Articles

Sustainable Design and Planning—the New Policy Imperative

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1. Scope

1.1 This paper addresses International, European and UK policy initiatives on energy usage and sustainable planning and illustrates the practical implications of policy changes in the UK towards sustainable design. I offer my opinion as to how emerging policies on sustainable development are likely to impact upon the planning system at local planning authority level.

2. Introduction

2.1 There is almost unanimous agreement amongst scientists and politicians that climate change is a fact. Human activities are increasing the amount of carbon dioxide and other greenhouse gases that are entering the atmosphere and this is leading to a warming of the planet resulting in changes to our climate. While geological records demonstrate that the world's climate has changed greatly over time by the coming and going of glacial cycles the current debate relates to the quickening human induced changes to our climate brought about by the burning of fossil fuels.

2.2 Climate change is a consequence of what is commonly described as the ''greenhouse effect''. Greenhouse gases permit solar radiation to reach the surface of the earth unhindered but then absorb the outward flow storing some of the heat in the process. This produces a net warming of the earth's surface. Eventually this heat will radiate back into space but not before the air temperature of the earth has increased resulting in changes to our climate.

2.3 The inter-governmental panel on climate change (''IPCC'') has examined different models and scenarios based upon the IPCC special report on emissions scenarios. These studies indicate that by 2100 average temperatures globally will rise by between 1.4 °C and 5.8 °C.[1]

2.4 Climate modelling for the UK suggests that average temperature increases of up to 5 °C over the same period may occur. Whilst summer rain is likely to decrease incidences of extreme weather events including flash floods and heat waves are likely to become more common.[2] Indeed some commentators believe we are already witnessing the beginning of such extreme weather conditions. Storms, flooding and drought appear commonplace in the news, not only internationally but across the UK.

[1] IPCC: Climate change 2001: the scientific basis.

[2] ''Climate change scenarios for the UK: the UK CI2 scientific report'', Tindall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich, UK.

2.5 As a nation we might all enjoy the sunshine of course, and some will argue that a warmer climate in the UK will discourage air travel to warmer locations for holidays—air travel itself is a significant producer of CO_2 emissions. However increased temperatures create other problems, for example, the summer of 2005 saw the greatest ever draw on summer energy demands in the UK fuelled by an increase in demand for air conditioning. We are using more electricity in the summer months than ever before.

3. International policy initiatives

3.1 Rio Summit: Brazil 1992. 172 Governments debated Global Warming and signed up to the resulting document entitled ''Agenda 21: the Rio Declaration on Environment and Development including the United Nations Framework Convention on Climate Change''. The Rio Earth Summit was an important milestone as it recognised that CO_2 emissions and global warming posed a serious threat to the environment and measures needed to be taken globally to reduce the CO_2 emissions.

3.2 Five years later in Kyoto a new agreement was negotiated as an amendment to the United Nations Framework on Climate Change ''(UNFCC''), commonly referred to as the Kyoto Protocol. Industrialised countries signing up to the protocol committed to reduce their collective emissions of greenhouse gases by 5.2 per cent compared to year 1990. Greenhouse gases include carbon dioxide, methane, nitrous oxide, hexafluoride, HFC's and PFC's.

3.3 Signed in Japan in 1997 the Kyoto agreement came into force in February 2005 following ratification by Russia. The Kyoto Protocol is seen as the first step to meeting the requirements of the UNFCC, which will be modified until climate change objectives are met as required by UNFCC Art.4.2(D).

4. EU response to Kyoto

4.1 On May 31, 2002 all 15 then members of the European Union deposited the relevant ratification paperwork with the United Nations showing compliance with the Kyoto Protocol. The EU produces about 22 per cent of global greenhouse gas emissions and has agreed a cut to cut of eight per cent of 1990 levels to be calculated as an average over the period 2008–2012. Note that compared to the emission levels that would be expected without the protocol in place, this target represents a significantly higher reduction in real terms.

4.2 The EU has consistently been one of the major supporters of the Kyoto Protocol negotiating hard to get waivering countries on board.

5. UK response to Kyoto

5.1 The UK's government's energy policy fully endorses the Kyoto goals for CO_2 emission reductions and has committed to reductions in national emissions on a phased basis.

5.2 Furthermore the government are concerned to ensure security of energy supplies. By 2020 the UK will be a net importer of energy and whilst some of the countries we trade with are considered reliable, there are many others whose political makeup may give rise for concern.

6. The European Policy background

6.1 The Maastricht Treaty set an objective of promoting stable growth whilst at the same time protecting the environment. Later the Amsterdam treaty added the principle of sustainable

development to the objectives of the European Union. Promoting the use of renewable energy sources is seen as an important part of European Policy, both to achieve a reduction in the EU's dependence on foreign energy imports as well as meeting Kyoto targets. Since 1997 the EU has been working towards 12 per cent renewable energy supply by 2010—note beginnings of UK planning policy coming out of the EU as regarding renewable energy, more of which I will comment upon later.

6.2 Germany is currently the only EU member state that is on track to achieve the objectives set out in the Kyoto Protocol.

6.3 At the European Conference for Renewable Energy in 2004, the EU set revised targets of 20 per cent total energy consumption to be met by renewable sources by 2020.

6.4 Thus at European level we have the key policy for reduction of Greenhouse Gas Emissions and the supply of an increasing proportion of our energy needs through renewable technology.

