', *Journal Of Environmental Economics And Management*, **36** (1998), 201–208.

in the future – as there is a high probability that it will. Do we really care that some hundreds of thousands of years hence, lots of people will be killed and humans might cease to exist? Do we care what they evolve into? As an abstract question it is interesting, but as a guide to action on climate change it adds little.

4. Idealism and pragmatism

The contrast between what we have styled as the Humean and Rawlsian positions in terms of the implications for climate change policy is a stark one: the former points to gradualism, the latter to an impractical and obscure perfectionism.

The gradualist approach places a special moral weight on the starting point. History has arrived at a particular combination of institutions, beliefs and values, and a particular distribution of resources between current peoples and between current and future peoples. The starting point is not 'ideal'. No ideal outcome is in prospect.

Given this starting point, the policy options are defined in terms of incremental steps. Calls for a 'revolution' in climate change policy run into a series of objections. Revolutions by definition tear up the starting point. They are uncertain in terms of their impacts and consequences, and they involve a discontinuity with the moral sentiments of the starting point. Unintended consequences of large scale intervention, as emphasised by Hayek and Popper, point towards caution.[18,19]

This is not an argument for a conservatism: that says that the world we inhabit is Panglossian. Quite the contrary: climate change unchecked will leave many worse off, though in very different degrees. Moral sentiments are not contiguous with the status quo. Rather the case for an evolutionary pragmatism is that it fits with human nature – it is grounded in reality – and that as a consequence it is likely to work. Revolution is not a normal part of human nature – a point that Burke was keen to make in reaction to the French Revolution.[20]

[18] F. A. Hayek, 'Individualism and Economic Order', (London, Routledge and Kegan Paul, 1949).

[19] K. R. Popper, 'The Open Society and Its Enemies' (Princeton, Princeton University Press, 1945)

[20] Edmund Burke, *Reflections on the Revolution in France* [1790] (Penguin Classics, 1986)

Progress – scientific, material and moral – is a process of trial and error and of learning-by-doing. We gradually try to expand the domain of moral sentiments. Over time, we have recognised that slavery is wrong, and extended our moral sentiments beyond race. We have extended our moral sentiments to the poor close to home, with concerns about inequality increasing over time. We have extended our moral sentiments to developing countries, howbeit to a modest aspiration of 1% GDP p.a. Now the challenge is to edge forward our moral sentiments to future generations. The revolutionary goes straight to zero discounting; the gradualist lowers the rate.

5. Implications for climate change policy

So what should we do about climate change? What guidance do moral considerations give us? Stern is right to claim that we cannot design policy without taking a moral view. There is no purely *economic* case for tackling climate change. But then this is hardly new – there has been a strong distinction between positive and normative economics for a very long time, echoing Hume's distinction of 'is' and 'ought'. The question is what moral approach to take.

Stern takes the rationalistic approach – derived from utilitarianism and the maximisation of the sum of utilities through time. He might rely on Mill's diminishing marginal utility of money to motivate his equality approach, or he can draw on the principle of impartiality as part of a theory of justice. Whichever route he takes, his is a radical prescription. It would involve a revolution in the way resources are currently allocated: there would be an immediate transfer of a significant proportion of GDP from the US and Europe to developing countries. It might even be most of current GDP. There can be no reason for Stern to discriminate between different people now, and between people now and in the future. There are plenty of people worse off now than many will probably be as a result of climate change in fifty years' time. His position is a radical egalitarianism both at a point in time and over time. That is what zero time discounting means.

Translating zero discounting into climate change policy dictates a correspondingly radical de-carbonisation policy. Ultimately the task at Copenhagen was to get politicians to agree that their populations should follow these radical implications, since Stern's zero time preference assumption is a necessary condition in his analyses to justify urgent action on climate change. Without zero time discounting, his review does not lead to this conclusion. As was revealed

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at Copenhagen, this proved impossible. The result – the Copenhagen Accord – has been correspondingly very limited.[21]

The alternative approach is pragmatic and incremental – to focus on near term improvements and gradually to confront polluters (us) with the consequences of our actions. Public education of the consequences of global warming, helping to show not only how the moral sympathies may be attenuated towards future generations but also to show how in quite narrow domains of our sympathies, there will be negative consequences are part of the pragmatic approach. The creation of institutions helps to bolster our commitments. In this, the starting point is where we are now, and to appeal first to our self-interest as well as to our benevolence, before extending the moral appeals.

With the pragmatic approach, early emphasis falls on those options which are 'no regret' and which have little cost. Energy efficiency measures are promoted as making us better off through lower energy bills. Switching from coal to gas in electricity generation is, for example, much cheaper than building very expensive offshore wind farms. And so on.

The policy mix is then gradually extended, as the equation between cost and benefits is better understood. Time matters here too: we can do the energy efficiency and the coal to gas switches in this decade, but nuclear (if appropriate) will take longer. We do not know what technologies will be available in three decades time, and hence it makes little sense to make decisions now about future choices – though we should build up R&D, and create open institutions to ensure diverse ideas flourish. Importantly too, we do not know what the effects of climate change will be with any precision. The IPPC's range of temperature increase in this century is between 1 and 6 degrees centigrade. It may well turn out that future generations will be better off than we are now with 1–2 degrees warming – but not 6 degrees.[22,23]

[21] United Nations Framework Convention on Climate Change, *Draft decision -/CP.15 Proposal by the President: Copenhagen Accord*, (Conference of the Parties Fifteenth session, Copenhagen, 7–18 December 2009, document FCCC/CP/2009/L.7).

