



Introduction

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**getting from 12½ tonnes to 3 tonnes
of carbon dioxide per person**

This book tries to show that individuals – rather than governments or companies – are going to have to be the driving force behind reductions in greenhouse gases. We cannot hide behind an unjustified expectation that political or corporate leaders are going to do something for us: the threat from climate change requires each of us to take personal responsibility for reducing our impact on the planet's atmosphere. Individually, of course, we are powerless; but our actions influence those around us. Eventually, private companies will perceive a market for low-carbon products, and governments will come to see that real action on climate change is not electorally disastrous. Individuals must provide the leadership that will eventually galvanize the rest of society.

Very few people know the details of how the activities of our day-to-day lives generate emissions of carbon dioxide (CO₂) and other harmful gases. This book provides information and practical suggestions that will enable concerned individuals to do the best they can to reduce greenhouse gas emissions. It is intended as a reference work to help people make good decisions on how most effectively to reduce their own responsibility for climate change.

Taking international air travel into account, people in the UK are each responsible for about 12.5 tonnes of greenhouse gases a year.¹ This figure is approximately the same as the European Union (EU) average, and other European countries face similar problems of controlling emissions. In most countries, including the UK, the tonnage of carbon dioxide is rising slightly year on year, largely as a result of increasing personal travel. About half of the total comes directly from the way in which we live our lives – running our homes and getting from place to place in car or plane. The share of all emissions coming from homes and personal transport is growing. Increasingly, it is our day-to-day way of life that is causing the continued rise in carbon dioxide and other warming gases.

The other half of the UK's greenhouse gases is emitted indirectly but on our behalf – bringing us our food, heating and cooling our offices, making the steel and plastics for the things we buy, and powering the construction of our new buildings. Just because we have no direct control over fossil fuel use in industry and commerce doesn't mean we can't do

anything about it. Individual citizens can, and should, change their purchasing habits and, perhaps, even their place of work in order to help reduce global warming.

If we are to have any hope of meeting our obligations to others on this planet, as well as to unborn generations, we need to slash today's unsustainable and dangerous 12.5 tonnes of greenhouse gas emissions per person, bringing it down to no more than 3 tonnes each. This book shows how.

GOVERNMENTS AND COMPANIES ARE NOT DEALING WITH THE PROBLEM

In 2000, the UK government published its first Climate Change Programme.² A barrage of initiatives and new proposals backed up the government's forecast that it would reduce the UK's greenhouse gas emissions in 2005 by about 37 million tonnes below the expected level. It didn't turn out that way: provisional figures for 2005 suggest that the government's many schemes had no impact whatsoever. Reductions in some areas masked substantial increases in others. Absolutely none of the planned reduction in emissions actually happened. UK carbon dioxide emissions rose in 2005 and now stand 4 million tonnes higher than in 2000. Even the notoriously optimistic long-range government forecasts see UK carbon dioxide output rising strongly in the period after 2010. The UK is not unusual; most countries will miss their targets for greenhouse gas emissions.

Speeches and articles contributed by political leaders worldwide conclude that climate change is a serious problem. But the figures reveal that we are as addicted as ever to the consumption of fossil fuels. Society has not yet grasped that reducing greenhouse gas emissions is difficult, even in mature economies. In the newly industrializing states, such as China and India, the problem is even worse.

The global economy, based on free markets, economic competition and international trade, and run by more or less democratic political institutions, will remain wholly reliant on the burning of cheap fossil fuels. Despite the increasing interest in low-carbon technologies, companies the world over face an imperative to continue to use large quantities of oil, gas and coal. The only possible route forward is, therefore, for individual citizens to take action to change their styles of life in order to minimize their own responsibility for emissions. This is what this book is about. As responsible members of prosperous societies, we have a duty to curb our own consumption rather than to rely on ineffectual governments and profit-seeking corporations. I try to show that cutting emissions systematically and substantially is within the easy grasp of everybody.