7. Energy performance of buildings directive (''EPBD'')

7.1 Directive 2002/91/EC on the energy performance of buildings came into force on January 4, 2003. Member states were obliged to implement the Directive by January 2006 although the UK government revisions to the Building Regulations in compliance did not come into force until April 2006. The Directive was introduced as part of Europe's commitment to the Kyoto Protocol recognising that buildings account for over 40 per cent of Europe's energy requirements. Heating fuel is the most important component (57 per cent of domestic energy consumption, 52 per cent of non-domestic energy consumption). Water heating next at 25 per cent of domestic consumption (9 per cent non-residential consumption) whilst lighting accounts for up to 25 per cent of total emissions mainly as a result of the commercial sector.

7.2 Article 1 of the EPBD sets the objectives as follows:

- A methodology to calculate integrated energy performance of buildings
- Minimum energy requirements for new buildings
- Minimum energy requirements for existing buildings being renovated
- Energy certification of buildings
- Regular inspection of boilers and air conditioning system.

7.3 The new part L of the Building Regulations introduced in April 2006 has been developed in response to the EPBD and the new Home Information Packs due for introduction in 2007 tie in with the EPBD so as to give those purchasing property an indication of the energy performance of each house. This links in with the energy rating system already in place for domestic appliances, such as washing machines and fridges.

7.4 The intention with the EPBD is to raise awareness amongst the public at large as to the importance of energy conservation in the built environment. The requirement to upgrade existing building stock, particularly larger buildings being altered and/or extended, places significant new demands on the development sector. For example, Art.6 of the Directive requires all governments to ensure that whenever a building with a total floor area in *excess* of 1000m^2 undergoes major renovation its energy performance is upgraded to meet new minimum standards—provided they are technically, functionally, and economically feasible. I foresee significant difficulties in implementing Art.6 of the Directive (and the respective UK 2006 Building Regulations) especially on the grounds

of economic feasibility. At the moment such tests are within the remit of local authority building inspectors but may, in due course, come to bear on developments at planning stage.

7.5 One final aspect of the EPBD is the requirement for public authority buildings and buildings frequently visited by the public to set an example by taking environmental and energy considerations into account. We can therefore expect to see public buildings in particular assessed for their energy performance on a regular basis in future.

8. UK Government Energy White Paper 2003

8.1 In February 2002 the Cabinet Office Performance and Innovation Unit published their energy review. This took a long term strategic look at the issues and challenges which will determine the UK's future energy policy and was used as the basis for an extensive public consultation.

8.2 The 2003 Energy White Paper was informed from the results of this consultation and other relevant sources of information and opinion. The White Paper, para.1.23, states:

> ''Discussions to tackle climate change beyond 2008—12 will start soon. On the basis of existing policies we expect UK carbon dioxide emissions of some 135 million tonnes of carbon (MtC) in 2020. We expect to aim for cuts in carbon of 15—25 MtC below that by 2020. We believe it is possible to achieve this by reducing our energy consumption, together with a substantial increase in renewable energy. By making our intention clear we aim to provide the signals needed for firms to invest—and help British manufacturers be ahead of the game in developing green technologies - we expect to play a large part in the world's future prosperity.''[3]

8.3 The target savings in carbon are further reinforced in the Sustainable Energy Act 2003 and the Housing Act 2004.

8.4 Within the Energy White Paper the government looks towards the planning system to assist in allowing investment in infrastructure and new electricity generation. Paragraph 1.33 states:

> ''The future energy system will require greater involvement from English regions and from local communities complemented by a planning system that is more helpful to investment in infrastructure and new electricity generation, particularly renewables.''

8.5 Thus we can see how UK government energy policies relate back to European and International energy initiatives primarily the Rio Summit and Kyoto Protocol.

8.6 But how will the built environment look in years to come? How are these strategic policies likely to impact upon our use of energy in the next five, ten and fifteen years?

8.7 A clue to answer this question can be found in the final section of the 2003 Energy White Paper where a possible scenario for the energy system in 2020 is outlined. The government envisage the energy system by 2020 being much more diverse than today. At its heart will be a much greater mix of energy, especially electricity sources and technologies.

8.8 The backbone of the electricity system is still expected to be a market based grid balancing the supply of large power stations but some of those large stations will be off-shore marine plants including wave, tidal and wind farms. Smaller onshore wind farms are also envisaged. The market

[3] UK Government White Paper 2003 published DTI.

will need to be able to handle intermittent generation by using backup capacity when weather conditions reduce or cut off these sources. The government predicts much more local generation, in part from medium to small local and community power plants fuelled by locally grown biomass and from locally generated waste, from local wind sources or wave and tidal generators. These will feed local networks which can sell excess capacity into the national grid.

8.9 The government also envisage much more micro generation, for example, from combined heat and power plants, fuel cells in buildings and photovoltaics. These will also generate excess capacity from time to time which will be sold back into the local electricity network. It is envisaged that energy efficiency improvements will reduce the demand overall despite an increasing requirement for gadgetry and domestic appliances. The government states in the White Paper that new homes will need to be designed to use very little energy and perhaps even achieve zero carbon emissions. The existing building stock will need to adopt energy efficiency measures with at least the opportunity to reduce demand, for example by using solar heating systems and photovoltaics.

8.10 These are some of the ideas contained in the 2003 Energy White Paper, which for the UK has set the policy background against which our planning system is now operating.

