

THE CRISIS OF SUSTAINABILITY

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THERE HAVE BEEN MANY DEFINITIONS OF SUSTAINABILITY. THE SIMPLEST I KNOW IS 'NOT CHEATING ON OUR CHILDREN'.

To that may be added, 'not cheating on our neighbours' and 'not cheating on the rest of creation'. In other words, not passing on to future generations an Earth that is degraded compared to the one we inherited, sharing common resources as necessary with our neighbours in the rest of the world and caring properly for the non-human creation. We are all guilty of cheating in these three respects.

THE SCIENCE OF GLOBAL WARMING

One of the most important and urgent problems of sustainability is global warming and climate change. Let me start by summarising the basic science. By absorbing infrared or 'heat' radiation from the Earth's surface, 'greenhouse gases' present in the atmosphere, such as water vapour and carbon dioxide, act as blankets over the Earth's surface, keeping it warmer than it would otherwise be. The existence of this natural 'greenhouse effect' has been known for nearly two hundred years; it is essential to the provision of our current climate to which ecosystems and we humans have adapted.

Since the beginning of the industrial revolution around 1750, one of these greenhouse gases, carbon dioxide, has increased by over 35 per cent and is now at a higher concentration in the atmosphere than for many hundreds of thousands of years. Chemical analysis demonstrates that this increase is due largely to the burning of fossil fuels – coal, oil and gas. If no action is taken to curb these emissions, the carbon dioxide concentration will rise during the twenty-first century to two or three times its pre-industrial level.

The climate record over past centuries shows a lot of natural variability arising from external factors (such as changes in the sun's energy or the influence of volcanoes) or from internal variations within the climate system. However, the rise in global average temperature (and its rate of rise) during the twentieth century is well outside this range of known natural variability. The warmest year in the instrumental records, which go back to 1860, was 1998. More strikingly, each of the first eight months of 1998 was the warmest on record for that month. There is strong evidence that most of the warming over the last 50 years is due to the increase of greenhouse gases, especially carbon dioxide.

Over the twenty-first century the global average temperature is projected to rise by

between 2 and 6°C (3.5 to 11°F) from its pre-industrial level: the range represents different assumptions about greenhouse gas emissions and the sensitivity of the climate. For *global average* temperature, a rise of this amount is large – the difference between the middle of an ice age and the warm periods in between is only about 5 or 6°C. So, associated with likely warming in the twenty-first century will be a rate of change of climate equivalent to, say, half an ice age in less than 100 years – a larger rate of change than for at least 10,000 years. Adapting to this will be difficult for both humans and many ecosystems.

THE IMPACTS OF GLOBAL WARMING

Talking in terms of changes of global average temperature, however, tells us rather little about the impacts on human communities. There will be some positive effects – for instance, a longer growing season at high latitudes – but most will be adverse. An obvious consequence will be a rise in sea level of about 50cm a century. The ocean waters will expand as they are heated (the rise will continue for many centuries because warming the deep oceans as well as the surface waters takes a long time) and this will be a major problem for communities living in low-lying regions. Many areas (e.g. in Bangladesh, where about 10 million live within the one metre contour; southern China; islands in the Indian and Pacific oceans) will be impossible to protect and many millions of people will be displaced.

Extreme events will also make an impact. The extremely unusual heat wave in central Europe during the summer of 2003 led to the deaths of over 20,000 people. Careful analysis leads to the projection that such summers are likely to be average by the middle of this century and below the average by the year 2100.

Water is becoming an increasingly important resource. A warmer world will lead to more evaporation of water from the surface, more water vapour in the atmosphere and more precipitation on average. More importantly, the increased condensation of water vapour in cloud formation leads to a greater release of latent heat of condensation. Since this latent heat provides the largest source of energy driving the atmosphere's circulation, the hydrological cycle will become more intense. This means a tendency to more intense rainfall events and also less rainfall in some semi-arid areas. Since, on average, floods and droughts are the most damaging of the world's disasters, their greater frequency and intensity is bad news for most communities and especially for those regions where such events already occur only too frequently (e.g. south-east Asia and sub-Saharan Africa). It is these sorts of events that provide some credence to the comparison of climate with weapons of mass destruction.

