

Climate Change

1 Introduction

- 1.1 Of all the global threats to future sustainability identified by world governments at Rio de Janeiro in 1992 – including resource depletion and waste, loss of biodiversity, deforestation, desertification, and pollution of air, water, and land – it is the likely impacts of climate change that have been most widely recognised as needing urgent action if its adverse effects are to be kept to manageable levels. The problem is a particularly difficult one to tackle, because it is our current forms of industrial production, consumption, and transportation which have raised standards of living to the levels they are, but which have also contributed most to the rapid growth in emissions of carbon dioxide (CO₂) and the other gases causing climate change.¹ The strongest industrial economies are the biggest polluters, but their entrenched ways of life (in car-based forms of urban development, in manufacturing and distribution, in energy use, in unrestrained consumption, and in personal mobility) are highly resistant to change.
- 1.2 Part of the problem is also public perception. The climate models used in predicting future impacts indicate that the probable result of climate change for the UK – headlined in the press as ‘global warming’ – will be warmer, wetter winters and drier, hotter summers. However, there has been some publicity for an alternative scenario (regarded by most experts as a low-probability, but high-magnitude event) under which, if the northern ice cap continues to melt and cool water flows south to meet the Gulf Stream, then a new ice age may be the future for the UK. Such differences in perception about future impacts, coupled with the inability of climate models to predict the outcomes with certainty, have been used as an excuse for delaying action, even though expert opinion is almost unanimous in calling for early and vigorous changes to reduce future risks. Major changes in attitude and practice are needed if the world is to avoid the potential dangers of:
- rising sea levels, threatening low-lying, often heavily populated and economically important coastal areas;
 - changes in average temperatures and rainfall happening at such a speed that crops and vegetation are unable to adapt, thereby threatening not only food production but also major forests, which are themselves so important in regulating world climate;
 - adverse effects on wildlife and biodiversity, with growing disruption of natural habitats that are often already fragmented; and
 - increased occurrence of extreme weather conditions, which are already creating emergency situations causing injury and distress, homelessness, and economic disruption.
- 1.3 Under the Kyoto Protocol originally signed in 1997 and now confirmed in the negotiations concluded in Bonn in July 2001, the UK is legally bound to reduce CO₂ emissions by 12.5 per cent from 1990 levels by 2010. In recent years the central government has consistently indicated its intention to do better than this, with a 20 per cent reduction. However, a report by Cambridge Econometrics issued in January 2001, based on latest analysis of the data, showed that even the lower target is unlikely to be achieved without more vigorous action.² Clearly every sector of the economy will have to do better.
- 1.4 In this context, it is important to recognise that the current target, while appearing ambitious, is still too low. In order to achieve the overall global reduction needed to restrain global warming, the best scientific advice is calling for the major industrialised countries to reduce emissions by between 60 per cent and 80 per cent from 1990 levels by 2050. This ambitious target is required in order to reduce total global emissions, while still allowing for the substantial increases in developing countries that will result from their efforts to industrialise and improve living standards.
- 1.5 The current UK target is clearly only a first step towards the more ambitious reduction that is essential if the threats from climate change are to be reduced to more manageable levels. However, even this modest current target will fail if the continuing increases in some sectors of the economy are not curtailed. Energy consumption in, and emissions from, the transport sector, for example, are still growing strongly, and reductions here are proving more difficult

to achieve. Housing, by contrast, is one sector where substantial reductions can be made relatively easily and quickly. However, in both cases, improvements in energy efficiency are being offset by the growth in traffic and the total number of dwellings. It is in this general context that the TCPA has produced this policy statement.

