

Core Strategy Topic Paper: Stroud District and Climate Change

February 2010



Background

The Council has published a series of background papers to accompany the Core Strategy – Alternative Strategies consultation (February 2010). These cover a range of issues and provide more technical or detailed information than is contained in the consultation document itself. They also provide links to the various published sources of evidence on which the development of the housing and employment options has been based.

The background papers are:

1. District Profile: a Portrait of Stroud District
2. Stroud District and Climate Change
3. Housing land availability
4. Employment and economic growth in Stroud District
5. Alternative Strategies Consultation: how we developed the seven strategy options
6. Summary guide to our evidence base
7. A summary of townscape analysis and urban design strategies
8. Rural settlement classification
9. Infrastructure position statement
10. Preliminary habitat regulations screening work
11. Summary of responses to the Issues consultation
12. Sustainability Appraisal / Strategic Environmental Assessment

These background papers can be downloaded from the Council's website or are available from the Council in hard copy at a charge to cover photo copying and postage/packing.

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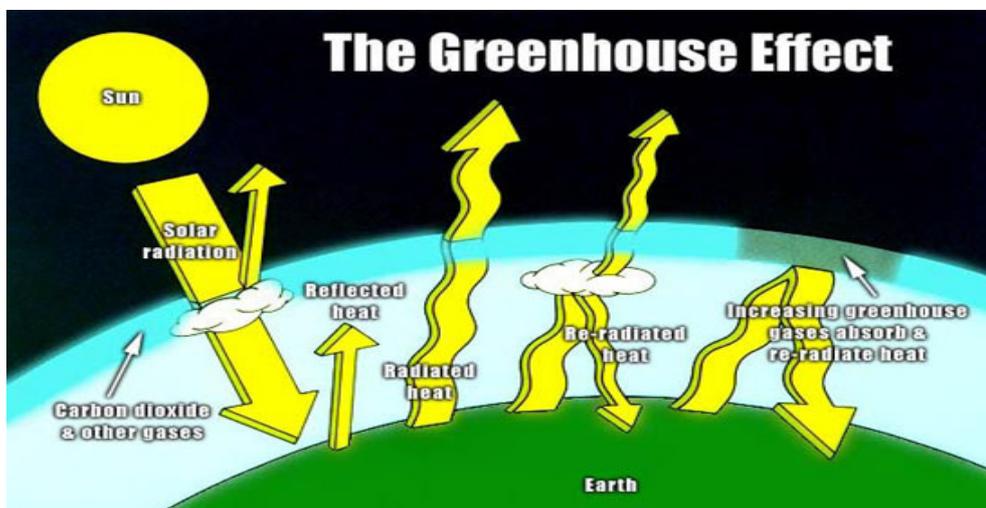
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1. What is climate change?

- 1.1 We are often told that climate change is one of the biggest challenges this generation faces. However, the first step is to understand exactly what it is.
- 1.2 Climate is the average weather and the nature of its variations that we experience over time. The earth's climate has changed many times in response to natural causes. However the term climate change usually refers to the changes in the climate that have occurred because of human activity in the last 100 years or so.
- 1.3 The natural process of the atmosphere letting in some of the energy we receive from the Sun (ultraviolet and visible light) and stopping it being transmitted back out into space (infrared radiation or heat) is called the greenhouse effect. Some infrared radiation is trapped by gases in the air and this assists the warming effect. These gases are referred to as greenhouse gases.



- 1.4 For several thousands of years the atmosphere has been delicately balanced, with relatively stable levels of greenhouse gases. However, human influence has now upset that balance and, as a result, we are seeing climate change.
- 1.5 In the last 100 years, the average temperature of the atmosphere near the earth's surface has risen by 0.74 degrees Celsius. The vast majority of scientists agree that global temperatures will rise further. If the temperature rise is high, changes are likely to be so extreme that it will be difficult to cope with them. There are likely to be more intense and frequent extreme weather events, like floods and hurricanes, and sea levels would rise further.

Causes of Climate Change

- 1.6 There will always be some degree of uncertainty in understanding a system as complex as the world's climate. However, there is now strong evidence and almost unanimous agreement that significant global warming is occurring. It is also likely that most of the recent warming can be attributed to human activities.
- 1.7 There are some changes to the world's climate that are caused by the natural interaction between the sun, land, oceans and atmosphere and the effects that they have on each other. These changes occur over very long periods of time. However, the most significant



cause of climate change is the increase in greenhouse gases emitted to the atmosphere as a result of human activity.

- 1.8 Human activities like burning coal, oil and gas (fossil fuels) have led to an increase in greenhouse gases in the atmosphere causing an enhanced greenhouse effect and extra warming. Also we have cut down huge expanses of forest to develop land for agriculture. Trees absorb carbon dioxide (one of the main greenhouse gases) and so with fewer trees, more carbon dioxide builds up in the atmosphere.
- 1.9 Other greenhouse gases are increasing too, such as methane and nitrous oxide. Methane is produced by bacteria that live in places like landfill sites, peat bogs and in the guts of animals like cows and sheep. Nitrous oxide is increased by the use of nitrogen fertiliser in agriculture.
- 1.10 Both these gases have a powerful greenhouse effect and also contribute to climate change. However, they have not been released in such large quantities as carbon dioxide and methane and does not last for as long in the atmosphere. So, while they make a significant contribution to climate change, it is man-made carbon dioxide which has by far the greatest influence.

2. Gloucestershire Climate Change Projections

UK Climate Projections 2009 (UKCP09)

- 2.1 The UK Climate Impacts Programme (UKCIP) provides information on likely future climate scenarios in the UK. Developed by the Met Office and funded by the Department of Environment, Food and Rural Affairs (DEFRA), the projections show the reality of climate change in the UK (with climate *projections*, not predictions) and help us understand both the importance of the need to reduce our emissions and adapt to inevitable changes in the climate. UKCP09 builds on the data published in 2002 (UKCIP02) by providing the probabilistic range of various outcomes occurring rather than one best estimate for climate changes. The probabilistic approach adopted in UKCP09 allows users to adopt a risk-based approach to planning and supports a more robust decision making process.

What are the projections?

- 2.2 The projections describe how the climate may change between now and 2099 based on different greenhouse gas emissions scenarios. They are based on the latest climate model runs and have been peer reviewed by an international group of leading experts. They do *not* include mitigation policies – i.e. global agreement to cut emissions. Until about the middle of the century, the amount of climate change that will be experienced has largely already been set, due to historical emissions of greenhouse gases. The extent of changes towards the end of the century depends on present-day and future emissions. The emissions scenarios are based on IPCC emissions pathways:
 - High – high reliance on fossil fuels;
 - Medium – mixed reliance on fossil fuels and new technologies;
 - Low – increased usage of new technologies.