Why have companies and governments failed to cut emissions so far? The reasons are simple. It is not in the interest of any single government to act to reduce carbon emissions if most of the rest of the world continues to pollute in growing volumes. If, for example,

the UK were unilaterally to introduce higher taxes on gas use, and our competitors did not follow, gas-using industries would simply shift abroad. There is no electoral advantage in addressing climate change: applying real restraint on fossil fuel use would lose votes, at little benefit to the global atmosphere, unless every country acted similarly.

Corporations face a similar problem. Their senior executives do genuinely worry about the long-term impact of climate change on the world's peoples. However, in market economies, such as the UK, the role of business is no more and no less than to meet consumer requirements at the cheapest possible price. Companies will therefore use the least expensive source of energy, knowing that failure to do so will mean competitors are able to charge less. Furthermore, business will always be able to lobby successfully for the lowest possible energy prices in order that their prices remain internationally competitive.

Second, companies will always follow consumer tastes. If customers demand appliances with higher energy consumption – such as, for example, larger cars, big-screen TVs or American-style refrigerators – companies will supply the requirement. Any company that did not would consign itself to failure. In the modern economy, successful companies meet consumer demands rather than fight against them. Unfortunately, as this book will repeatedly illustrate, most consumers prefer products and services that contain increasing amounts of fossil fuels.

The upshot is that neither government nor companies have any choice about climate change. They can talk a good story, advertise their green credentials and promise future virtue; but they will remain obdurately set in their ways. They will follow what the voters ask for or what purchasers require. We therefore cannot shift the responsibility for dealing with climate change onto others; the responsibility belongs to individual citizens of the world. In particular, it belongs to the educated members of prosperous societies. We know enough – it is almost undeniable that climate change is going to devastate large areas of the world, particularly the rural South – and we also have the capacity to easily reduce our own impact.

A further point arises. It is not generally understood that it is the wealthiest members of wealthy countries who pollute the most. The heaviest responsibility for addressing the issues of climate change falls upon the economic elite. You may not think of yourself as a member of this club, but you probably are. If you travel abroad for holidays, run a reasonably sized saloon car and have a conventional middle-class lifestyle, your damage to the global environment may be double that of the national average. The hydrocarbon feeding frenzy is led by ordinary people, not by monster corporations or evil governments. Responsible citizens need to change their habits. The good news is that this is not difficult.

Nevertheless, getting people to change their ways is rarely easy. We are lazy and listen to siren voices that say that inertia is a perfectly satisfactory alternative. Just at the moment, the voices urging inaction have three good stories: first, the world is running out of fossil fuels and pollution will eventually fall; second, technology will reduce the demand for

hydrocarbons; and, last, increased prosperity brings with it a natural propensity for decreased energy use because of improving efficiency. These are all falsehoods. Do not imagine that the declining availability of oil will reduce carbon emissions at any stage in the near future. More oil is burned each year than is discovered in new fields, and probably 50 per cent of the world's recoverable oil has been extracted. But one estimate suggests that we have access to 180 years of coal at current consumption rates.³ We are not going to be saved from ourselves by running out of hydrocarbons.

Carbon emissions will not be reduced by the scarcity of fuels. Nor will they be dramatically curtailed by a move to nuclear electricity; easily recoverable uranium deposits will probably run out long before the coal does.⁴ The move to the so-called 'hydrogen economy' is also a dangerous mirage. Current technologies to produce hydrogen consume more fossil fuel energy than is generated by the gas when combusted. This is unlikely to change for decades. Also, independent forecasters almost universally see global energy consumption rising by over 50 per cent in the next 20 years.⁵ The official forecast for the US sees demand rising by over 30 per cent between now and 2030, and most of this increase will be met by greater use of oil and coal.⁶ Prosperity increases the demand for fossil fuel products.