8.11 As regards renewable energy the established goals for the UK's renewable sources are 10 per cent of electricity generation by 2010 and 20 per cent by 2020—exactly the same as EU targets. The amount of renewable generation added in the year 2004 was 250MW and in 2005, 500MW. At present some 4 per cent of the UK's electricity production is from renewables—enough to provide energy to 500,000 homes. There is also a programme established for micro generation (i.e. facilities of less than 100KW used in or adjacent to buildings) as well as a photovoltaic programme. By comparison, both Germany and Japan have photovoltaic programmes much larger than the installed base in the UK. Hydro electric energy is not a viable option for most of the UK due to terrain and lack of force of rivers.

8.12 I have demonstrated above how the EU and UK government appear seriously committed to meeting the obligations of the Kyoto Protocol with policies and initiatives to ensure reduction in energy usage. Lest there should be any doubt about the government's commitment I refer to Secretary of State David Miliband speaking in the House of Commons on June 21, 2006. Miliband explained to the House that in March 2006 the government announced the climate change programme setting out measures affecting all major sectors and sources of UK emissions. He estimated that this would reduce the UK's carbon dioxide emissions to between 15 per cent and 18 per cent below 1990 levels and greenhouse gas emissions to between 23 per cent and 25 per cent below 1990 levels, *double the Kyoto target*.

8.13 Further, the Climate Change and Sustainable Energy Act 2006, received Royal Assent in June 2006. It deals with a number of matters including improving the enforcement of Part L of the Building Regulations and the promotion of micro-generation (solar power, micro wind turbines and ground source heat pumps) within domestic properties. It also paves the way for the Secretary of State to make future Building Regulations covering micro-power generation.

8.14 On July 11, 2006 the Department of Trade and Industry published the government's latest Energy Review which measures progress against the medium and long term White Paper goals. This sets out the latest proposals for future energy policy which includes ''aggressive implementation'' of the microgeneration strategy to remove barriers to household of renewables, fundamental changes to the planning system for all types of energy projects, measures to facilitate the consideration of new nuclear power stations and encouragement of localised rather than centralised power generation.

8.15 Of particular interest in the Energy Review are proposals to make changes to the General Permitted Development Order (''GPDO'') to exempt microgeneration from the need to apply for planning permission and advice to local authorities urging them to set ambitious policies for the percentage of energy in new developments which come from on site renewables.

8.16 It seems therefore that the targets set Internationally by the Kyoto Protocol are looking to be well exceeded by UK government initiatives.

9. Central, regional and local planning policy initiatives

9.1 Planning Policy Statements set out central government policy on a range of planning issues. Of particular relevance to sustainable energy are Planning Policy Statement (''PPS'') 1: Delivering Sustainable Development, (published 2005) and PPS22: Renewable Energy, (published August 2004).

9.2 PPS1 sets out the core planning objectives, in particular setting the scene for planning to facilitate and promote sustainable and inclusive patterns of urban and rural development by:

— making suitable land available for development in line with economic, social and environmental objectives to improve people's quality of life
— contributing to sustainable economic development
— protecting and enhancing the natural and historic environment, the quality and character of the countryside, and existing communities
— ensuring high quality development through good and inclusive design and the efficient use of resources, and
— ensuring that development supports existing communities and contributes to the creation of safe, sustainable, liveable and mixed communities with good access to jobs and key services for all members of the community.

9.3 The principles of sustainable development have been incorporated in the government's vision for sustainable communities set out in ''Sustainable Communities—Building for the Future''.[4] Planning has a key role to play in the creation of sustainable communities: communities that will stand the test of time, where people want to live and which will enable people to meet their aspirations and potential.

9.4 PPS22: Renewable energy describes how the planning system should be used to deliver renewable energy applicable to regional planning bodies and the Mayor of London to assist in the preparation of Regional Spatial Strategies (or Spatial Development Strategy for London) and by local planning authorities in the preparation of local development frameworks.

9.5 The companion guide to PPS22 gives more detailed information about particular technologies as well as a range of good practice guidance on planning and the use of renewable energy.

10. PPS22 companion guide

10.1 A weighty document which restates the government's objectives of 10 per cent renewable energy by 2010 and 20 per cent renewable energy by 2020.

[4] ODPM February 2003.

10.2 The Companion Guide offers practical advice as to how these policies can be implemented on the ground.

10.3 The Guide is geared primarily to local and renewable energy schemes but includes examples of specific local plan policies such as the London Borough of Merton, UDP (2003) policy PE.13 Energy Efficient Design.

> ''all new non-residential development above a threshold of 1000 square metres will be expected to incorporate renewable energy production equipment to provide at least 10% of predicted energy requirements .... This will be subject to the impact on the amenity of the local environment taking into account the environment of the area.''

10.4 Interestingly the Companion Guide, para.4.14 states that renewable energy policies:

> ''should not place undue burdens on developers. Local authorities should be mindful of the level of development pressure in their area in setting generation targets. . ..''

10.5 It is my experience to date that local planning authorities are not listening to the development industry (do they ever?) but are instead pushing forward with ambitious policy targets in line with the government's overall stated aims to reduce CO_2 emissions.

10.6 Note that under the Planning and Compensation Act 2004 a Sustainability Appraisal is mandatory for Regional Spatial Strategies, Development Plan Documents and Supplementary Planning Documents. A Sustainability Appraisal under the 2004 Act is designed to incorporate and comply with the full requirements of the European Directive 2001/42/EC known as the Strategic Environmental Assessment or SEA Directive.