Overview of expected climate changes in Gloucestershire

- 2.3 Gloucestershire will experience significant changes in climate over the coming decades. These changes can be summarised as:



- Hotter, drier summers;
- Milder, wetter winters;
- More frequent extreme high temperatures;
- More frequent heavy downpours of rain;
- Significant decreases in soil moisture content in summer;
- Sea level rise and increases in storm surge height;
- Increased frequency and severity of extreme weather events.

2.4 Other trends, such as increased frequency of gales and reduced cloud cover in summer are predicted in some models but not others, so they cannot be treated with the same degree of confidence. The likely impacts, in particular those resulting from extreme weather events, cannot be ignored on the basis of their uncertainty, and the difficulty of predicting future weather is of itself a factor that must be considered in drawing up adaptation plans.

2.5 It is important to note that:

- Until about the middle of the century, the amount of climate change that will be experienced has largely already been set, due to emissions of greenhouse gases that are already in the atmosphere.
- The extent of changes towards the end of the century depends on present-day and future emissions:
 - the low emissions scenario assumes that global emissions will fall below today's levels by the 2080s,
 - the high emissions scenario assumes that emissions increase at a faster rate than current levels until the 2080s, by when emission rates will be approximately four times today's level
- Some of the anticipated changes are predicted by climatologists with a high degree of confidence, whereas others are less certain.

The impacts for the period to 2050 for Gloucestershire are summarised below:

Climate Variable Likely Change by Around the 2050s

(Relative to 1961-1990 base period, using 50%ile probability level for the low and high emissions scenario data from UKCIP09)

Temperature

Annual warming 2.2 to 2.8 °C (2.8 to 4.4 degrees Celsius by 2080s)

Greater night-time than day-time warming in winter

Greater day-time than night-time warming in summer

Greater warming in summer and autumn than in winter and spring

Summer warming 2.5 to 3.1 °C (3.0 to 5.0 degrees Celsius by 2080s)

Summers as warm as 2003 become more common

Precipitation

Winters 11 to 15% wetter (15 to 25% wetter by 2080s)

Summers 13 to 18% drier (14 to 27% drier by 2080s)

Heavy rainfall in winter becomes more common

Greater contrast between summer (drier) and winter (wetter) seasons

Winter and spring precipitation becomes more variable

Snowfall totals decrease significantly

Summers as dry as 1995 (37% <average) become more common

**Cloud Cover**

Reduction in summer and autumn cloud, and an increase in radiation
Small increase in winter cloud cover

Humidity

Specific humidity increases throughout the year
Relative humidity decreases in summer

Soil Moisture

Decreases in summer
Slight increase in winter soil moisture

Storm tracks

Winter depressions become more frequent, including the deepest ones

North Atlantic Oscillation

The North Atlantic Oscillation (NAO) tends to become more positive in the future, giving wet, windy and milder winters

For more facts and information on climate change look at:
the Met Office website
<http://www.metoffice.gov.uk/climatechange/>

the South West Climate Change Impacts website
<http://www.oursouthwest.com/climate/index.htm>

the UK Climate Projections website
<http://ukclimateprojections.defra.gov.uk/> - including full user technical interface

3. Policy Context

- 3.1 This section brings together the key elements of International, National, Regional and local strategies.

International Framework

- 3.2 The 1992 Rio de Janeiro “Earth Summit” can be seen as the starting point for a global discussion into tackling the effects of climate change. It was at this conference that the Rio Declaration on the Environment and Development and UN Framework Convention on Climate Change were signed.
- 3.3 The Kyoto protocol, a legal agreement monitored by the United Nations, which the UK signed up to in 1997 and came into effect in 2005, has set the agenda with regard to producing targets for the overall reduction of greenhouse gas emissions.
- 3.4 “The Bali Roadmap” agreed on 14 December 2007 set out a global negotiation process to 2009 and beyond aimed at creating a post-2012 international agreement on climate change. Two major themes from this conference were to develop and transfer technologies to counter the effects of climate change and reduce emissions from deforestation and thus conserve forest carbon stocks. Also agreed was the introduction of an Adaptation Fund, which will develop strategic priorities, policies and guidelines towards combating the effects of climate change.



European Policy Framework

- 3.5 The EU strongly supports the UN Framework Convention on Climate Change and the Kyoto Protocol. In June 2000 the Commission launched the European Climate Change Programme (ECCP). The goal of the ECCP is to identify and develop all the necessary elements of an EU strategy to implement the Kyoto Protocol.
- 3.6 There are three European Directives which are relevant to climate change:
- The Water Framework Directive 2000 is an overarching programme to deliver long-term protection and improve the quality of groundwater, surface water and associated wetlands.
 - The European Directive on Energy Performance of Buildings 2002 sets out to promote the improvement of energy performance of buildings.
 - The Emissions Trading Scheme Directive 2004 aims to tackle emissions of carbon dioxide and other greenhouse gases.

National Framework

- 3.7 Central government published its sustainable development strategy '**Securing the future**' in March 2005. The strategy aims to enable all people to satisfy their basic needs without compromising the quality of life of future generations. To do this central government will focus on measures to engage people and encourage national, regional and local government to lead by example.
- 3.8 In 1990 as part of the Kyoto agreement the UK agreed a national target of reducing CO₂ emissions to 12.5% below the 1990 level by 2010. The programme introduced a new range of measures to encourage energy efficiency, the wider use of biofuels and the promotion of renewable sources of energy.
- 3.9 In the **Climate Change Programme** (March 2006), and the White Paper, **Meeting the Energy Challenge** (May 2007) central government set an objective of moving to a low carbon economy and reducing CO₂ emissions.
- 3.10 Central government has further pursued its climate change agenda by introducing the **Climate Change Act 2008** (November 2008), making the UK the first country in the world to have a legally binding long-term framework to cut carbon emissions. It also creates a framework for building the UK's ability to adapt to climate change.
- 3.11 The Climate Change Act enhances the UK's ability to adapt to the impact of climate change and establishes that:
- a UK wide climate change risk assessment must take place every five years;
 - a national adaptation programme must be put in place and reviewed every five years to address the most pressing climate change risks to England;
 - the Government has the power to require public authorities and statutory undertakers (companies like water and energy utilities) to report on how they have assessed the risks of climate change to their work, and what they are doing to address these risks ;
 - the Government is required to publish a strategy outlining how this new power will be used, and identifying the priority organisations that will be covered by it;
 - the Government will provide statutory guidance on how to undertake a climate risk assessment and draw up an adaptation action plan; and
 - the creation of an Adaptation Sub-Committee of the independent Committee on Climate Change in order to oversee progress on the Adapting to Climate Change Programme and advise on the risk assessment.