[22] R. Tol, 'Estimates of the Damage Costs of Climate Change. Part 1: Benchmark Estimates', *Environmental and Resource Economics*, **21** (2002), 47–73.

[23] R. Tol, 'The Economic Effects of Climate Change', *Journal of Economic Perspectives*, **23** (2009), 29–51.

Focusing on the current context is at odds with zero time discounting. Current more certain utility is worth more than future uncertain utility. Even Stern concedes that extinction gives a positive discount rate. And declining discount rates are either a reflection of a fatter tail in the probability distribution of climate change damage – the small probability of large scale damage – as time goes on (and hence arguably should be addressed in the calculations of the costs of global warming and not the discount rate), or a violation of the Humean approach to near neighbourliness.

If Stern's revolutionary approach of zero time discounting does not provide convincing moral guidance on what to do about climate change, what does? Above we have argued that the focus should be on the composition of economic growth, and on reconsidering the concept of measuring the improvements of welfare through GDP. In Stern's calculations, the decisive reason why early action on climate change is merited is his zero time preference rate. Otherwise, with a conventional time preference rate, we should do very little. The costs of action now are too great compared with the discounted benefits in the future, on the assumption that future people will all be much better off. If, as discussed in section 2 above, the US and Europe are twice as wealthy by 2050, and the Chinese and Indians are four times as wealthy, they will have so many more consumption opportunities – so much more utility – to trade off against the costs imposed upon them by global warming. Why should we make sacrifices now for those who are going to be so much better off than we are now, and for whom there will be a plethora of technologies that we can only begin to imagine? Stern's answer is that we should care about them on an equal basis and go through a moral revolution to support them.

The Stern Review does not therefore get us very far: we should only take action now if we adhere to a moral principle which does violence to human nature and in any event has virtually no chance of passing an electoral test. But fortunately the case for action now does not need Stern's discount rate. The arguments from sustainability get us there independently. We can go on with a more conventional time preference rate and still have the benefits of early action outweighing the costs.

Sustainability focuses on consumption and growth and requires us to reconsider the concept of GDP – of well-being and wealth creation. Recapping, GDP takes no account of what we are doing to our assets, and in effect treats the substitution of natural for man-made capital as at least one-to-one. (Actually, since the natural capital is not priced at

all, it is worse than one-to-one). GDP does not take account of pollution and pollution costs.

It is therefore straightforward to argue that the efficiency of economies would be improved by calculating economic growth on a *net* rather than *gross* basis, accounting for asset depreciation, incorporating ecological considerations into critical depletion thresholds, and pricing in pollution. This set of steps does not directly involve distribution: we do not need to bring equity at a point in time or over time into this calculation to make the case for early action on climate change. By valuing the atmosphere and biodiversity, by calculating the depreciation and compensating for it, and by pricing the pollution (by a carbon price), very substantial changes would be dictated.

There would be consequences to current standards of living – put another way, GDP flatters us about changes in our welfare. There would be indirect distributional consequences too: by measuring the carbon emissions on a consumption basis, the burden of meeting the costs of current emissions would fall on those that cause them. Britain, for example, would not be allowed to get away with the fiction that because its production of carbon is falling, that therefore its pollution is too – because it is importing carbon intensive goods, causing the pollution elsewhere.

Such measures would not exhaust the moral arguments about intergenerational equity. Coincidental with the above sustainability-based measures, the case for an expanded moral domain can be made. But this is a long-term project, about moral progress. It involves moral education, cultural developments and the evolution of our institutions. It may not even work: human nature may not allow its full extent. The veneer of civilisation – and especially its institutions – may be thin, and indeed the history of the twentieth century dents the belief in a linear progressive path. In the climate change case, there is not enough time to evolve towards moral ideals: it will be too late.

6. Conclusions

Climate change is about inter-generational equity and it forces us to consider how the welfare of future people should be taken into account, in a context in which we are uncertain about their circumstances. The problem can be approached on the basis of an ideal moral principle – that we should be impartial between current and future people. This is the idea of zero time discounting, used to derive the Stern Review's claim about the costs and benefits of

action on climate change. Alternatively it can be approached from the current context, and a more limited moral claim about our (partial) concerns for future people can be involved, widening the moral dimension on the basis of neighbourliness. Stern's starting point is Utopian, and his conclusion collapses once a positive time preference is introduced. He provides no credible basis for his conclusion on action on climate change. But the conclusion does not require his zero time preference moral principle. By looking at the impacts of climate change on economic growth (properly measured), early action may well be justified. Future people may not be so well-off once the principle of sustainability has been applied to assets, natural and man-made. It is the much more limited sustainability principle which provides the basis for both policy action and our moral responsibilities.

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