10.7 We are also seeing significant moves towards the use of renewable technology in planning policies at regional level. London leads the way in this respect. The Mayor of London (2004) ''The London Plan: Spatial Development Strategy for Greater London'' published by the GLA, sets a policy designed to use less energy, more renewable energy and to supply energy more efficiently. Policies and targets include:

- 665GWH of renewable energy and 280GWH of heat capacity by 2010
- every London borough to have at least one zero carbon development by 2010
- the use of energy service companies to deliver a more sustainable, decentralised energy network, and
- improved energy efficiency in housing by setting minimum Standard Assessment Procedure (''SAP'') targets

10.8 The Spatial Development Strategy (''The London Plan'') was adopted in February 2004. It provides the statutory framework for delivering targets set out in the government's energy strategy and has been followed by other regional development agencies in the preparation of their regional spatial strategies. For example, the draft South East plan has within it a key sustainability theme with specific policies CC1 and EN1 relating to sustainable issues as follows.

10.9 Policy CC1: Sustainable Development

The principal objective of the Plan shall be to achieve and to maintain sustainable development in the region. The strategy and policies of the Plan promote measures that contribute to:

i Achieving a sustainable economy
ii Promoting good governance
iii Using sound science responsibly
iv Living within environmental limits
v Ensuring a strong, healthy and just society

All public authorities shall ensure that their actions contribute to meeting the objectives set out in the Integrated Regional Framework (''IRF'').

10.10 Policy EN1: Development Design For Energy Efficiency And Renewable Energy

Local Development Documents should encourage the incorporation of high standards of energy efficiency in all development, subject to economic viability considerations. This will be achieved through design, layout and orientation. Local authorities should use design briefs and/or Supplementary Planning Documents to promote development design for energy efficiency and renewable energy.

Local authorities should also encourage the use of energy efficient materials and technologies, by using all the tools at their disposal.

A proactive approach towards the implementation of this policy may involve:

i Encouraging developers to submit an assessment of a development's energy demand and provide at least 10 per cent of the development's energy demand from renewable sources for housing schemes of over 10 dwellings and commercial schemes of over 1,000m^2.
ii Attainment of high energy efficiency ratings in all new development, where appropriate, through the use of best practice guidance such as the Building Research Establishment Environmental Assessment Method (''BREEAM'') and the National Home Energy Rating (''NHER'').
iii Incorporation of renewable energy sources including, in particular, passive solar design, solar water heating, photovoltaics, ground source heat pumps and in larger scale developments, wind and biomass generated energy.
iv Active promotion of energy efficiency and use of renewable energy sources where opportunities arise by virtue of the scale of new development, including the regional Growth Areas.

Local authorities and other public bodies, as property owners and managers, should seek to achieve high levels of energy efficiency when refurbishing their existing stock.

11 Local planning policy initiatives

11.1 Having explained the strategic policy background to sustainable design and planning I now examine the practical implications of new policies and how they are currently influencing the planning system at local level. I take as a convenient and topical example the Oxford City Council Local Plan 2016 which places significant demands upon new development in terms of energy consumption and waste.

11.2 The Oxford Local Plan was adopted in November 2005. It has policies relating to energy use as follows.

11.3 Oxford City Local Plan 2016 Policy CP.15—Energy Efficiency

Planning permission will only be granted for developments which are designed to optimise energy efficiency. Developments will be assessed against the following criteria:

a. the use of appropriate materials, siting, form, orientation, and layout of buildings to maximise the benefits of passive solar (or natural) heating, cooling, lighting and natural ventilation;
b. the use of soft landscaping, including tree planting, to increase summer shading and reduce heat loss in winter; and
c. the use of energy-efficient, renewable-energy technology, whether new or traditional, for heating, cooling, power and lighting.

11.4 Policy CP.16—Renewable Energy

Planning permission will be granted for renewable energy schemes in appropriate locations.

11.5 Policy CP.17—Recycled Materials

Planning permission will only be granted for developments of 10 or more dwellings, or non-residential developments of 2,000m^2 or greater, where the design includes the use of recycled materials. This may form part of the Natural Resource Impact Analysis (''NRIA'').

11.6 Policy CP.18—Natural Resource Impact Analysis

Developments of 10 or more dwellings or non-residential developments of 2,000m^2 or more will be expected to submit a Natural Resource Impact Analysis, as detailed in a Supplementary Planning Document. Planning permission will only be granted for developments if, through the NRIA, the proposal demonstrates careful attention to and exploitation of:

a. opportunities for the reduction in energy use;
b. efficiency in the use of energy;
c. the generation of energy from renewable energy sources;
d. the use of renewable resources in general; and
e. the use of recycled or reclaimed materials in their construction.

12 Sustainable planning policy in practice

12.1 So how will these sustainable design initiatives work in practice?

12.2 Oxford City Council has recently published their Natural Resource Impact Assessment Supplementary Planning Document. The Oxford NRIA SPD is not untypical of similar initiatives up and down the country and shares many of its targets with those in the London Plan. It gives detailed guidance as to how the local planning authority will apply the above mentioned policies to individual planning applications.

12.3 The introduction to the SPD at para.1.3 sets the context and is typical of what might be expected from other local planning authorities. It states:

> ''Oxford City Council has a longstanding commitment to making Oxford more sustainable. Incorporating sustainable design and building principles in developments is an important way that this commitment can be realised. These principles must be considered from the start of the design process and not seen as an additional bolt-on at a later stage.''