2 The Long-Term Programme

- 2.1 Without more radical changes than those made so far, the necessary longer-term reductions will not be achieved. Moreover, scientific studies have shown that the longer the delay in making these changes, the more difficult and more ineffective they become. Therefore putting the timescale in perspective is vitally important. Much of the increase in the levels of damaging emissions has occurred in the 40 years since 1960, but it is estimated that in order to achieve the reductions required over the next 40 years, current trends must be reversed well before 2010.
- 2.2 Planning has a major contribution to make through policies and programmes to:
- reduce the energy inefficiencies of old building stock and industrial processes;
 - increase the energy efficiencies of new building stock and industrial processes;
 - gradually change the pattern of land use so as to reduce the need to travel by environmentally harmful modes;
 - mitigate the impacts of climate change on land use by careful strategic and local planning; and
 - provide effective alternatives to the expansion of nuclear power, given its unresolved dangers.
- 2.3 What is needed is a more vigorous long-term programme of action, encompassing:
- a medium-term target (20 years) for the country as a whole for reducing energy consumption and emissions of all greenhouse gases, compatible with global targets for preventing climate change from escalating out of control;
 - short- (up to the year 2010) and medium-term (up to the year 2020) targets for each sector of the economy to maximise its contribution to the overall national target for reducing emissions;
 - an implementation strategy which identifies priorities for action, distinguishing between those sectors (for example transport and re-shaping urban areas) where results cannot be achieved quickly, and others (for example energy generation and greater efficiency in the use of energy by industry, commerce, and domestic consumers) where quicker results are possible through more modest investments and where there is potential for offsetting savings in operating costs; and
 - a concerted programme of publicity about the objectives, and technical help for achieving them, designed to generate widespread recognition by all decision-makers and the general public of the urgent reasons for change, the limited time scale for action to be effective in reducing climate change, and the benefits in terms of environmental improvements and cost savings which are possible.
- 2.4 The TCPA made its first major attempt to spell out what such a strategy and action programme would imply for future development in its book *Planning for a Sustainable Environment*,³ published in 1993. Since then, public awareness and political commitment have grown, and substantial progress in reducing emissions has been made in some fields, notably in the change-over from coal to gas, in more efficient domestic appliances, and in better insulation of buildings. However, many of the components for longer-term success are still missing. Some of the major issues requiring action over the next 20 years are outlined in the box above right.

3 Spatial Planning to Meet the Climate Change Challenge

- 3.1 Spatial planning can and must play a key role in meeting the challenge of climate change. Planning policy guidance in England (and the equivalents in Scotland, Wales, and Northern Ireland) sets the scene at national level, and mention is already being made in some guidance of the need to reflect climate change in strategic planning. Local transport plans are also required to demonstrate how sustainable development issues are dealt with, or funding for transport packages may be withheld.
- 3.2 However, much more could be done to spell out how local planning authorities could embrace this complex issue in development plans and other strategies. A good practice

Action areas for the next 20 years

- Much new development – whether domestic, retail, distribution, industrial, or essential services – is not designed so as to minimise energy consumption, nor located so as to minimise the generation of road traffic.
- The growth in road and air traffic far outweighs increases in engine efficiency, to the extent that emissions from the transport sector are still growing strongly and show no signs of levelling off.
- Only a small proportion of existing dwellings (11 per cent) have full insulation, and 96 per cent of all homes have an energy efficiency ratio of less than SAP 60,⁴ which is regarded as the minimum acceptable level.
- The current building standard for new dwellings results in energy consumption and greenhouse gas emissions two to three times higher than current best practice in the UK and other leading European countries.
- Local planning authorities need to adopt sustainability targets and implement them through supplementary planning guidance (SPG) for sustainable development, which would cover all aspects of design and layout, energy and water supplies, and waste disposal. Such guidance would supplement the Building Regulations.
- Dependence on fossil fuels is still much too high, and renewable energy production is growing too slowly to make its full contribution to reducing climate change impacts.

guide, being prepared by the ODPM at the time of writing, cannot come too soon. Model policies are needed. The Environment Agency, and equivalents outside of England, have recently done much to raise the profile of this issue. Again, this work is beginning to come through, but more is needed, especially in identifying and implementing those changes which can produce early results while longer-term strategies are being developed.