- 3.12 In the **Housing Green Paper 2007**, Homes for the Future: More Affordable, More Sustainable, the Government set the target of delivering 2 million homes by 2016 and 3 million homes by 2020. The Government has also set the target for all new homes to be zero carbon by 2016. Greener homes therefore play a huge role in the efforts to tackle the effects of climate change.
- 3.13 Central government's **Local Authority White Paper 'Strong and Prosperous Communities'** recognises that all local authorities can and should be taking action to combat climate change and that if best practice were followed UK emissions would drop significantly.
- 3.14 As a result these targets have been fed down to regional and local targets.
- 3.15 **The Planning and Compulsory Purchase Act 2004** contains a statutory requirement (Section 39 (2)) for those responsible for preparing the **Local Development Framework (LDF)** in England to undertake this functions with a view to contributing towards the achievement of sustainable development. In doing so Local Authorities are required to work within, and take account of, the national land use policy framework. This is largely provided through **Planning Policy Statements (PPSs)** which set out the Government's national policies on different aspects of planning. PPSs published to date include advice on sustainable development, renewable energy and climate change. These policies state:
- 3.16 **Planning Policy Statement 1: Delivering Sustainable Development (2005)** sets out the overarching planning policies on the delivery of sustainable development, the core principle that underpins planning, and how it can be delivered through the planning system. This PPS should be read in conjunction with other relevant national planning policy statements. It sets out the following:-
- Development Plan policies should seek to minimise the need to consume new resources over the lifetime of the development by making more efficient use or re-use of existing resources
 - Local Authorities should promote resource and energy efficient buildings; community heating schemes; the use of combined heat and power, small scale renewable and lower-carbon buildings energy schemes in development
 - Development Plan policies should contain policies to promote and encourage rather than restrict the use of renewable energy
 - Development Plan policies should take account of environmental issues such as mitigation of the effects of, and adaptation to, climate change through the reduction of greenhouse gas emissions and the use of renewable energy
- 3.17 **Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1 (December 2007)**. This PPS on climate change supplements PPS1 by setting out how planning should contribute to reducing emissions and stabilising climate change and take into account the unavoidable consequences

Used effectively, planning has a pivotal role in helping to:

- secure enduring progress against the UK's emissions target, by directing influence on energy use and emissions, and bringing together and encouraging actions by others;
- deliver the Government's ambition of zero carbon development
- shape sustainable communities that are resilient to and appropriate for the climate change now accepted as inevitable
- create an attractive environment for innovation and for the private sector to bring forward investment, including in renewable and low-carbon technologies and supporting infrastructure
- capture local enthusiasm and give local communities real opportunities to influence, and take, action on climate change



- 3.18 The PPS states that the planning system must support the delivery of the timetable for reducing carbon emissions from domestic and non-domestic buildings.
- 3.19 The following principles in making decisions about the direction of the spatial strategy should be applied:
- The proposed provision for new development, its spatial distribution, location and design should be planned to limit carbon dioxide emissions;
 - New development should be planned to make good use of opportunities for decentralised and renewable or low carbon energy;
 - New development should be planned to minimise future vulnerability in a changing climate;
 - Climate change considerations should be integrated into all spatial planning;
 - Mitigation and adaptation should not be considered independently of each other, and new development should be planned with both in mind;
 - Sustainability appraisals (incorporating strategic environmental assessments) should be applied to shape planning strategies and policies that support the Key Planning Objectives; and
 - Appropriate indicators should be selected for monitoring and reporting in planning authorities Annual Monitoring Reports (AMRs). Such monitoring should be the basis on which planning authority's periodically review and roll forward their planning strategies
- 3.20 The PPS also sets out principles which local authorities, when determining planning applications, must adhere to.
- 3.21 The PPS states that planning authorities should consider the opportunities for the Core Strategy to expand upon the policies and proposals in the relevant Regional Spatial Strategy (RSS) such as where local circumstances would allow further progress to be made to achieving the Key Planning Objectives. In developing the Core Strategy and supporting Local Development Documents (LDDs), planning authorities should provide a framework that promotes and encourages renewable and low carbon energy generation.
- 3.22 The Core Strategy should also be informed by, and in turn inform, local strategies on climate change including the sustainable community strategy.
- 3.23 **Planning Policy Statement 3 – Housing (2006)**
This PPS complements and should be read together with PPS1, and reflects the Governments commitment to improving the affordability and supply of high quality housing. It advises that: -
- Local Planning Authorities should encourage applicants to bring forward sustainable and environmentally friendly new housing developments and conform to the principles set out in PPS1 and the Supplement on Climate Change.
 - Proposes that local planning authorities should encourage applicants to apply the principles set out in the Code for Sustainable Homes to improve resource efficiency and give purchasers and tenant's information on the running costs and sustainability of their new home.
- 3.24 **Planning Policy Statement 10 - Sustainable Waste Management and Companion Guide (2005)**
This PPS promotes the need to deliver sustainable development through driving waste management up the waste hierarchy, addressing waste as a resource and looking to disposal as the last option, but one which must be adequately catered for.
- 3.25 The overall objective is to protect human health and the environment by producing less waste and by using it as a resource wherever possible. In order to achieve this, a step-



change is needed in the way waste is handled and for there to be significant new investment in waste management facilities.

- 3.26 **Planning Policy Guidance Note 13 – Transport (2001)**
This planning policy guidance promotes growth patterns which reduce reliance on the car whilst supporting more sustainable transport choices. Policies need to be integrated with policies for the environment, education, health and the economy as well as land use.
- 3.27 **Planning Policy Statement 22 – Renewable Energy (2004) and Companion Guide**
This PPS sets out a pro-active approach to achieve the Government’s aspirational target of 20% of UK’s electricity to be produced from renewables by 2020. Additionally, it promotes the use of percentage targets for the energy used in residential, commercial or industrial developments coming from on-site energy developments.
- 3.28 Regional Planning Guidance is required to establish regional targets for renewable energy generation capacity.
- 3.29 This PPS states that Local Planning Authorities may include policies in Local Development Documents that require a percentage of the energy to be used in new developments to come from on-site renewable energy sources. Additionally, Local Planning Authorities and developers should consider the opportunity for incorporating renewable energy projects in all new developments. Small-scale renewable energy schemes utilising technologies such as solar panels, Biomass heating, small scale wind turbines, photovoltaic cells and combined heat and power schemes can be incorporated both into new developments and some existing buildings. Local Planning Authorities should specifically encourage such schemes through positively expressed policies in Local Development Documents
- 3.30 **Planning Policy Statement 25 – Development and Flood Risk and Good Practice Guide (2006)**
This sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall. It also advises that Local Planning Authorities should prepare a Strategic Flood Risk Assessment (SFRA) in consultation with the Environment Agency.