12.4 This is one of the fundamental issues which we all have to come to terms with in understanding the practical implications of the new policy imperative. It is not possible to tack onto a standard development proposal simple measures to reduce energy demand and consumption in a way that, for example, conditions might be applied on a planning approval. Meeting the new policy will have a significant impact upon the layout, massing and appearance of new developments not to mention the cost whether they are a single dwelling or a major development of commercial or residential uses. Accordingly sustainable design has to be thought about at the very outset and cannot be left to later in the development process. This is an important matter to understand particularly to those involved in planning appeals. In my opinion, you need to look very carefully at the credentials of the designer and their brief in coming forward with proposals when first instructed. How much consideration was given to sustainable design from the outset of the design development? Has the designer or the developer sought to apply sustainable design principles from the beginning or have they been added as a bolt-on later? In my opinion, the odds of a successful outcome for any planning application which has not been properly researched and designed from the very outset on grounds of sustainability are reducing.

12.5 The Oxford City NRIA SPD document applies to all major developments which are defined as schemes of 10 or more dwellings or 2,000m^2 or more floor space. In the case of mixed use developments, the proposals will be assessed on a pro rata basis by the local planning authority to decide whether or not an NRIA is required. On smaller developments the LPA encourages applicants to comply with the SPD wherever possible.

13 What is an NRIA?

13.1 An NRIA is a document which evaluates the use of natural resources and environmental impacts and benefits arising from a proposed development, both at the construction stage and throughout subsequent day to day running of the buildings. An NRIA is required to demonstrate how, through design, the use of natural resources can be minimised over the lifetime of the building. Here we see the planning system being used not only to control the immediate environment but also to have a long term effect on reducing CO_2 levels.

13.2 The Oxford NRIA SPD sets out a template in the form of a series of questions which the applicant is required to answer in respect of each planning application. Developers must explain how each question has been answered with specific reference to their scheme or, if not, to give reasons why questions have not been answered.

13.3 Developers are advised to use the Council's template but are free to use their own format provided it meets the requirements of Council policy. The SPD states that officers will be happy to provide advice as to whether an NRIA provides the correct information to enable a scheme to be determined. However, at a recent user group meeting of the planning service at Oxford City Council, senior development control officers admitted that they had neither the training nor the resources to interpret or understand NRIA submissions or questions from developers on the subject.

13.4 The final section of the NRIA must be in the form of a completed checklist. The checklist comprises a series of measurable questions and sets out the City Council's ''minimum'', ''preferred'' and ''target'' standards for each of these. It is intended to review the standards again in 2010 to account for improvements in best practice.

13.5 Whilst Oxford City Council refers to national systems to measure the sustainability of buildings—for example, BREEAM, Eco-homes and the forthcoming Government Code for

Sustainable Homes, the NRIA template and checklist are designed to address the issues of importance to Oxford City Council. If a developer wishes to use one of the above mentioned national standards it must be submitted alongside a completed Oxford City NRIA.

13.6 It is particularly relevant to note that Oxford City Council expect outline applications over the 10 dwelling threshold to be accompanied by an NRIA. This is likely to pose the end of outline planning applications as we know them in Oxford City since the level of information required to complete the NRIA checklist requires detailed design decisions at application stage. Compliance with national standards alone will not suffice.

13.7 The Oxford City NRIA is divided into sections covering energy efficiency, renewable energy, choice of materials and embodied energy, recycle materials and water resources.

13.8 At App.4 the template and checklist gives details of what is expected at application stage.

14. How is the Oxford NRIA expected to work in practice?

14.1 Besides the 37 question checklist required to be completed, prior to application stage, the Oxford City NRIA includes a template with points awarded for varying elements of energy efficiency. For example, the ''minimum'' standard for a residential SAP rating is good (1 point), the ''preferred'' standard is best (2 points) and the ''target'' standard is advanced (3 points). Similar standards are set for non-residential buildings using the SBEM rating.

14.2 Use of renewable energy scores as follows: the ''minimum'' standard is 20 per cent renewable energy awarded 1 point. The ''preferred'' standard is 30 per cent, awarded 2 points, and the ''target'' standard is 40 per cent, awarded 3 points.

14.3 The use of recycled materials as aggregate on site is scored as follows: the ''minimum'' standard requires ''some'' recycling scoring 1 point and a ''maximum'' 3 points if 60 per cent or greater of all aggregates consumed on site are recycled from demolition. The use of FSC certified timber and/or the use of reclaimed timber also scores high points, as does the use of insulation materials made from recycled or naturally occurring sources.

14.4 Even the distance of supply of the materials to the site is scored. There is no minimum standard but if the average distance travelled by materials to the site is less than 100 miles this scores 1 point and if 50 per cent of materials can be sourced from within 35 miles 2 points are awarded.

14.5 The management and checking of such standards are, in my opinion, fraught with difficulty. The local builder's merchants may be only a few miles from the site but how can you track the precise location of building materials, many of which are mass produced in different stages using materials gathered from varying sources. Furthermore, how can you predict this at planning application stage and who will check it out during construction?

14.6 Similar points are awarded for frugal use of water although, curiously, recycled water has been taken out of the NRIA, presumably because it is considered to be too mainstream now?

14.7 In order to pass the Oxford NRIA checklist, a score of at least six must be achieved including at least the ''minimum'' standard in each section.

14.8 Although I have chosen the Oxford City NRIA as an example I believe similar documents are likely to be adopted shortly by most of the local authorities within the Oxfordshire Region and throughout the rest of the south east. You can expect similar policies everywhere.

15. Issues to be considered at the design stage

15.1 Orientation

15.1.1 The orientation of a building has a significant impact on the amount of passive solar gain available. To maximise solar gain buildings should generally be orientated with the longest face within 30° of south. South easterly is generally preferable to south westerly as this maximises early morning gains and reduces the likelihood of overheating in the afternoon. In the design of commercial buildings however, such as offices, too much sunlight can cause overheating and an increasing demand for comfort cooling. Louvres, external blinds and roof overhangs can provide shade in the summer whilst still allowing maximum daylight penetration.