- 3.3 At regional level, regional planning guidance (RPG) or its successor is likely to play an increasing role. This operates at the physical scale and over the longer (20-year) time horizon in which the various strategies need to be co-ordinated for maximum effectiveness. It is the scale at which much of the work by the Hadley Centre and the Environment Agency has been concentrated. Pioneering work in England's North West and Eastern regions is identifying the vulnerable areas and economic sectors most likely to be affected. Work of this kind can inform regional economic strategies, as well as the many other kindred strategies at this scale, creating the strategic framework for ensuring that economic development targets include the necessary measures.
- 3.4 All guidance, development plans, and strategies, should contain policies, targets, and design guides specifically aimed at minimising climate change. At each tier of planning, as appropriate, these should focus on the following essential objectives:
- All new urban development should be designed for maximum energy efficiency.
 - There should be positive encouragement for a rapid expansion in renewable energy.
 - All new development should be located to minimise the need to travel by car, with maximum provision for convenient access by bus and rail, by bicycles, or on foot.
 - All existing urban areas should have comprehensive environmental improvement programmes for improving energy efficiency and reducing road traffic.
 - Areas under threat from climate change should be identified and their protection should be arranged where appropriate, avoiding inappropriate development, and designing new development to function in harmony with natural forces.

These objectives are considered in sections 4-8 of this policy statement.

4 Maximising Energy Efficiency in New Development

- 4.1 The recent changes to the Building Regulations have begun to address the issues discussed above by bringing energy efficiency into their remit, and thus presenting a challenge to the slow-to-adapt construction industry. However, action to improve the overall energy efficiency of new development needs to look beyond individual buildings, to include such factors as where and how energy is sourced. For instance, combined heat and power (CHP) can efficiently supply whole developments, solar gain can reduce demand for energy, and geothermal, photovoltaic and wind technology can produce clean energy on-site. Where site self-sufficiency is not possible or practical, major new developments should be designed to make maximum use of the nearest available renewable-energy plant. Local circumstances are important, and overall energy efficiency strategies need to be locally driven to be effective.

- 4.2 Comprehensive sustainability action programmes need to be developed by all local authorities, and also by the regional development agencies (RDAs), to ensure that current best practice is applied in all new industrial, commercial, and domestic development, in terms of both energy-supply and energy-saving technologies. Local air quality plans should be part of the context for such action programmes. Central government could help to provide some much needed impetus by providing tax breaks for investment in the development and use of such energy-efficiency technologies.
- 4.3 A particular opportunity exists to make major advancements with the 4 million-plus new dwellings that are to be built in England by 2021, where the application of current best practice would reduce emissions by an average of between 60 per cent and 70 per cent per household,⁵ while at the same time improving comfort and reducing fuel bills. New homes being built over the next 20 years should typically:
- be designed and orientated to use passive solar gain to supplement space heating;
 - use thermal solar panels to augment hot water systems;
 - have water- and energy-saving measures included as standard fittings;
 - collect rainwater and recycle 'grey' water;
 - have an energy rating of over SAP 90 for insulation;⁴
 - use photovoltaic roofing systems to generate the dwelling's basic electricity supply;
 - be largely carbon-neutral – for example offsetting the energy (or carbon) used in constructing major housing schemes by extensive planting of community forests;
 - be designed to last much longer, in order to make maximum use of the embodied energy and avoid the additional energy costs involved in demolition and replacement – this necessarily requires building more flexibility into buildings so that they can adapt to changing needs; and
 - be more economical in the use of scarce resources, using local sources for energy and building materials wherever possible in order to reduce transport impacts.
- 4.4 There are also important savings to be made in non-residential buildings, bearing in mind that the dynamics of the economy are such that many existing industrial buildings are becoming defunct and are being redeveloped for new industrial or alternative uses. This increasing proportion of new build means new opportunities for more environment-friendly design, using criteria similar to those given above. Designing to facilitate changes of use, to maximise re-use and recycle materials wherever possible, and to source more energy and building materials locally will also help in the drive to be more economical in the consumption of scarce materials.
- 4.5 Minerals planning guidance (MPG), which calls for more recycling of aggregates, may well need strengthening, with regional targets worked out as part of the regional framework for reducing climate impacts.
- 4.6 The cumulative impact of these changes would be a substantial contribution to the national reduction in greenhouse gas emissions, would make a major impact on public and political awareness, and would help to develop the emerging technologies and industries of tomorrow.

