

## THE DAVID HUME INSTITUTE

### Reducing carbon emissions—the view from 2050

This David Hume Seminar, held on 14 October 2008 at Our Dynamic Earth in Edinburgh, represented a new departure for the Institute in a number of respects. The evening started with a film; it was constructed around a publication (Hume Occasional Paper No 79) which was written and distributed before rather than after the seminar; the paper itself had contributions from 20 authors rather than just one or two; and the size of audience fully justified the larger venue than usual.

The scene was set with a DVD of children talking about climate change. It brought out the central moral responsibility for action by this generation on climate change. While we have not been responsible for all the anthropogenic greenhouse gases in the atmosphere this form of pollution has accelerated on our watch. Importantly, it is our generation who have the opportunity to do something about it – and if we fail it is our children and grandchildren who will pay the price. They told us in the film how they loved the world as it is, but dreaded it being messed up in their lifetimes.

**Sir Brian Hoskins** laid out the science. The root cause of global warming is simply stated. Greenhouse gases in the atmosphere, mostly CO<sub>2</sub> but also methane and nitrous oxides, reflect heat radiation back down to the surface. The upper layers of the atmosphere are thus colder, and from outer space the earth then looks like a colder body and colder bodies radiate less heat than hotter ones. So the earth is warming up, to a much greater extent than natural fluctuations would explain, by 0.5° so far and with CO<sub>2</sub> up from 310 parts per million (ppm) in 1960 to 380 ppm now.

The fourth assessment of the IPC at 2007 concluded that global warming is unequivocal. Scientists never say that theories are 100% proven, always remaining in principle falsifiable by new data. But in practice the accumulation of observations, and the testing of theories against observations, represents evidence which is overwhelming. Looking back, there is a strong correlation between surface temperature and CO<sub>2</sub> concentrations, as fluctuations in the earth's orbit have generated surface temperature fluctuations, which have then positively fed back through increases in the CO<sub>2</sub> with its attendant greenhouse effect. The system is now being forced by anthropogenic greenhouse gases – a hugely dangerous experiment in view of the positive feedback mechanisms.

Depending on what we do now, there are different storylines, with increases of 1 – 4° C in average global surface temperatures, with big error bands. Importantly, however, the storylines only start diverging in 2030. So we are discussing policy and life style changes over the next two decades which will only bite on the problem, one way or another, as the middle of the century approaches. Nevertheless, the divergence of the storylines thereafter puts our responsibility to posterity into sharp relief.

Average surface temperatures may increase by 1- 4° across the entire planet but the effects are much greater at the poles than at the equator. We are already seeing summer melting of the northern ice cap, with the North West Passage open to shipping. The 7 – 8° increase predicted on some scenarios for northern latitudes has the potential for huge disruption: melting of permafrost in the tundra, with substantial

methane emissions; reduced CO<sub>2</sub> absorption as sea water gets warmer; movement of the winter storm tracks, resulting in severely reduced rainfall in populous, agricultural areas like the Mediterranean and Southern Australia. The melting of the Greenland ice sheet, is already underway and that alone has the potential to disrupt human activity across the globe through raising sea levels and flooding low lying agricultural and urban areas.

So that's the problem. All our activities generate greenhouse gas and greenhouse gas is bad for the planet.

In Scotland, the target is for an 80% reduction in CO<sub>2</sub> emissions by 2050 and this target has also been adopted for the UK generally in the Climate Change bill. This is only two tons per person per annum, much less than current consumption. To the extent that the population grows, the carbon ration per person will have to reduce.

There are three possible responses: adaptation to warmer temperatures, change weather patterns and higher sea levels; mitigation of the effects, through reduced emissions, which will have to be on the basis of international agreement to be effective; and geo-engineering – planetary scale interventions, for instance by seeding the upper atmosphere with dust to imitate volcanic eruptions – but where the uncertainty is in science are still huge.

After this sobering start, and call to action, **Peter Jones** reviewed the set of essays produced by our group of contributors. They were each asked to imagine themselves in a 2050 where the reduced emissions targets had been met, and to describe how this had been done. So there was a built in optimism bias – that whatever had happened up to 2050, CO<sub>2</sub> emissions had been successfully controlled.

Finding the solution depends on changing people's attitudes. Peter Jones identified as drivers

- high prices of energy (below their peaks at the time of writing but the long term trend must be upwards as fossil fuels are exhausted.)
- the need to achieve cost savings
- security of energy supply and self-sufficiency, (do we want to have to depend on Russia?)
- weather catastrophes such as flooding and heat waves, and consequent climatic migration to places like Scotland with better climates
- Population growth from the current 6.7 billion to 8 – 10 billion by 2050 (which makes the 80% emission cut harder.

Against these drivers what are the brakes?