15.2 Passive solar

15.2.1 Offers a one off opportunity (as does orientation) to reduce the lifetime energy requirements at little or no cost by keeping fuel bills to a minimum as well as reducing the demand for conventional energy in the form of lighting, heating and cooling. In addition, designing for passive solar gain can maximise the potential for other forms of renewable energy such as solar power generation by promoting layouts which maximise the extended south facing roof areas.

15.2.2 The basic principle is to minimise the size of north facing glazed areas and maximise windows facing south. Adding conservatories and atria assist in solar heating and ventilation and can act as a thermal buffer in winter.

15.2.3 Passive solar gain is not a new concept. The typical eighteenth century farmhouse provides a useful model: orientation towards south, main living room windows in south façade with splayed side reveals to maximise light penetration, a long north sloping roofline down to single storey rooms at the rear of the house accommodating the kitchen, larder and a few small windows.

15.2.4 Note that the payback period for passive solar and orientation is immediate. In modern housing 25 per cent of the heating and lighting energy can be saved by the application of passive solar design principles (PPS22 Companion Guide, para.5.3).

15.2.5 Where previously local planning authorities would be reluctant to consider solar heating and light capture as relevant planning matters alongside the more normal layout, siting and appearance of developments, PPS22 specifically includes passive solar in the list of renewable energy technologies to be taken into account in the preparation of development plan policies. Thus such issues now become valid in the evaluation of planning applications. However, such is the strategic impact of passive solar design that it does not lend itself to the application of planning conditions because PSD concerns fundamental issues of layout, master planning and orientation. It must therefore be taken into account at the very outset of the design process.

15.3 Solar water heating

15.3.3 Solar water heating using flat plates or airtight (evacuated) tubes can be mounted on south facing roofs. They use solar radiation to heat water and can operate for most of the year in Britain although they are most successful in southern regions during the summer months. They have to be used in conjunction with traditional water heating systems and can provide on average up to 50 per cent of hot water requirements year round.

15.3.4 Interestingly, the Companion Guide to PPS22 states that solar water heating systems should be treated as within the plane of the existing roof slope for the purposes of Part I, Class B1(b) of the Town and Country Planning (General Permitted Development) Order 1995. Such installations are thus deemed ''permitted development'' not requiring a planning application unless installed on a listed building or within a designated area.

15.3.5 Typical installation costs for flat plate collectors is £2000–£3000 whilst evacuated systems are between £3500 and £5000. Solar water heating can save between 0.4–0.75 tonnes of CO_2 per year for the average household depending upon the fuel replaced.

15.4 Active solar: Photovoltaics

15.4.3 Photovoltaics generate electricity from solar energy. Cells can be added to the outside of existing buildings on south facing walls or roofs. The technology is continually improving and prices are falling. However, photovoltaic materials remain considerably more expensive than conventional building materials (except in the case of the prestigious cladding systems). A typical domestic installation will have an area of between $9m^2$ and $18m^2$ producing between 1kw and 2kw peak energy output—enough to provide almost half the average family electricity demand (assuming gas is used for heating).

15.4.4 Photovoltaics are well suited to urban environments, they are clean and silent in operation. Unless the installation is of an unusual design or involves a listed building or is within a designated area installations should be treated as within the plane of the existing roof as for solar water heating systems and thus express planning consent is not normally required.

15.4.5 Whilst the cost of photovoltaic materials is falling the typical domestic installation costs between £4000 and £9000 per KWP

15.5 Biomass and combined heat and power (''CHP'')

15.5.3 The most common biomass technology to be found in urban areas are heating schemes for larger individual properties or combined heat and power schemes serving larger developments.

15.5.4 In practical terms individual biomass heating schemes may be appropriate to low density developments but are not well suited to high density urban living for a number of reasons. Space is required to store the fuel, commonly in the form of wood chips or pellets. Domestic biomass boilers require more room than standard boilers and are unlikely to fit into small properties. Fuel requirements are also more complex. CHP schemes are more applicable in an urban context as they are best suited to users requiring consistently high levels of heat throughout the year eg hospitals, hotels, leisure centres, etc.

15.5.5 Biomass CHP plants can also be the drivers of district heating systems whereby a number of neighbouring properties are linked to a central CHP plant.

15.5.6 Planning issues are likely to be limited to the delivery and storage of biomass fuel and the impact of the combustion process in the form of odours or smoke etc.

15.5.7 The costs of domestic biomass boilers vary depending upon the fuel chosen. A typical 15kW domestic pellet boiler would cost from £4000–£12000 installed including the cost of the flue and commissioning. Unlike other forms of renewable energy however, you have to pay for the fuel.

15.6 Wind power

15.6.3 Small scale wind generation can be considered within industrial developments and on some urban sites where power generated can be dedicated to on site use. It is not likely to prove economical in urban areas except, possibly, as a backup to other technologies such as ground source heat pumps.

15.6.4 The use of micro wind power is becoming more topical, not least due to David Cameron's proposal to install wind turbines on the roof of his house in London. It is likely that future amendments to the Building Regulations will encourage the use of micro generation, particularly in the form of micro wind turbines on buildings as a result of the Climate Change and Sustainable Energy Act 2006.