Other Relevant National Guidance and Strategies

- 3.31 **Government Climate Change: The UK Programme**
This provides a summary of the climate change issue and puts forward the target of cutting the UK’s emissions of carbon dioxide by 20% below 1990 levels by 2010. As part of the Kyoto Protocol the UK has agreed to reduce greenhouse gas emission by 12.5% below 1990 levels by 2008-2012.
- 3.32 **The Planning Response to Climate Change (2004)**
This response states that planners should be aware of the contemporary and long-term effects of climate change and offers solutions as to how they can combat them through the effective use of relevant planning legislation and guidance.
- 3.33 **Building a Greener Future: Policy Statement (2007)**
This sets out the Government’s vision and programme to achieve zero carbon for all new residential development by 2016. It should be read in combination with the Code for Sustainable Homes and Planning and Climate Change: Supplement to PPS1. The Government proposes to achieve a zero carbon goal in three stages: by 2010, a 25%



improvement in energy/carbon performance in the Building Regulations'; 44% by 2013 and zero carbon by 2016.

3.34 The Code for Sustainable Homes (2008)

On 27 February 2008 the Government confirmed that a rating against the Code will be mandatory from 1 May 2008.

3.35 The Code measures the sustainability of a new home against nine categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a one to six star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level and, within England, replaces the EcoHomes scheme, developed by the Building Research Establishment (BRE).

3.36 The Code supports the government target that all new homes will be zero carbon from 2016 and the step changes in Building Regulations Part L leading to this. The [*Proposed changes to Part L and Part F \(ventilation\) of the building regulations*](#), are currently under review following the consultation which closed on 17 September 2009.

3.37 Air Quality Strategies/Guidance and Contaminated Land Legislation

There are a number of national strategies and guidance relating to air quality and contaminated land: The National Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Working Together for Cleaner Air 2000; Air Quality and Transport Local Air Quality Management Guidance Notes G3 and G4 2000, Air Quality and Land Use Planning – Local Air Quality Management Guidance Notes G4 (00) (2000), and Circular No. 01/2006 Contaminated Land. These documents provide a framework to facilitate improvements to air quality, protecting peoples' health and the environment from pollution.

3.38 The UK Low Carbon Transition Plan (launched last summer)

The UK Low Carbon Transition Plan is the Government's white paper setting out the first ever comprehensive plan to deliver emission cuts of 18% on 2008 levels by 2020 and 29% in conjunction with wider policies. Local authorities will have a key role to play; indeed, reference is made to the local government performance framework as an opportunity for local government and partners to reflect priorities through their Local Area Agreements. Areas that have already been identified include transport and community heating. For transport, the plan for 2020 is:

- to reduce emissions by 14% on 2008 levels through supporting a shift to new technologies and fuels;
- promote low carbon choices;
- use market mechanisms to encourage a shift to lower carbon transport.

3.39 Local authorities will be involved in the demonstration of 340 new electric and low carbon cars, provision of electric vehicle charging infrastructure in approximately six cities throughout the United Kingdom and supporting 10% of UK transport energy coming from renewable sources by 2020. Local authorities are also being encouraged to bring forward community-scale heat and electricity generation and to increase community heating from the current 2% to a potential 14%. This will be done through the incorporation of energy planning into local authority decision making processes as set out in the Climate Change Planning Policy Statement. It will include £25 million announced in Budget 2009 to fund 10 exemplar community heating infrastructure schemes across the UK.

3.40 Heat and Energy Saving Strategy

The consultation (now closed) on the Government's Heat and Energy Saving Strategy sets out an aim for emissions from existing buildings to be approaching zero by 2050. This means increasing the scope and ambition of our energy saving measures, as well as



decarbonising the generation and supply of heat. To support this, it sets out the following key policy proposals:

- All homes to have received by 2030 a 'whole house' package including all cost-effective energy saving measures, plus renewable heat and electricity measures as appropriate. All lofts and cavity walls will be insulated where practical by 2015.
- Comprehensive information and advice to be made available to help people make changes to save energy and save money – including widespread availability of home energy advice by accredited advisers.
- Development of new ways to provide financial support so people can make more substantial energy saving and renewable energy improvements to their homes through mechanisms that allow costs to be more than offset by energy bill savings.
- Consideration of whether a new delivery model is needed, to allow a more coordinated approach to rolling out improvements to homes and communities, house-by-house and street-by-street.
- Consideration of widening requirements under Building Regulations to carry out energy saving measures alongside certain types of building work, and consideration of a new voluntary code of practice with the building trade on energy efficiency and low carbon energy.
- A new focus on district heating in suitable communities, and removing barriers to their development.
- Encouragement of combined heat and power and better use of surplus heat through carbon pricing mechanisms. Taken together, the policies in this consultation will aim to reduce annual emissions
- by up to 44 million tonnes of CO₂ in 2020 – the equivalent of a 30% reduction in emissions from households compared to 2006 – making a significant contribution to meeting our carbon budgets.

Regional Framework

3.41 **Regional Spatial Strategy for the South West**

The Secretary of State's Proposed Changes to the Draft RSS (July 2008) acknowledge that climate change, principally due to the emission of greenhouse gases from human activity, is already affecting life in the South West. The region's average air temperature has increased by about 1 °C since the 1960s, and the sea level is continuing to rise. Potentially this could have major impacts on the region's coastline, low-lying areas, infrastructure and major coastal towns and cities settlements, and there will be further effects in future years as climate change accelerates. The long term effects are therefore an important consideration for any future development.

3.42 Regionally, transport is responsible for 28% of CO₂ emissions (based on recent research by DEFRA which allocated indirect emissions to the region), with road transport dominating that total. Consequently, transport is one priority area where the RSS can have an effect by addressing the need to travel, particularly by car.

3.43 A further 33% of the region's emissions come from homes, with 36% resulting from industry and commerce. Policies therefore need to be directed at ensuring that encouraging all new



developments to be planned and designed to release very low levels of CO₂ and as well as upgrading existing buildings and infrastructure are upgraded as opportunities arise. This highlights the need to move to a low carbon economy. The following is an important baseline policy in the RSS.

Policy SD2 Climate Change

The region's contribution to climate change will be reduced by:

Reducing greenhouse gas emissions at least in line with the current national targets, of 30% by 2026 (compared to 1990 levels), as part of a longer term reduction of 60% by 2050

The region will adapt to the anticipated changes in climate by:

- Managing the impact of future climate change on the environment, economy and society
- Identifying the most vulnerable communities and ecosystems given current understanding of future climate change and provide measures to mitigate against these effects
- Avoiding the need for development in flood risk areas and incorporating measures in design and construction to reduce the effects of flooding
- Recognising and putting in place policies and measures to develop and exploit those opportunities that climate change will bring
- Requiring 'future proofing' of development activity for its susceptibility to climate change
- Improving the resilience and reliability of existing infrastructure to cope with changes in climate and in the light of future demand.