Sea level rise, changes in water availability and extreme events will lead to increasing pressure from environmental refugees. A careful estimate has suggested that, due to climate change, there could be more than 150 million extra refugees by 2050.¹

In addition to the main impacts summarised above are changes about which there is less certainty, but if they occur they will be highly damaging and probably irreversible. For instance, large changes are being observed in polar regions. If the

temperature rises more than about 3°C (~5°F) in the area of Greenland, it is estimated that meltdown of the ice cap would begin. Complete meltdown is likely to take 1000 years or more but it would add seven metres to the sea level.

CAN WE BELIEVE THE EVIDENCE?

How sure are we about the scientific story I have just presented? It is largely based on the assessments by the world scientific community carried out through the work of the Intergovernmental Panel on Climate Change (IPCC).² I had the privilege of being chairman or co-chairman of the panel's scientific assessment from its beginning in 1988 to 2002. Many hundreds of scientists from various countries were involved in its work. No assessments on any other scientific topic have been so thoroughly researched and reviewed. In June 2005, the Academies of Science of the world's eleven most important countries (the G8 plus India, China and Brazil) issued a statement endorsing the IPCC's conclusions.³

Unfortunately, there are strong vested interests that have spent tens of millions of dollars on spreading misinformation about the climate change issue. They first denied the scientific evidence and more recently have argued that its impacts will not be large, that we can 'wait and see' and, in any case, we can always 'fix' the problem if it turns out to be substantial. The scientific evidence cannot support such arguments.

INTERNATIONAL AGREEMENT REQUIRED

Global emissions of carbon dioxide to the atmosphere from fossil-fuel burning are currently approaching seven billion tonnes of carbon per annum, and rising rapidly. Unless strong measures are taken they will reach two or three times their present levels during this century and climate change will continue unabated. To halt climate change, emissions must be reduced to a fraction of their present levels before the century's end.

It is essential that all countries join the international agreements being negotiated under the Framework Convention on Climate Change (FCCC). The UK government, for instance, has taken a lead and has agreed a target for the reduction of greenhouse gas emissions of 60 per cent by 2050 – a target that recognises that developed countries need to make greater reductions to allow some headroom for developing countries. Economists in the Treasury Department have estimated the cost to the UK economy of achieving this target as no more than the equivalent of six months' growth over the 50 year period.⁴

WHAT ACTIONS CAN BE TAKEN?

Three sorts of actions are required if such reductions are to be achieved. First, there is energy efficiency. Very approximately, a third of energy is employed in buildings (domestic and commercial), a third in transport and a third by industry. Means are available to double the efficiency of energy use in all three sectors, in

many cases with significant savings in cost. Secondly, a wide variety of non-fossil fuel sources of energy are available for development and exploitation – for example, biomass (including waste), solar power (both photovoltaic and thermal), hydro, wind, wave, tidal and geothermal energy. Thirdly, there are possibilities for sequestering carbon that would otherwise enter the atmosphere either through the planting of forests or by pumping underground (e.g. in spent oil and gas wells). The opportunities for industry for innovation, development and investment in all these areas is large. Technology transfer from developed to developing countries is also vital if energy growth in the latter is going to proceed in a sustainable way.

STEWARDS OF CREATION

People often say I am wasting my time talking about environmental sustainability. 'The world,' they say 'will never agree to take the necessary action.' I reply that I am optimistic. One reason I give is that I believe that God is committed to his creation and that we have a God-given task of being good stewards of creation. We therefore have a responsibility first to God to look after creation – not as we please but as God requires – and secondly to the rest of creation as ones who stand in the place of God (cf. Gen 1.26,28; 2.15).

We are only too aware of the strong temptations we experience, both personally and nationally, to use the world's resources to gratify our own selfishness and greed. The disasters we find in the environment speak eloquently of the consequences of a broken relationship with God (cf. Gen 3).