15.6.5 However there are significant planning issues in respect of installation of wind turbines including noise, landscape and visual impact, access for maintenance and repair, safety, ecology and ornithology, electro-magnetic radiation and shadow flicker.

15.6.6 The optimum size of wind turbine for an average household is 1.5–3KW. Costs vary depending upon location etc., but can be expected to fall in the range £4000–£8000 installed.

15.7 Ground source heat pumps

15.7.3 The ground just a few metres beneath us contains heat that can be harnessed for use in buildings. The heat from a ground source can be transferred into a heating system thus reducing the need for fossil fuel generated heating systems on site. The system works in a similar manner to a refrigerator but in reverse. Whilst not totally renewable (a small amount of power is needed to run the pump element of the system although this can be provided from a renewable source) heat pumps can provide significant levels of heat from a renewable source. Other benefits are that they are maintenance free, do not require annual inspections as gas and oil-filled systems do, and neither do they require any form of fuel storage as in an oil or LPG system. Ground source heat pumps can be used to sufficiently heat a building by drawing heat through the ground through buried loops or bore holes, concentrating it and delivering it into the building.

15.7.4 Heat pumps are particularly suitable for buildings with underfloor heating or blown air systems and some can be reversed to provide cooling in the summer. Where buildings require piled foundations the closed looped system of pipes can be integrated into the foundations.

15.7.5 The installed cost of a typical 8kW domestic system varies between £8000 and £12000 plus the cost of the distribution system (i.e. underfloor heating or radiators). However, there are few moving parts and little servicing is required.

15.8 Water management and recycling

15.8.1 As well as being a precious resource in its own right, the treatment of water through the sewage system requires large resources and energy. Minimising the amount of mains water that is used in a building is inherently good for the environment but also reduces running costs.

15.8.2 Reducing overall mains water usage has another benefit in that sewage rates are related to mains water consumption. The Thames region is amongst the driest in the UK receiving an average of 690mm of rainfall per year compared to an annual national average of 897mm. Extraction of water in the region is having a severe impact in the south east.

15.8.3 An average of 150 litres of water is used per person per day. 34 per cent of water used in the home is in bathing and showers, 29 per cent in toilets and 4 per cent in gardens. Installing water saving devices can reduce these levels considerably. Low flush toilets, aerating taps, low flow showerheads are examples of devices that can reduce water consumption. Even landscaping can be designed to minimise the level of water needed for its maintenance. This can include the careful choice of planting and hard paving materials.

15.8.4 The Environment Agency state that a domestic property in the United Kingdom including roofs and driveways can typically capture 100,000 litres of water per year. That's 270 litres of rainwater each day. Enough rainwater can be collected from the average house to meet half the annual average total consumption. Simple uses of harvested rainwater include garden irrigation and car washing, but it can also be used to flush toilets and for washing machines if treated through filtration.

15.8.5 Grey water recycling is the term given to the reuse of water which has already been used in wash basins, showers, baths and washing machines. Grey water can also be collected, filtered and reused.

15.9 Combining multiple technologies

15.9.1 Examples exist of successful schemes incorporating many of the above mentioned technologies. One of the most widely publicised scheme is BedZED in South London. On a smaller scale here in Oxford is Professor Susan Roaf's solar house which incorporates large arrays of photovoltaic cells and passive solar design enabling the property to be essentially carbon neutral. Overall energy consumption in the year is negative—Sue Roaf sells more electricity back to the national grid than is consumed.

16 Implications of sustainable design policy upon the town and country planning system

16.1 It is likely that we will see more advice from Central Government to Regional and Local Planning Authorities upon how to devise and implement sustainable design policies. Be prepared for a new PPS on Climate Change (draft expected to be published late 2006) and be warned—the Oxford SPD example is set to be rolled out nationwide as new LDF's are prepared. It's no longer only Merton.

16.2 I predict many local planning authorities will have considerable difficulty in assessing compliance with their own policies in respect of applications for planning consent. At a recent user group meeting of the Planning Service here in Oxford officers of the council admitted they would be receiving no specific training on sustainability. Yet Oxford City Council's SPD explicitly encouraged pre-application discussions on sustainable design. Who will attend these discussions? There has to be a question over the ability of the average local planning authority to administer their own policies in an efficient manner. Perhaps we will see the outsourcing of sustainability evaluation on applications submitted. Furthermore who is going to monitor the sustainability of what is built ?

16.3 As is the case with many other aspects of the ever-burgeoning planning system, more and more detailed information is being demanded at application stage—even before an application is deemed complete enough to be registered. However, local planning authorities do not appear to have the in-house knowledge or skills to properly assess the information once submitted. There is, in my opinion, a huge resourcing issue here. It appears much of the DC function is based upon a ''tick box'' mentality. Even the government's Best Practice Guidance on the Validation of Planning

Applications (''ODPM'') lists more than 60 separate items of information to be considered with every planning application.

16.4 Developers, clients, architects, planners, lawyers and surveyors must all wise up to the new policy imperative because sustainable design solutions cannot be bolted on to standard planning submissions as an optional extra. The professions need to be aware of the challenges the moment a development is proposed. Unlike the majority of planning policies where the detail can be reserved for later approval by conditions, the impact of sustainable design policies strikes at the very core of the development and design process starting with the first and most obvious sustainability test—is the building needed in the first place?

16.5 Are we going to find ourselves having to prove need? Is the building considered efficient and economical in terms of its size, land take etc? For example, in the case of a new commercial building will the applicant have to prove that the facility needs to be the size it is? Has the applicant, for example, considered shift or flexible working, hot desking or allowing staff to work from home. The most sustainable building is no building at all. You can see perhaps where this might lead to.