5 Planning Measures to Expand Renewable Energy

- 5.1 Central government's current target for the proportion of energy supplied from renewables is 10 per cent by 2010 (from 2.8 per cent in 2001, including energy from waste incineration and hydro-generation), and it is likely that as experience and the market grow and technologies improve, this figure can be raised, helping to reduce further the consumption of fossil fuels. Added urgency has been given to this objective by recent reports⁶ suggesting that EU gas reserves have a life of about 20 years, and that world oil production could peak before 2010. So while faster development of renewable energy sources is necessary for environmental reasons, there is also an added urgency in the need to ensure energy supply.
- 5.2 The phasing out of nuclear energy, with the closure of most existing plants well before 2030, gives further weight to the above argument. The possibility of a new nuclear power programme remains, particularly when the substitution of nuclear fuels for carbon fuels is used as the justification; but the experience of recent years has confirmed that, in comparison with renewable energy, nuclear is more expensive, even ignoring the costs of dealing with nuclear wastes (the safe disposal of which is still unresolved). The cost of renewable power is falling, while the estimates of the potential for production are growing, and the potential for energy saving through improved efficiency continues to be largely unexploited. In these circumstances the arguments for embarking on yet another nuclear gamble need to be strongly resisted.

- 5.3 Every new development should be designed to incorporate some form of renewable energy and/or make use of renewable sources wherever possible. The latter potentially includes hydro-, wave and bio-fuel power generation, and onshore and offshore wind power.
- 5.4 The regional tier of the planning system is particularly suitable for planning renewable energy infrastructure, since the potential of individual technologies varies considerably by region. RPG (or, in future, regional spatial strategies) should therefore contain clear renewables strategies. This would provide the policy framework for RDAs and local authorities in preparing more detailed proposals for a regional energy budget, which would cover energy-efficiency measures and the expansion of renewable sources. To date, progress has not matched either generation potential or consumer demand, and there may be a need for a renewable energy agency to develop a national strategy as the framework for regional action programmes.
- 5.5 The most suitable locations for wind farms, and other renewables technologies requiring major infrastructure installations, should be identified in structure plans (or, again, in regional or sub-regional spatial strategies), and specific sites should be allocated in local plans (or, in future, in local development frameworks). Sensitive sites will always need to be avoided, but the planning system, as well as local opposition, has so far proved to be too much of an obstacle to developing renewables. Experience shows that it becomes easier to secure local support where the local community is the developer (perhaps in partnership with private enterprise), bringing financial benefits to the local community, as well as local involvement in decision-making. Powers for local authorities to acquire sites and provide finance for development should therefore be available in order to encourage local initiatives in implementing local plan proposals.
- 5.6 An expanded programme of research into all forms of renewable energy is needed, as a basis for a more solid assessment of their potential contribution to total energy supplies. It is important to make up for the delays resulting from the years of disproportionate investment compared with nuclear power. Such research will complement the recently completed regional renewable energy assessments, which looked at the potential contribution each region could make to overall supply. Financial incentives would also help to expedite the development and use of renewable power, and would boost the growing interest of both producers and consumers. For example, reducing VAT on energy bought from renewable sources would improve competitiveness and encourage uptake.