3.44 More information can be found at

<http://www.gos.gov.uk/gosw/planninghome/691545/713860/?a=42496>

3.45 **South West Climate Change Impacts Partnership**

The South West Climate Change Impacts Partnership's key role is to raise awareness of the impacts of climate change, inform and advise on the challenges and opportunities of climate change in SW England, and develop practical adaptation responses. They influence the strategies and plans of key partners and work with stakeholders across key sectors to enhance the region's resilience to the impacts of climate change. More information can be obtained from <http://www.oursouthwest.com/climate/index.htm>

3.46 **South West Climate Change Action Plan**

The South West Climate Change Action Plan (launched 3.9.08 and first updated July 2009) can be found on the South West Councils' website from this link:

www.swcouncils.gov.uk/nqcontent.cfm?a_id=3580&tt=swra

3.47 The Action Plan draws together issues from across the region to ensure that there is a shared vision on tackling climate change, access to a common evidence base and a jointly agreed set of priorities for taking the issues forward. The Action Plan sets out a clear programme of regionally agreed priority actions to address both mitigation and adaptation activity from 2008 to 2010.

3.48 The main areas of mitigation activity within the SWCCAP include tackling emissions from existing housing, business and public sector operations, transport, new build, energy generation, and land management. Adaptation activity covers: the region's strategic response to climate change; awareness raising; land and marine management; and adapting to flood risk.



4. How is Stroud District Council addressing climate change?

- 4.1 We have demonstrated our commitment to adapting to climate change by signing the **Nottingham Declaration**. We signed up to it in 2007. This document declares that we acknowledge climate change and commits us to tackling the causes and effects on our district. In 2009 we also signed up to the '10/10' campaign, committing to reduce the councils carbon emissions by 10% in 2010.
- 4.2 During 2005 it became clear that the Council needed to make a step change in its performance if it was going to respond successfully to public demands for more action on the environment, in particular reducing waste to landfill, tackling climate change and improving the quality of public spaces.
- 4.3 During 2006 the Council undertook an extensive programme of consultation, stimulating debate through the use of an **Environment 'Green' Paper**. The 2006 annual budget survey was also used to test the priorities of local people. What came through very strongly was that Environment was the top priority for local people; scoring higher than affordable housing and community safety. The 2006 and 2007 household budget surveys revealed that 69% and 68% of local people respectively thought that the environment was important or very important. The complementary survey of companies showed 78% in 2006 and 83% in 2007 of business people felt the same way. The Green Paper consultation results showed that waste and recycling and climate change response dominated the concerns of local people.
- 4.4 These results were used to develop a 20-year **Environment Strategy**, which was adopted in February 2007. The Council's 4-year Corporate Delivery Plan and Medium Term Financial Plans have also been aligned with the Strategy. In the 2006/07 budget round an additional £1.5m was made available over the medium term to support the delivery of our Environment Strategy including £700,000 on climate change response.
- 4.5 One of the key commitments made within the Strategy was the development of an independent **Climate Change Panel**. The purpose of the panel is two fold:
- To act as an independent advisory panel to the Council and Local Strategic Partnership (LSP);
 - To provide non-elected member external scrutiny of Council policy and performance in relation to climate change;
- The panel consists of 9 local and national experts in matters relating to climate change including matters such as energy, construction, urban and rural planning and land management. The Panel has met three times - October 2007, June 2008 and September 2009. Their recommendations have been reported to the Council's Cabinet.

The role of the Local Strategic Partnership

- 4.6 The Stroud District Local Strategic Partnership, generally known as the LSP, was formed in 2002 and is made up of members from about 30 different organisations. There are public, private, voluntary and community groups represented who have a diverse wealth of local knowledge and expertise.
- 4.7 The LSP's purpose is to improve the quality of life for local people by encouraging effective partnership between those people who can directly and indirectly bring about change.



- 4.8 In shaping its thinking the LSP members realised they should prioritise problems within the District and concentrate on areas where they felt real improvement, over time, would be achievable. By concentrating on specific areas they hope their influence on budget proposals, policy and partnership development will result in tangible results over the next 20 years.
- 4.9 In October 2007 the Local Strategic Partnership established a **Global Changes Think Tank** to consider the twin impacts of climate change and Peak Oil. The membership of the Think Tank is drawn from LSP members, The Transition Town movement and Council officers. Others with specialist interests relating to climate change are invited to Think Tank meetings and provide evidence.
- 4.10 The topic area is huge and with the agreement of the LSP the Think Tank separated the main issues out and tackled each over a period of time. The Work Programme subject areas agreed were:
- General framework for addressing the impacts of climate change and Peak Oil
 - Role of Land use Planning
 - Housing
 - Transport
 - Food
- 4.11 Reports on each of these topics have been produced and presented to the LSP and to the Council. There is a 'sixth' step to be undertaken in due course, which is to review and revise progress. This will be done within the context of the new Sustainable Community Strategy, which has a strong focus on climate change and Peak Oil.
- 4.12 This work has also helped to inform Council policy and the approach taken to climate change in the Core Strategy. There are two central issues that the Core Strategy must help to address if we are to successfully adapt to the impacts of climate change and mitigate its worst effects.
- How to address the increased risk of flooding through sea level rise and increased rainfall in extreme weather events.
 - How to help facilitate a reduction in carbon emissions.
- 4.13 There are no simple or single answers to these issues. There is instead a multiplicity of actions that we can take to adapt and mitigate climate change. To date the council has addressed these issues through a variety of mechanisms including its Corporate Delivery Plan, its Environment Strategy, Procurement Policy, Local Plan etc



5. What are the potential climate change impacts that the Core Strategy can help address?

Climate Variable	Specific climate changes and impacts	Direct impacts
Warmer temperatures	Declining number of days requiring heating	Reducing heating requirements in buildings – impact on design and building cost
	Increasing number of days requiring cooling	Increasing need for cooling systems in existing buildings and incorporation of measures to provide cooling in new buildings - impact on design and building cost
	Increasing frequency of very warm summers and very warm days	Increased Tourism Increased Heat stress - risks to vulnerable people Infrastructure risks Risks to biodiversity Health risks - heat related illness and deaths Risk to food security Increasing need for cooling systems in existing buildings and incorporation of measures to provide cooling in new buildings
	Lengthening of the growing season	Increasing requirements to manage green spaces over longer period Changes to crops and biodiversity
Rain and snow	Drier summers	Pressure on water supply resources Reduced stream flow and water quality Increased drought Subsidence Decreased crop yields – changing agricultural practice
	Wetter winters with less snow	Increased risk of flooding Increased subsidence Risks to urban drainage Severe Transport disruption Reduced requirement for snow clearing of roads
	Increasing frequency of extreme rainfall events	Increased risk of flash floods Increased risk of water penetration of buildings
	Increasing frequency of very dry summers	Increased risk of droughts and water shortages Increased risk of long-term damage to some tree species
Cloud cover	Reduction in summer and autumn cloud and an increase in radiation	Increased risk of harmful solar radiation causing skin cancers Increasing need for shading in buildings and open spaces
Humidity	Increases in specific humidity throughout the year	Increased heat stress to vulnerable adults, children, animals Increase in damp in poorly ventilated buildings
Soil moisture	Decreases in summer soil moisture	Increasing demand for irrigation of vegetation Increased risk of long-term damage to some tree species
Wind/storms	Increasing frequency of deep depressions and hence high winds/ storms in winter	Potential damage to buildings and other infrastructure
Sea level rise and storm surges	Up to 260mm rise in sea levels in the Severn estuary by 2050	Increasing risk of ‘tide locking’ on rivers flowing into the Severn and consequent flooding Loss of salt marsh & wetland habitats
	Increased frequency of storm surges	Increasing risk of ‘tide locking’ on rivers flowing into the Severn & consequent flooding