16.6 Can an existing building be retained and renovated in preference to demolition and rebuild? The reuse of existing structures is by definition a sustainable venture. Are we now going to have to prove the case to redevelop buildings on the grounds of sustainability?

16.7 Here is another implication. I was recently called in to assist a national housebuilder whose application was all but approved for a major housing development save for the fact that it didn't comply with the Council's newly introduced SPD on sustainable design. Amongst other things, the developer was required to demonstrate a minimum 20 per cent renewable energy features within the design and, with less than a week to go before the period for determination expired, there was little we could do to assist. I looked at the layout and concluded that major and fundamental design changes were necessary to meet the Council's policy. This, after two years of pre-application negotiations with the local planning authority. Is it any wonder we have a housing shortage?

16.8 I am often asked if the built environment will look different as a result of such sustainable design policies. At the moment we have a small number of high profile prototype schemes such as BedZED which are truly innovative and ground breaking. In my opinion, however the provision of 10 per cent or even 20 per cent renewable energy requirements will not necessarily make a significant difference to the architecture, though it will to orientation and site layout. However the ultimate goal of carbon neutral or ultra low carbon developments will, in my view, require a change in our perceptions. Thus, perhaps over the next decade, design solutions will not need to change significantly but beyond 2020 we will see material changes in our environment especially with more affordable and wide spread use of photovoltaics, micro wind generation, passive solar and other technologies.

16.9 What do I say to a prospective client who asks ''I only want to achieve planning permission so as to fix the value of my land prior to sale''? For example, a National Health Service Trust or PCT. These clients do not want to spend a small fortune just to test out a principle. Is there a future for outline planning applications? Not in the sense we used to know, i.e. red line around a site plan and submit the forms. Even the new Circular 1/06 on planning applications demands much more information than ever before at outline stage. Perhaps one answer, at least for some, is to submit your application with the minimum of information necessary to ensure registration and then wait to see what reasons are given for refusal. Then, at the re-submission, you at least know what to aim for

to achieve success. This might, in the long term, prove cheaper than endeavouring to meet all of the policy tests at the outset.

16.10 I am also concerned about the interface between recognised national environmental standards such as BREEAM, Eco-homes and the new Part L Building Regulations. Emerging sustainability policies in LDF's go far beyond these national standards and achieving an Eco-home rating is not in itself going to meet the targets set by most local planning authorities. Would it not be better if national environmental standards, through the Building Regulations were strengthened so that everyone is on a level playing field? How am I as a designer going to cope with a multitude of different sustainable design policies and SPDs across all the local authority districts in which I work? The government really don't make it any easier for themselves or for us.

16.11 How are developers and their agents going to cope with the level of detailed information demanded at planning application stage. Do developers really know the specification of the heating system at outline application stage or how much recycling they can commit to? How on earth can the source of materials be confirmed so early in the development of the process? The whole concept of sourcing materials is something of a minefield. On the face of it the use of natural materials low in embodied energy should gain good ratings for sustainability. However, it is not that simple. As an example, natural slate is on the face of it an excellent roofing material from a sustainability point of view, as it has low embodied energy in its manufacture. But if you compare the cost differential between a natural Welsh slate (heavy, robust, capable of many centuries of use and reuse) and the more popular and vastly cheaper variety imported from South America, China or Spain (brittle, easily broken and with a lifespan in use of 40—50 years) the choice becomes more complex. Further complexities are introduced when you factor in that foreign slate may be shipped half way around the world to reach its destination. Then, if you undertake a sustainability audit you might well discover that the use of an artificial slate made from recycled oil-based products in a factory in Stoke-on-Trent is more eco-friendly than the natural variety.

16.12 Are we likely to see more small scale developments over the next few years rather than large scale schemes? The Oxford NRIA only kicks in on developments of 10 or more dwellings—that is typical of other LPA policies. When viewed in conjunction with affordable housing policies, which often have a similar threshold, I predict more smaller scale development proposals will come forward which fall just under the threshold.

16.13 I also predict an increase in the energy efficiency of buildings simply because it is cheaper to reduce energy demand through design than it is through the addition of renewable energy generators. If you can reduce your consumption by a half over a standard design then providing 10 per cent or even 20 per cent of that reduced consumption via renewables is a good deal easier to achieve.

16.14 Furthermore as well as the legislative aspect there is a financial element to energy efficiency. Recent years have seen significant increases in the cost of utility bills. For example, Energy Watch estimate that the average domestic gas bill has increased by 38 per cent and the average domestic electricity bill by 30 per cent since October 2003. The incorporation of energy saving measures in the initial design and construction of a building can significantly affect the levels of energy consumed and thus the running costs of the building after completion.

16.15 Finally, do I as a practitioner believe that these new policies will stick? I think undoubtedly they will. The government appears fully committed to reducing carbon emissions and to improving the security of our energy supplies. More importantly however, the public at large are becoming more aware of the sustainability agenda. Hardly a day goes by without some climate change scare on

the TV screen and we are witnessing extreme weather conditions across the world causing us all to think about the environment in which we live. It is this change in public perception which I believe will be the biggest driver towards an acceptance of sustainable design policies.

16.16 Thirty years ago this chamber would have been thick with cigarette smoke as the delegates puffed their way through the speeches. Today attitudes towards smoking have changed dramatically. If the public can kick an addiction to nicotine they can also kick an addiction to carbon. I believe the new sustainable policy imperative is here to stay.