6 Minimising Dependence on Road Traffic

- 6.1 The transport sector contributes close to 30 per cent of total UK emissions and continues to rise, showing no sign of slowing, much less levelling off or declining. Despite substantial improvements in engine efficiency in recent years, and the likelihood of zero-emission hydrogen-powered cars becoming commercially viable by around 2010,⁷ such gains have more than been offset by the overall growth in vehicle numbers and total trips. Attempts to increase the proportion of trips made by public transport have seen limited success in some larger urban areas, but overall the private car still dominates. The heavily car-dependent nature of the location and design of much new development over the past 40 years, and the lifestyles adopted as a result, means that this is a particularly difficult problem to overcome. Consequently, measures to mitigate the climatic impacts of transport will not be quick to show results.
- 6.2 All this has three important consequences:
- Since improvements are unlikely to be great enough in the short term, major reductions in emissions from other sectors of the economy are all the more necessary.
 - Urban regeneration schemes will need to attach a great deal of importance to reducing the need to travel by car and providing viable alternatives.
 - Consideration needs to be given to the location and layout of all new development so as to generate fewer private vehicle trips and maximise the use of public transport, cycling, and walking for access to employment and essential services.⁸
- 6.3 Therefore the design of the new urban development that will accommodate the 4 million-plus additional dwellings over the next 20 years will require fresh thinking if urban forms are to be created which minimise the use of private transport. Such thinking could be given real impetus by a major research programme to improve our understanding of how to design and manage such urban forms effectively. This would go beyond the work already being done by the likes of Llewelyn-Davies into car-free developments and higher densities.

- 6.4 Small-scale extensions to existing urban areas are likely to make only a limited contribution in this respect. However, all larger urban developments, whether town extensions or free-standing new communities, with a substantial critical mass (probably 10,000 people or more) could take the lead in demonstrating innovations in layout and movement systems.
- 6.5 Corresponding changes will obviously be needed within existing urban areas. Apart from the climate change imperative, existing levels of road congestion and air pollution equally show the need to reduce trip generation and provide alternatives to the private car.
- 6.6 While continuing to recognise market realities, more emphasis must be placed on retaining and improving local availability of essential services (shops, schools, recreation, and jobs) in order to reduce the need to travel. In addition, redevelopment schemes should contribute to the development of improved public transport, and to the creation of more complete networks of safe, attractive routes for pedestrians and cyclists, providing easy access to local facilities. Such changes will often be more difficult to achieve in existing urban areas than in new development, but both are needed if the drive to slow down climate change is to succeed. The current emphasis on urban regeneration will provide valuable opportunities, but criteria for addressing climate change must be written into the design brief.
- 6.7 There are also important issues of longer-distance travel which must be addressed:
- the growth of long-distance freight movements by road;
 - the increase in longer journey-to-work trips by single-occupancy cars; and
 - the rapid growth of air travel, including freight movement.

The latter presents particular problems because greenhouse gas emissions from aviation are predicted to rise from 3 per cent to 7 per cent of the total, and there are currently no viable alternatives to carbon fuels for aircraft engines. All three issues indicate the need for major improvements in rail services, as the more climate-friendly alternative, particularly for journeys of less than 500 kilometres. In addition, priority should be given to expansion of electrified rail using power supplies drawn from renewable sources.

- 6.8 Obtaining more food and materials from local sources would also help address the transport issue, and would have the added advantage of reducing costs if fuel prices rise. The increasingly global nature of industry has resulted in more and more long-distance freight transport, with consequent increases in fuel consumption, electricity use for refrigerated foods, and congestion of roads and air. Reducing food miles and working towards greater regional self-sufficiency in resource use also offers opportunities for producers: promoting local sustainable enterprise would benefit rural economies and help local communities adapt to the challenges of climate change.
- 6.9 The major theme of this section is reducing the demand for road-based movement, but many of the changes proposed cannot be expected to reduce total demand in the short term. This would require greater use of fiscal measures such as road pricing, increased parking charges, and reinstatement of the fuel price escalator (which actually produced a small reduction in transport energy use in 2001). The political acceptability of such measures will need to be promoted by demonstrating their necessity as part of a balanced overall strategy, in which attractive alternatives are provided using the money collected by such measures. Even so, since higher motoring costs seem to have only limited impact on demand, more positive physical constraints will also be needed, such as reserving more road space for bus lanes and car-share drivers, and reducing car parking at destinations where public transport (including park-and-ride schemes) can provide a viable alternative.