6. Stroud Climate Change Impacts: Opportunities and Challenges

Positive Impacts of Climate Change in Stroud

There is a variety of positive messages associated with climate change mitigation and adaptation which can help to make the transition less scary for people. Transition to a low carbon world would be good for Stroud in a number of important areas:

- Air Quality improvement
- Opportunities for environmental technology business
- Improved community awareness
- Remote working could lead to families spending more time together
- Healthier lifestyles
- More locally grown food, locally sourced products
- Lower fuel bills
- Increased energy resilience

Opportunities	Challenges
Agriculture, horticulture and forestry	
<ul style="list-style-type: none"> • Longer growing season providing increased yields • Potential for new crops (grapes, navy beans, sweet corn, soya and sunflowers) • Reduced frost damage should increase productivity • Potential increased growth rate (e.g. for forest trees) • Opportunities for new forestry planting in floodplains to mitigate flooding 	<ul style="list-style-type: none"> • Reduced die-off of pests and diseases due to warmer winters • Decreased soil quality and increased erosion due to increased run-off from winter precipitation • Need for increased irrigation in summer • Possible wind & storm damage to standing crops & nursery stock • Increased heat stress to poultry and livestock • Potential loss of South West's competitive advantage
Coastal issues and marine fisheries	
<ul style="list-style-type: none"> • Increased tourism in coastal zones may boost local economies • Increased marine activity, water sports, surfing etc • Increased scope for aquaculture of new species of fish and shellfish • Some fisheries may be enhanced by longer breeding season 	<ul style="list-style-type: none"> • Increased rate of coastal erosion and silting of estuaries • Loss of natural assets in the coastal zone e.g. wetlands and beaches • Reduced overall productivity of oceans, and loss of some commercial species (fish and shellfish) • Deterioration in water quality and increase in algal blooms • Increased run-off and leaching from land, damaging flora & fauna in coastal zones • Pressures arising from increased tourism in coastal zones



Opportunities	Challenges
Biodiversity	
<ul style="list-style-type: none"> • Flora and fauna species with pronounced southern distribution become more widespread • Integrated land management to aid nature conservation 	<ul style="list-style-type: none"> • Risk to species vulnerable to drought • Risk to species requiring sub-zero period to break seed dormancy • Risk of expansion of naturalised alien species • Increased visitor pressure on natural environment • Loss of coastal and estuarine habitats due to increased rate of coastal erosion and invasion • Threat to saline lagoons and silting of estuaries • Increased incidence of fire in hot dry summers
River flooding and drainage	
<ul style="list-style-type: none"> • Introduction of sustainable urban drainage systems • Commercial opportunities in flood defence and flood management • Opportunity to integrate estuarine and coastal flood defence 	<ul style="list-style-type: none"> • Increased risk of flooding from increased rainfall and possibly more storms • Improvements and higher specification required for flood defences • Improvements and higher specification required for urban drainage and rainwater disposal systems
Transport	
<ul style="list-style-type: none"> • Increased scope for walking and cycling for everyday travel and tourists • Improved rail and road infrastructure to provide alternative and diversionary routes in case of extreme climate events • Less frost damage to roads from winter cold; less need for road salting • Fewer ice/snow related accidents on roads and footpaths • Fewer ice/snow related points failures on railways 	<ul style="list-style-type: none"> • Increased pressure on transport systems from more tourists • Flood risks (including flash floods) disrupting roads in some major towns • River/coastal flooding and landslip threats to railways • Increased threat of storm damage to road and rail • Some disruption to air traffic (Gloucestershire Airport)
Food and drink	
<ul style="list-style-type: none"> • Availability of new crops and species in the region, reducing import costs • Developing new markets for local produce, especially new local varieties • Increased consumption of warm weather food and drinks leading to new markets 	<ul style="list-style-type: none"> • Increased demand for cooling with associated environmental and financial costs • Increased bacterial build-up in foods leading to health risks and associated litigation • Loss of some traditional species and crops • Impacts on transport infrastructure especially ports, affecting distribution to and from markets



Opportunities	Challenges
Water resources and water quality	
<ul style="list-style-type: none"> • Increased supply available in winter but needs capturing and storing • Greater potential for one-season recharge of larger reservoirs and aquifers • Greater potential in winter for increasing water releases to hydropower 	<ul style="list-style-type: none"> • Increased evaporative losses from surface water stores • Increased demand for water in summer • Higher concentrations of pollutants in watercourses from reduced summer rainfall • Increased risk of algal blooms and pollution in reservoirs • Potential for saline incursions into coastal water abstraction plants and boreholes • Increased risk of sediment and pollution run-off into watercourses caused by changes in farm management practices adopted to adapt to climate change
Built environment and housing	
<ul style="list-style-type: none"> • Reduced heating demand, especially in winter, and therefore reduced heating costs • Commercial opportunities for developing local expertise in passive solar heating, cooling, shading & other environmental technologies • Increased scope for outdoor activities around buildings, especially in summer • Increased potential for renewable sources of energy (e.g. passive solar) • Increased need for shading (e.g. more trees in urban streets and squares) 	<ul style="list-style-type: none"> • Planning & design of new buildings in locations vulnerable to flooding – design standards will need to be revised • Potential overheating of interior environment in existing and new buildings in summer will require sustainable solutions to cooling • Increased subsidence and associated insurance claims due to drying out of substrata (especially in clay areas) • Structures under construction vulnerable to storm damage • Increased summer demand for water
Utilities	
<ul style="list-style-type: none"> • Reduced heating demand, especially in winter may lead to lower bills for consumers • Commercial and environmental opportunities for developing renewable energy production (wind, tidal, bio-mass, bio-fuels, solar) • Commercial and environmental opportunities for passive solar heating, cooling, shading and other environmental technologies • Increased potential for renewable sources of energy (e.g. passive solar) 	<ul style="list-style-type: none"> • Increased tourism, in summer and winter, will increase demand on utilities • Potential summer overheating of buildings will require sustainable solutions to cooling • Utilities infrastructure is vulnerable to storm damage in exposed locations



