

What is Progress?

George Monbiot

When you warn people about the dangers of climate change, they call you a saint. When you explain what needs to be done to stop it, they call you a communist.

There is now a broad scientific consensus that people need to prevent temperatures from rising by more than 2°C above their pre-industrial level. Beyond that point, the Greenland ice sheet could go into irreversible meltdown, some ecosystems collapse, billions suffer from water stress, droughts could start to threaten global food supplies. (1,2)

The British Government proposes to cut the UK's carbon emissions by 60% by 2050. This target is based on a report published in 2000. (3) That report was based on an assessment published in 1995, which drew on scientific papers published a few years earlier. The UK's policy, in other words, is based on papers some 15 years old. The British target, which is one of the toughest on earth, bears no relation to current science.

Over the past fortnight, both Gordon Brown and his adviser Sir Nicholas Stern have proposed raising the cut to 80%. (4,5) Where did this figure come from? The last G-8 summit adopted the aim of a global cut of 50% by 2050, which means that 80% would be roughly the UK's fair share. But the G-8's target isn't based on current science either.

In the new summary published by the Intergovernmental Panel on Climate Change (IPCC), one will find a table which links different cuts to likely temperatures. (6) To prevent global warming from eventually exceeding 2°, it suggests, by 2050 the world needs to cut its emissions to roughly 15% of the volume in 2000.

It is better to look up the global figures for carbon dioxide production in 2000 (7) and divide it by the current population. (8) This gives a baseline figure of 3.58 tons of CO₂ per person. An 85% cut means that (if the population remains constant) the global output per head should be reduced to 0.537t by 2050. The UK currently produces 9.6 tons per head and the US 23.6t. (9,10) Reducing these figures to 0.537t means a 94.4% cut in the UK and a 97.7% cut in the US. But the world population will rise in the same period. If one assumes a population of 9bn in 2050 (11), the cuts rise to 95.9% in the UK and 98.3% in the US.

The IPCC figures might also be out of date. In a footnote beneath the table, the panel admits that "emission reductions... might be underestimated due to missing carbon cycle feedbacks". What this means is that the impact of the biosphere's response to global warming has not been fully considered. As seawater warms, for example, it releases carbon dioxide. As soil bacteria heat up, they respire more, generating more CO₂. As temperatures rise, tropical forests die back, releasing the carbon they contain. These are examples of positive feedbacks. A recent paper (all the references are on this author's website) estimates that feedbacks account for about 18% of global warming. (12) They are likely to intensify.

A paper in *Geophysical Research Letters* finds that even with a 90% global cut by 2050, the 2° threshold “is eventually broken.” (13) To stabilise temperatures at 1.5° above the pre-industrial level requires a global cut of 100%. The diplomats who started talks in Bali recently should be discussing the complete decarbonisation of the global economy.

It is possible by switching the whole economy over to the use of electricity and by deploying the latest thinking on regional supergrids, grid balancing and energy storage, one could run almost the entire energy system on renewable power. (14) The major exception is flying (don't expect to see battery-powered jetliners) which suggests that one should be closing rather than opening runways.

This could account for around 90% of the necessary cut. Total decarbonisation demands that people go further. Preventing 2° of warming means stripping carbon dioxide from the air. The necessary technology already exists (15): the challenge is making it efficient and cheap. Last year Joshua Stolaroff, who has written a PhD on the subject, showed some provisional costings, of £256-458 per ton of carbon. (16,17) This makes the capture of CO₂ from the air roughly three times as expensive as the British government's costings for building wind turbines, twice as expensive as nuclear power, slightly cheaper than tidal power and 8 times cheaper than rooftop solar panels in the UK(18). But it appears his figures are too low, as they suggest this method is cheaper than catching CO₂ from purpose-built power stations(19), which cannot be true. (20)

The Kyoto Protocol, whose replacement the Bali meeting discussed, has failed. Since it was signed, there has been an acceleration in global emissions: the rate of CO₂ production exceeds the IPCC's worst case and is now growing faster than at any time since the beginning of the industrial revolution. (21) It's not just the Chinese. A paper in the *Proceedings of the National Academy of Sciences* finds that “no region is decarbonizing its energy supply.” (22) Even the age-old trend of declining energy intensity as economies mature has gone into reverse. (23) In the UK there is a stupefying gulf between the government's climate policy and the facts it is creating on the ground. How will Britons achieve even a 60% cut if they build new coal plants, new roads and a third runway at Heathrow?

Underlying the immediate problem is a much greater one. In a lecture to the Royal Academy of Engineering in May, Professor Rod Smith of Imperial College explained that a growth rate of 3% means economic activity doubles in 23 years. (24) At 10% it takes just 7 years. This people knew. But Smith takes it further. With a series of equations he shows that “each successive doubling period consumes as much resource as all the previous doubling periods combined.” In other words, if the economy grows at 3% between now and 2040, the country will consume in that period economic resources equivalent to all those people have consumed since humans first stood on two legs. Then, between 2040 and 2063, they must double their total consumption again.

People must confront a challenge which is as great and as pressing as the rise of the Axis powers. Had people thrown up their hands then, as many persons are tempted to do today, one would be reading this paper in German. Though the war often seemed impossible to win, when the political will was mobilised strange and implausible things began to happen. The US economy was spun round on a dime

in 1942 as civilian manufacturing was switched to military production. (25) The state took on greater powers than it had exercised before. Impossible policies suddenly became achievable.

The real issues in Bali were not technical or economic. The crisis the people of the world face demands a profound philosophical discussion, a reappraisal of who they are and what progress means. Debating these matters makes dissenters neither saints nor communists; it shows only that they have understood the science.

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3. Royal Commission On Environmental Pollution, June 2000. *Energy—the Changing Climate*.
4. Gordon Brown, 19th November 2007. *Speech on Climate Change*.
5. Sir Nicholas Stern, 30th November 2007. “Bali : Now the rich must pay.” *The Guardian*.
6. Intergovernmental Panel on Climate Change, 2007. Fourth Assessment Report. Climate Change 2007: Synthesis Report. Summary for Policymakers, Table SPM.6.
7. All the following figures are for CO₂ from the burning and flaring of fossil fuel.
8. Currently 6,635m.
9. The latest figures are for 2005. <http://www.eia.doe.gov/pub/international/iealf/tableh1co2.xls>
10. Population figures for 2005.
11. This is a conservative assumption.
12. Josep G. Canadell et al. 25th October 2007. Contributions to accelerating atmospheric CO₂ growth from economic activity, carbon intensity, and efficiency of natural sinks. *Proceedings of the National Academy of Sciences*.
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15. Frank Zeman, 26th September 2007. Energy and Material Balance of CO₂ Capture from Ambient Air. *Environmental Science & Technology*, Vol. 41, No. 21, pp 7558-7563. 10.1021/es070874m
16. Stolaroff's figures are \$140-250/US ton-CO₂. These have been converted into £/metric tonne-C. The weight of CO₂ is 3.667x that of C.
17. One can read his PhD here.
18. Department of Trade and Industry (now the DBERR), 2003. Energy White Paper—Supplementary Annexes, p7.
19. The DBERR gives figures for C savings through capture-ready power stations of £460-560/tC.
20. It cannot be true because the concentration of CO₂ in thermal power station effluent is many times higher than that in ambient air.
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