7 Reducing Impacts from Existing Buildings

- 7.1 It would, of course, be a radical change from recent decades if all new construction, wherever located, was required to comply with the principles outlined above. However, reduction on the scale required, and in the time scale available, will also require changes to existing buildings. The fact that 96 per cent of existing dwellings fail to reach even minimum standards of energy efficiency shows the potential scope for improvements in this area.
- 7.2 A concerted drive to raise the energy efficiency of all existing buildings, supported by technical advice and financial incentives, is clearly an essential ingredient of the overall drive to reduce global warming emissions. A range of technical changes – including better insulation, the use

of energy-saving equipment, the use of solar panels for hot water and photovoltaic arrays to allow buildings to generate their own electricity – need to be vigorously promoted over the next decade. Such changes need continuing promotion through the Building Regulations, using the recent introduction of Part L, which does apply to refurbishment as a starting point. Tougher targets will be needed for energy efficiency and also for the re-use and recycling of materials.

8 Protecting Areas Threatened by Climate Change

- 8.1 Even with the most successful implementation of the measures outlined in the previous four sections, it is known that climate change will still continue for many decades as a result of the greenhouse emitted, and still present in the atmosphere, since the 1960s. Since some form of change in climate seems inevitable, it is important that we face up to the likely impacts, such as coastal and inland flooding, and the effects on local ecosystems and agriculture, and plan appropriately.
- 8.2 Long-range regional planning must therefore play a major role in identifying areas under threat and taking important decisions in preparing for, and wherever possible mitigating, the potential impacts. An essential part of this process will be designing protection (such as coastal defences and flood prevention schemes) that will stand up to more extreme conditions. However, where protection is not deemed to be desirable, guidance and plans at strategic level should also be identifying areas of managed retreat.
- 8.3 Equally important will be the reduction of flood risks through such measures as sustainable urban drainage schemes (SUDS), increased flood-storage capacity in wetlands, and surface water flow-attenuation, for instance through the creation of woodlands. Payment to landowners for creating and maintaining areas where floodwater can lie may be needed in order to promote effective implementation.
- 8.4 Further research into how best to adapt to climate change must be undertaken in order to better inform decision-making.⁹ But, equally, better public understanding and awareness of the issues needs to be nurtured. Careful consultation with local communities will be necessary in order to develop a realistic understanding of the acceptability of change, and to establish an acceptable compromise between current needs and the measures necessary to deal with long-term trends.
- 8.5 Development plans can take all these issues and articulate them more precisely. Supplementary planning guidance and other policy programmes – for example local Environment Agency plans (LEAPs) – can more fully elaborate proposals to recreate flood meadows, deal with managed retreat, address groundwater protection, designate areas for afforestation, tackle soil erosion, etc.
- 8.6 It is vital that planning applications are fully tested by local planning authorities against a climate change checklist and that full account is taken of consultation responses before determination. Too often in the recent past, unsuitably designed major developments have been permitted on land liable to flood, with the socially and economically damaging outcomes that follow. In all cases where there is danger of flooding, local development plan policies should require mitigation measures to be incorporated into planning applications, without which permission will be refused.

9 Costs and Benefits

- 9.1 The long-term costs imposed by climate change itself will impinge on all aspects of national and personal life, which is why governments world-wide are committed to reductions in the emissions of greenhouse gases. What is not sufficiently recognised is that the immediate financial costs of programmes to reduce the rate of climate change, and to mitigate its effects, often result in valuable savings.
- 9.2 The campaign for more vigorous action to combat climate change needs to better publicise the financial benefits of improving energy efficiency. Fuel savings mean lower bills; better insulation means more comfortable homes; planning for more accessible local facilities means added convenience; traffic reduction, and more alternative routes for walking and cycling, mean improved safety; and better public transport means enhanced mobility for the many non-drivers.