Opportunities	Challenges
Health	
<ul style="list-style-type: none"> • Generally less ill health due to reduced cold conditions • Reduced winter mortality (e.g. from hypothermia) • Healthier lifestyles due to increased opportunities for outdoor activities • Fresh, healthy and locally-produced food available for a longer period • Less risk of injury due to falls on ice 	<ul style="list-style-type: none"> • Increased risk of food poisoning • Increased risk of sunburn, heatstroke, and exposure to UV radiation (skin cancer) • Increased risk of heat exhaustion and dehydration in summer • Risk of deterioration in water quality and increase in infection • Higher air pollution in urban locations leading to respiratory disease • Increase in some diseases (e.g. Lyme disease spread by ticks)
Tourism and leisure	
<ul style="list-style-type: none"> • Longer, more reliable summer season leading to increased visitor numbers and visitor spend • Warmer winters, leading to a more year-round tourist season • More outdoor and water-related recreation • Increased tourism in the area due to more UK holidaying, urban tourism and city breaks as Mediterranean destinations become too hot 	<ul style="list-style-type: none"> • Increased demand on transport and utilities infrastructure due to increased visitor numbers • Coastal attractions vulnerable to sea level rise and storms • Increased visitor pressure on natural environment e.g. Cotswolds • Threats to historic gardens of changing habitat and species • Storm and flood damage to caravan sites and other tourist infrastructure
Financial services	
<ul style="list-style-type: none"> • Reduced insurance claims arising from cold weather conditions • Investment opportunities resulting from increased economic activity (e.g. tourism) • Investment opportunities resulting from new market opportunities (e.g. environmental technology) 	<ul style="list-style-type: none"> • Increased insurance risk due to flooding, landslips and subsidence • Higher insurance costs generally and potential for insurers not to provide cover to certain locations, premises, and activities • Increased insurance costs of storms and impacts on transport, infrastructure, business and property • Increased marine and offshore impacts and related investment and insurance losses



7. What can the Core Strategy contribute?

Aims to be addressed in Core Strategy

7.1

- To **reduce** greenhouse gas emissions, specifically reducing energy use, waste, and the use of unsustainable forms of transport.
- To **encourage** other sectors of the district to reduce their own greenhouse gas emissions
- To **prepare** for the changes that will happen because of the changing climate.
- To **create** a behaviour change around how we use our natural resources.

Energy

7.2 The LDF Core Strategy and its associated Development Plan Documents are the fundamental building blocks for the creation of a strong policy and planning framework for low carbon, community-scale energy generation.

7.3 The core strategy can lay down the fundamental principles that will be applied to all new development. A core strategy and subsequent DPD's can:-

- Identify locations for renewable energy generation. Industrial areas are ideal for the location of larger energy generation projects, including those with significant visual impacts such as wind power and requiring large movements of vehicles such as anaerobic digestion and large-scale biomass heat and power generation.
- Use energy and heat mapping to inform housing and employment allocations
- Plan the co location of mutually supportive land uses (in energy terms)
- Identify areas of poor performing property and prompt community scale renewables or redevelopment
- Establish expectations for connection to heat mains
- Identify land energy related uses (siting of a community CHP)

Reduce energy use

7.4 While new build can meet the highest energy standards, the biggest challenge is the existing stock. The improvement, remodelling and selective demolition of properties to achieve Housing Market Renewal, investment in new mixed tenure housing and programmes to deliver improved community facilities create a range of opportunities from the communal scale to individual buildings.

The core strategy could

- Reduce need to travel with appropriate location of development and live work units.
- Make provision for renewable energy resources both on and off site with appropriate legal mechanisms to provide new generating capacity with new development
- Consider mixed-use developments that enable use of CHP schemes through the co location of mutually supportive land uses.
- Planning for the socio economic impact of falling property values for inefficient dwellings and the special impact that may result.
- Planning for the dramatically ageing population and the increased risk of fuel poverty when looking at locations and the design of new developments.



Waste

- 7.5 The maxim with regard to waste is:
- **Reduce:** minimise wastage of materials in construction
 - **Reuse:** identification of sites that could be specifically allocated for recycling business, both in the processing of the material but also manufacture using the recovered material.
 - **Recycle:** allocation of suitable sited community recycling and community composting sites.
 - **Recover:** (energy) waste becomes an asset rather than a problem, provision of decentralised facilities to utilise the energy in putrescent waste while removing the majority of recyclable material to be utilised as close to the source as possible.

Flood risk

- 7.6
- Protect areas at risk of flood from development – tidal and fluvial
 - Consider the impact of displaced homes and business.
 - Consider the socio/economic impact of falling land values were flood risk cannot be practically mitigated
 - Ensure drainage systems in new development do not add to, and preferably reduce, risk of flooding elsewhere.
 - Provide for flood prevention measures in appropriate circumstances
 - Allocate land for flood water attenuation schemes

Biodiversity

- 7.7
- Allow for adaption to change – protect wildlife corridors to allow migration of species
 - Focus attention on those species we can make a real difference for and not take action for those species at the limit.
 - Protect land for habitat creation opportunities (E.g. more wetland and trees for shade/carbon sinks)
 - Protect land against loss of important habitat and (E.g. Beech Woodland on escarpment)

8. Checklist for action in response to climate change

In the checklist below, there is a range of actions identified that need to be considered when climate proofing a development against the impacts of climate change. Acting on these points will help address the need to mitigate and adapt to climate change and build societal resilience to the changes that global warming inevitably will bring.

Adaptation to global warming requires initiatives and measures to minimise the vulnerability of natural and human systems to actual or expected climate change. Adaptation to risks and opportunities requires essentially local action and can be achieved through:

- i. Guiding **strategic development** to locations offering greater protection from impacts such as flooding, erosion, storms, water shortages and subsidence
- ii. Ensuring new and existing building stock are more **resilient to climate** change impacts.
- iii. Incorporating **sustainable drainage** measures and high standards of **water efficiency** in new and existing building stock



- iv. Increasing **flood storage** capacity and developing sustainable **new water resources**
- v. Ensuring that opportunities and options for **sustainable flood management** and **migration of habitats and species** are not foreclosed.

Mitigation of global warming requires a reduction in greenhouse gas emissions in order to reduce global warming. It requires action at both local and global levels. The reduction of greenhouse gas emissions can be addressed through greater resource efficiency including:

- i. Improving **energy efficiency** performance of new and existing buildings and influencing behaviour of occupants
- ii. Reducing the **need to travel** and ensuring good accessibility to public and other sustainable modes of transport
- iii. Promoting land use that acts as **carbon sinks**
- iv. Encouraging development and use of **renewable energy**
- v. Reducing the amount of **biodegradable waste going to landfill**

Resilience is the the ability to recover quickly from change or misfortune and return to a stable state. Building resilience to climate change requires us all to build capacity to prevent or withstand major change, and to rebuild and respond to the impacts of global warming impacts. We can do this by:

- i. Stopping practices that put people at high risk
- ii. Incorporating climate change information into planning, practice, and decision-making
- iii. Implementing measures that pro-actively reduce climate impacts
- iv. Developing informed risk spreading practices

A resilient community can withstand shocks and rebuild itself when necessary. Resilience is different from adaption in that resilience is the ability to recover from a disturbance, whereas effective adaption means that a disturbance would not need a response as the community has been proactively designed to accommodate a disturbance.