While government waits and wrings its hands, this book shows how a concerned citizen of the world can cut his or her consumption of fossil fuels to a level that is commensurate with the continued existence of normal life on Earth. Of course, the actions of single individuals, even multiplied a million fold, are wholly insignificant. But in acting as examples to others, and showing companies and governments the support for genuine changes in lifestyle, your actions can be powerful. The great movements in social improvement in Western society, such as the end of slavery, the universal franchise, control over child labour and universal primary education, all came after sustained action by small groups of committed individuals. My thesis is that action to address climate change can only happen in the same way.

This book presents a summary of what we need to do to cut our carbon emissions by 75 per cent. This reduction is necessary across the developed world if we are to have any prospect of avoiding temperature increases that make life impossible in large parts of the globe. There are two ways for the concerned citizen to get to the target: spending money or changing lifestyle – both types of action are addressed in the following chapters. Most people will find a combination of these routes most congenial. Low-carbon living isn't necessarily compatible with all aspects of the aspirational Western style of life; but it is surprisingly easy to make huge reductions in carbon emissions.

This book contains detailed accounts of how today's lives generate carbon emissions. For those seeking simple prescriptions as to what to do, a summary of recommendations is contained near the beginning of the later chapters.

THE ELEMENTARY SCIENCE

Almost 30 billion tonnes of carbon dioxide enters the atmosphere as a result of human activities each year.⁷ Carbon dioxide is one of the two main products of the combustion of hydrocarbons, such as coal and gas, which fuel the modern economy. This otherwise innocuous gas, the most important contributor to global warming, still only constitutes about 380 parts per million of the world's atmosphere. The concentration is rising by 2 to 3 parts per million every year and, if current trends continue, looks set to exceed 500 parts per million by 2050, or almost twice pre-industrial levels. Other greenhouse gases, such as methane and nitrous oxide, will push the concentrations to the equivalent of more than 550 parts per million.

Visible light from the sun warms the Earth's surface. Like a conventional room radiator, the surface eventually retransmits this energy outwards as heat in the form of infrared radiation and convection. Increasing levels of greenhouse gases render the atmosphere less transparent to outgoing infrared radiation, and the heat is trapped. More carbon dioxide in the atmosphere will, all other things being equal, raise the temperature of the atmosphere at the Earth's surface.⁸

No one can be completely sure about the precise relationship between rising greenhouse gas concentrations and increasing temperatures. The consensus estimate is that a concentration of 550 parts per million is likely to increase temperatures by about 2 to 4 degrees Celsius above today's levels. The increase is likely to vary substantially between different parts of the world. The higher temperatures will have a variety of severe effects, ranging from drought in areas now reliant on the summer melting of rapidly disappearing glaciers to higher sea levels, making life impossible in the coastal areas that are home to a large fraction of the world's population. Some optimists claim we can cope with temperatures 4 degrees higher. In the temperate regions, this is possible. We can build higher sea walls, adjust our agriculture and acclimatize to higher temperatures. In countries living on the margin – stressed already by water shortages, coastal flooding, tropical hurricanes or temperatures too high for good agricultural productivity – this option is not available. In general, it is the poorest countries that are going to find it most difficult to adapt to rising temperatures and disruption of weather patterns. The carbon emissions of the rich world will ruin the lives of the poor.

The mid-point of the range of expected temperature rise – 3 degrees – is about half the difference between the temperatures of the last ice age and the early modern period. It may not seem much; but this increase will totally alter the distribution of animal and insect life, often causing extinction as species fail to adapt in time. Even more worryingly, this increase may not be the maximum possible. Evidence is strongly emerging that the moderate temperature increases already recorded are inducing changes likely to tip the

world towards yet greater rises. These changes include the melting of northern tundras – causing the release of greenhouse gases that had been trapped in permafrost – and the reduction of permanent snow cover, which will tend to reduce the reflection of solar energy back into space.