- 9.3 Businesses are increasingly finding that their investment in energy efficiency and reducing waste is more than offset by lower operating costs. The development of new business opportunities, for example in profitable recycling of waste materials or in manufacturing renewable energy equipment, will provide scope for the growth of new enterprises and additional employment.
- 9.4 The new investment required to counteract the dangers posed by climate change will bring a host of other benefits, but these will need to be publicised to help generate the public and political support needed if they are to be successful.
- 9.5 Equally important will be the use of selective fiscal measures which experience has already shown can be especially effective in shifting the cost-benefit balance and thereby encouraging environmentally desirable changes. A good example is the climate change levy which is persuading commercial developers to explore renewable energy and CHP (Combined Heat and Power) schemes. Similarly powerful effects were created by the fossil fuel levy, landfill tax and the fuel price escalator. But, fiscal measures alone cannot bring about the required changes; a whole portfolio of measures, both regulatory and incentive based will be necessary.

10 Climate Change Opportunities

- 10.1 While doing as much as possible to prevent and minimise climate change, there is also need to prepare for the opportunities that may be created. If the North West is to get wetter and the South East drier, then water retention and transfer becomes more viable, in addition to essential water conservation measures. Likewise, if there is to be a rise in ambient temperatures, then tourism could receive a boost in certain areas. Agriculture could also benefit where new high-value crops can be grown or the growing season extends. Socio-economic scenarios have been produced by the Social Policy Research Unit on behalf of the DTLR, and these will prove helpful in guiding thinking.
- 10.2 What is clear is that the impact of climate change will differ appreciably between regions and between those localities most affected, in relation to both the impacts and the potential opportunities. Planning has a major role to play, especially at regional level, in creating a positive framework for guiding new development to accommodate the changes, while maximising the potential benefits.

Notes

- 1 The global warming gases include not only carbon dioxide (which is the most significant), but also methane (which is even more damaging and growing in significance), nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride
- 2 *UK Energy and the Environment*. Newsletter. Cambridge Econometrics, Cambridge, Jan. 2001
- 3 A. Blowers (Ed.): *Planning for a Sustainable Environment*. Earthscan Publications for the TCPA, London, 1993
- 4 SAP is a measure of the energy efficiency of a structure and its means of heating, with SAP 60 regarded as the minimum acceptable. Construction conforming to the Building Regulations in 1995 would achieve an SAP rating of 86, and current 'best practice' would achieve an SAP rating of 100
- 5 See S. Roaf and R. Rookwood: 'Building to sustainability standards'. *Town & Country Planning*, 2000, 69, Jun., pp.188-191 for evidence of the energy savings (both for the building 'in use' and also allowing for the embodied energy in the structure)
- 6 *World Energy Prospects to 2010*. International Energy Agency, Paris, France, 1998 (<http://www.iea.org/g8/world/world.pdf>); there is also a useful list of references in *Newsletter 2000-3*. M. King Hubbert Center for Petroleum Supply Studies, Colorado School of Mines, Golden, CO, USA (http://hubbert.mines.edu/news/Fleay_00-3.pdf)
- 7 See P. Burall: 'Can technology tame the car?'. *Town & Country Planning*, 2001, 70, May, pp.136-138 on the development of zero-pollution cars
- 8 The importance of location is illustrated by research by a member of Warwickshire County Council on the contribution to climate change of two Inland Revenue offices – the old very energy-inefficient office in London, and the new low-energy offices in Manchester – which that found 'the Manchester office used five times more energy purely because staff drove into Manchester and the London office staff used public transport'
- 9 The UK Climate Impacts Programme is already initiating studies of this together with the EPSRC