The checklist:

Location of development

- Establish the Environment Agency flood risk designation(s) for the site and ensure that the design of the development accords with it.
- Check the Environment Agency's Flood Map resource at <http://www.environment-agency.gov.uk/homeandleisure/37837.aspx>
- Check with the Local Planning Authority to review any strategic flood risk assessments.
- Undertake an appropriate flood risk assessment and evaluate the flood risk over the design life of the development. Demonstrate that this is acceptable for the proposed use(s) and, at a minimum, that there will be no overall increase in flood risk (likelihood and negative impact).
- Consult the insurance industry guidance *Climate Adaptation - Guidance on Insurance Issues for New Developments* about the viability of the development for insurance purposes.
- Help reduce the build up of heat in urban areas e.g. by planning green space and using appropriate shade when locating your development.
- Consider the implications of coastal erosion when planning a development.
- Locate development on public transport routes where possible
- Minimise the need for travel by car by locating development close to the services and facilities that its users require.



Site layout

Ensure the overall layout and massing of the development:

- Does not increase flood risk and where possible reduces risk both on and off site;
- Minimises solar gain in summer;
- Maximises natural ventilation;
- Maximises natural vegetation;
- Takes account of the increased risk of subsidence;
- Provides homes and other appropriate uses with a private outdoor space wherever possible.

Buildings

A: Structure

Demonstrate the structure is:

- strong enough or able to be strengthened if wind speeds increase in the future due to climate change;
- strong enough to avoid movement due to expected future levels of subsidence and heave;
- able to incorporate appropriate ventilation and cooling techniques/ mechanisms; of an appropriate thermal mass for the intended use and occupancy.

B: Physical envelope of structures

Demonstrate the envelope of the building is designed so that:

- drainage systems and entrance thresholds can cope with more intense rainfall;
- there are opportunities for incorporating green roofs or walls;
- the exterior of buildings reduces heat gain in summer;
- the overall envelope avoids infiltration from increased wind and temperatures;
- cladding materials are able to cope with higher wind speeds.

C: Materials

- Ensure the materials specified will perform adequately in the climate throughout the lifetime of the development.
- Ensure the construction methods to be used are suitable for the weather conditions at the time of construction.

Ventilation and cooling

- Ensure that ventilation brings clean pollution-free air into the building and does not compromise noise levels or security.
- Demonstrate the building has or is capable of having installed a ventilation system which will deliver comfortable temperatures (i.e. exceeding 28°C for less than 1% of the time and exceeding 25°C for less than 5% of the time) for the expected climate throughout the design life of the development.
- Cooling and ventilation systems, where necessary, should be designed to use as little carbon-based energy as possible by utilising renewable energies and being as energy efficient as practicable.

Drainage

- Carry out a site survey to determine which SUDS techniques will be appropriate for use on the site. For example, ground conditions will determine the suitability of infiltration systems.
- Consider rainwater harvesting, green roof systems and opportunities for permeable paving if soil permeability is low.
- Ensure, in consultation with the Environment Agency, that the requirements of the Groundwater Regulations are complied with (you should note that shallow, extensive infiltration systems will minimise risks to groundwater).



- Demonstrate consideration is given to future maintenance requirements of SUDS including the need, where necessary, for the removal of silt which will be treated as a controlled waste, and that space requirements for this purpose are allowed for in the design.
- Ensure that responsibility for maintaining SUDS is clear at the planning application stage
- Consider using permeable paving anywhere that loadings will not cause structural failure. In practice, all pavements, driveways, footpaths, car parking areas and access roads could have permeable surfaces.
- In developing the drainage plan for the site, ensure that the design standard takes account of climate change and that carriageways, paths and other features of the site are designed to convey this excess flow safely.

Water

- Estimate the net water consumption of the development under normal use and under water conservation conditions (i.e. during a drought), both initially and during the lifetime of the development in consultation with the relevant water company.
- Discuss existing sewerage infrastructure and sewage treatment capacity with the local sewerage provider.
- Regarding water use, for housing, achieve a target of 30 cubic metres per person per year under typical use and for offices, 1.05 cubic metres per person per year.
- Minimise water use in buildings, consider the use of rainwater collection/re-use systems and consider the environmental impact (in terms of water consumption) of products, materials and building methods.

Outdoor spaces

- Incorporate an appropriate range of public and private outdoor spaces in developments, with appropriate shade, vegetation and water features.
- Ensure the design of surfaces takes account of more intense use, permeability, potential for causing dust and for soil erosion.
- Ensure the selection of vegetation with longer life (over 10 years) takes account of future climate change.
- Ensure water features have minimal net water use.
- Provide a rainwater collection system/grey-water recycling for watering gardens and landscaped areas.
- Ensure there are arrangements for storing waste which allow for separation and prevent excessive smell in hotter conditions.

Connectivity

A: Infrastructure Resilience

- Ensure there are safe access routes above the likely flood levels and the routes are clearly marked (e.g. by a series of poles) during the design life of the development.
- Negotiate with utilities and others over the resilience of services and infrastructure to the development.

B: Impact on Neighbours

- Identify immediate neighbour impacts as well as the cumulative impacts and the increased demands on services.

Core Strategy Consultation:

Alternative Strategies for shaping the future of Stroud District
8th FEBRUARY – 22nd MARCH 2010

This background paper has been published to support the main 'Alternative Strategies' consultation document: a discussion paper, which looks at seven alternative spatial strategies and proposed policies. You can see this online at www.stroud.gov.uk/core and at the following locations during their normal opening hours:



- Town and parish council offices that open to the public: Berkeley, Cainscross, Cam, Chalford, Dursley, Minchinhampton, Nailsworth, Painswick, Rodborough, Stonehouse, Stroud, Wotton-under-Edge



- Public libraries at Berkeley, Brockworth, Dursley, Nailsworth, Minchinhampton, Painswick, Quedgeley, Stonehouse, Stroud, Wotton-under-Edge

- The customer service centre at Stroud District Council offices, Ebley Mill. There are computers for public internet access here as well.



- The Tourist Information Centre at the Subscription Rooms, Stroud

You can print out **consultation response forms** from our website or take a photocopy from APPENDIX 1 of this document. Please return your completed form to the address given on the back of this document by Monday 22nd March 2010.

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