This story, put here in its simplest possible form, is now well understood and generally agreed by scientists, political policy-makers and many concerned citizens around the world. Newspapers devote pages to the problem. Politicians call it the most serious issue facing the globe. Pressure groups campaign ceaselessly to alert the public to particular implications of rising temperatures. There is still disagreement on many matters; but the single fact – universally acknowledged and the subject of no dispute – that carbon dioxide increases the atmosphere's opacity to infrared radiation from the Earth's surface should be enough to convince even the most hard-boiled sceptic that greenhouse gas pollution is a desperately serious problem.

Carbon dioxide is not the only gas to act as a blanket in this way. Other greenhouse gases, such as methane and nitrous oxide, are produced in very much smaller volumes but have a much more virulent warming effect. In the UK, land-based sources of these other gases are tending to decline, except in the case of emissions from agriculture. Nitrous oxide emissions from aircraft engines are growing as the amount of air travel increases.

WHAT WE CAN DO

Despite our increasing levels of knowledge and the expressions of earnest concern, the world has not yet been successful in reducing carbon dioxide emissions. There is no single scapegoat. For example, we should not focus on the scientific sceptics who deny the scale of the problem. Rather, we should see that the problem is so pervasive, so widespread, that there is no single entity that can be blamed. Governments have, indeed, been ineffective. The impact of the protocols, programmes and policies pursued by governments and companies around the world has only been marginally to diminish the rate of increase in the use of fossil fuel. Carbon dioxide emissions are still rising fast almost everywhere, and on current trends will probably continue to do so for at least a generation to come. Historians writing in the next century will marvel at the extraordinary lassitude with which the world's elite faced the high likelihood of catastrophic changes to climate.

Many people blame the US for the lack of progress on holding down greenhouse gas emissions. This finger-pointing is also convenient but unfair. Almost every developed country will fail to meet its obligations under the Kyoto Protocol to reduce greenhouse gas emissions. Even the UK, proud of its early record in reducing emissions, may well miss its target, although this conclusion is still energetically rebuffed by the current administration. But government ministers do admit that on present trends, UK carbon dioxide output will almost certainly rise well above the Kyoto limit during the decade after 2010.

The UK yearly average of 12.5 tonnes of greenhouse gases per person is equivalent to a column of CO₂ 1 square metre in extent, extending upwards for 7km. Stated another way, human activities put the equivalent of a blanket of almost 2m thick of carbon dioxide across the entire UK last year. Other countries in the developed world have higher or lower figures, depending partly upon the proportion of their electricity that is generated with carbon-intensive coal, gas or nuclear fission. The US and Canada are worse, at over 20 tonnes per person, and some oil-exporting states are higher still. China's rapid industrialization has pushed its consumption to over 4 tonnes, while India is also rising fast from its current 2 tonnes.⁹

These levels of emissions are not compatible with stable temperatures. To hold carbon dioxide levels to a maximum of 550 parts per million in the global atmosphere, the world can probably afford emissions of no more than about 3 tonnes per person. Any more and temperatures will continue to rise beyond the 3 degree level. As our scientific knowledge improves, even 3 tonnes seems too high, and a figure of 2 tonnes per person looks a better aim. To take the typical European emissions down to this level, we need a reduction of over 80 per cent. Not even the rhetoric of governments and corporations dares to clearly specify this figure. It seems so difficult to attain that it invites sceptical ridicule. However, the science is clear: minor changes to Western emissions are not going to be enough. Stopping climate change is not about shaving a few percentage points here and there, but about substantial behavioural change among billions of people.

The text of this book was submitted to the publishers in late September 2006. Since that date, major work has been published on the topic of climate change. These publications include George Monbiot's book *Heat* and the detailed final report of Sir Nicholas Stern on the economics of climate change. I try very briefly to deal with the new ideas in these documents in a short Afterword at the end of this book.

For ongoing developments, this book has a companion website: www.lowcarbonlife.net. On this site readers will find commentary on the latest advances in low-carbon goods and services, independent analysis of products, and the most recent data on how our lives generate emissions.