We, in the developed countries, have already benefited over many generations from abundant fossil-fuel energy. The demands on our stewardship take on a special poignancy as we realise that the adverse impacts of climate change will fall disproportionately on poorer nations and will tend to exacerbate the increasingly large divide between rich and poor. Our failure to be good stewards is a failure to love God and a failure to love our neighbours, especially our poorer neighbours in Africa and Asia.

Some Christians tend to hide behind an Earth that they think has no future. But Jesus has promised to return to Earth, to redeem and transform it.⁵ In the meantime, Earth awaits, subject to frustration, that final redemption (Rom 8.20–22). Our task is to obey the clear injunction of Jesus to be responsible and just stewards until his return (Lk 12.41–48). Exercising this role provides an important part of our fulfilment as humans. These days we concentrate so much on economic goals – getting rich and powerful. Stewardship or long-term care for our planet and its resources brings to the fore moral and spiritual goals. Reaching out for such goals could lead to nations and peoples working together more effectively and closely than is possible with many of the other goals on offer.

NEW ATTITUDES

Not only do we need goals but also new attitudes and approaches in the drive towards sustainability, at all levels of society. One of the biggest challenges faced

by the international community is how emissions of carbon dioxide can be shared fairly between nations. Currently great disparity exists between emissions by rich nations compared with poorer ones. Expressed in tonnes of carbon per capita per annum, they vary from about 5.5 for the USA, 2.2 for Europe, 0.7 for China and 0.2 for India. Further, the global average per capita, currently about 1 tonne per annum, must fall substantially during this century. A proposal by the Global Commons Institute⁶ is that emissions should first be allocated to everybody in the world equally per capita, then transfer of allocations being allowed through trading between nations. The logic and the basic equity of this proposal is in principle quite compelling, but is it achievable?

At an individual level, there are some actions that all of us can take.⁷ For instance, we can ensure our homes and the appliances or the car we purchase are as energy efficient as possible. We can buy 'green' electricity, use public transportation or car-share more frequently. We can become better informed about the issues and support leaders in government or industry who are advocating or organising the necessary solutions. To quote from Edmund Burke, a British parliamentarian of 200 years ago, 'No one made a greater mistake than he who did nothing because he could do so little.'

PARTNERSHIP WITH GOD

We may feel daunted as we face the seemingly impossible challenge posed by global warming. But an essential Christian message is that we do not have to carry the responsibility alone. Our partner is no other than God himself. The account of Eden contains a beautiful description of this partnership: God 'walking in the garden in the cool of the day' (Gen 3.8), no doubt asking Adam and Eve how they were getting on with learning about and caring for the garden.

An unmistakable challenge is presented to the worldwide Church by the reality of human induced climate change. It provides an unprecedented mission opportunity for Christians to take a lead and demonstrate love for God as creator and redeemer and love for our neighbours, wherever they may be, remembering the words of Jesus, 'From everyone who has been given much, much will be demanded' (Lk 12.48).

NOTES

1 N Myers and J Kent, *Environmental Exodus: An Emergent Crisis in the Global Arena* (Washington DC: Climate Institute, 1995).

2 Climate Change 2001 in four volumes, published for the IPCC by Cambridge University Press, 2001. Also available on the IPCC website www.ipcc.ch. My book, *Global Warming: The Complete Briefing* (3rd edn.; Cambridge: Cambridge University Press, 2004) is strongly based on the IPCC reports. Further, a review I have recently written ('Global Warming, Reports Progress', *Physics* 68 [2005], pp. 1343–403) provides a concise summary of the science and associated impacts.

3 See www.royalsoc.ac.uk/document.asp?id=3222.

4 From an Energy Report by the UK government's Policy and Innovation Unit (PIU) 2002

5 See NT Wright, *New Heavens, New Earth* (Cambridge: Grove Booklets, 1999).

6 For more details see www.gci.org.uk.

7 See, for instance, *For Tomorrow Too*, booklet from Tearfund, www.tearfund.org.

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