- denial (a feeling that climate change is not happening or is not caused by human agency)

- the China evasion – that whatever we do is as nothing compared to Chinese success or otherwise in curbing emissions
- conflicts within the Green lobby e.g. over nuclear power plants and wind farms
- the planning system, which delays innovation
- costs as renewables cost 2 – 3 times conventional energy.

But to cure the problem we do have some tools

- carbon pricing, which will have to be global
- an ecological tax base rather than a tax on wealth creation or consumption
- regulation, such as the existing system of renewal obligation certificates (ROCs), preferably broadly focused to allow flexibility
- a mixed economy, with Government and market mechanisms both available in the absence of broad agreement favouring one rather than the other
- streamlining of the planning system
- participative structures
- legislative obligations

So how do the remedies compare in terms of cost?

- cheapest is to design energy efficient buildings, and insulate better the ones we already have, since 75% of them will still be in use in 2050
- energy firms broadening their scope, moving from selling as much to as little energy as possible.
- transport, moving over to electric vehicles and trains, cutting down radically on air travel
- landscape changes, with more forestry
- and the most expensive, moving electricity production to renewables, and installing a localised national grid to cope with small scale, distributed generation.

Doing all these things, by 2050 we should be able to make the latter half of the century and beyond less unpleasant.

**Ian Marchant** was speaking as in 2020, at the launch of his biography. He characterised 2000-2007 as the age of irresponsibility, with 2008 being the year of reckoning. The week of the seminar saw the climax of the banking crisis, with both HBOS and RBS rescued by an injection of public funds. It felt like a turning point: the end of cheap credit, the end of cheap carbon, the end of cheap electricity capacity and the end of cheap oil, gas and coal.

From 2020, 2009 seems like a year of stasis but in fact the foundation was being laid for a decade of delivery in 2010 – 2020 with the roll out of smart metering; two thirds of vehicles on new fuels by the end of the decade; wide spread micro-generation; rapid investment in renewables particularly waves and off-shore wind; carbon capture technology and carbon free homes. Energy companies will have to sell not just electricity but the means to use it efficiently.

**Simon Pepper** felt an obligation of optimism because it would be too easy to be frozen into inactivity by pessimism. High energy prices provide the explosive charge for major change, Scotland is extremely well placed to exploit renewable sources. He saw a big role for state intervention, for instance in retro-fitting houses for energy efficiency but was sceptical about the big technologies – nuclear and carbon capture. Dangerous, climate change induced population movements and the politics of insecurity should lead to globally enforced carbon caps. However a less-resource intensive life-style should allow us to reconnect with our real needs.

**Sue Roaf** pointed out that the price mechanism had its limitations and fuel poverty, already serious, will become a huge issue and we are going to have to build the new micro-grids to give people to distribute power where it is needed.

Other contributors in the discussion pointed out how climate change was the ultimate challenge to society as a whole and only co-operative effort could solve it. We can study the science and technology, which reduces the uncertainty over climate change projections and give us options for mitigation by understanding the physics better; but in the end individual action is the key – and who knows, we might be offering ourselves greater happiness.

In discussion after the seminar, some of the ideas were developed further. The evidence is overwhelming that there is a real problem, and to solve it the trick is to harness private actions to the public good. There was general agreement that Government regulation and intervention was necessary, but it would not be sufficient alone and the form of that intervention will be critical. On an economic analysis, the most potent weapon is to adjust prices through green taxes, such that they more accurately reflect externalities. But there has to be broad public consent, as shown by the episode of the hauliers strike a few years ago, and it was suggested that 40% of the UK population still deny the reality of climate change. The role of the media is crucial but the debate about climate change and the response to it cannot be entirely one sided. But the interface between scientists and media is a hard once to manage because science expresses its conclusions in terms of likelihoods and probabilities, whereas the media like certainties.

Meanwhile the role of politicians is not only to be responsive to public opinion but also to provide the leadership that is needed.

On one analysis, business has got us into this fix and business must get us out of it, by investing in new technologies and by putting their own houses in order. Retailers, it was suggested, have a moral duty to sell the right things.

So a moral shift is needed, to change morality and change behaviour in the same way that slavery was abolished, CFCs were banned in the Montreal protocol and the signs are that the smoking ban has moved the climate of opinion against smoking, even among young people.

The last word from **Richard Wakeford**, whose idea this seminar was: we shall start making real progress on climate change once it gets into the general mindset, beyond the chattering classes. But the evidence for anthropogenic climate change is already overwhelming and each of us, all of us, society as a whole needs to take action.

**Sir Brian Hoskins** is Director of the Grantham Institute for Climate Change at Imperial College, London

**Peter Jones** is an independent journalist

**Ian Marchant** is Chief executive of Scottish and Southern Energy and Chair of the UK Business Council for Sustainable Energy

**Simon Pepper** is Lord Rector of St Andrews University and a former Director of the World Wildlife Fund

**Sue Roaf** is Professor of Architectural Engineering at Heriot-Watt University

**Richard Wakeford** is Director General, Environment in the Scottish Government

Jo Elliot  
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