Supplementary Planning Document

Leicester City Council

Climate Change

Adopted January 2011

Leicester City
local
development
framework

CONTENTS

oneplanet

1.1 Role and purpose of this document

Climate change is the greatest environmental challenge facing the world today. As our energy demand has increased so has the amount of carbon dioxide released into the atmosphere. There is wide agreement that this is the main cause of climate change and that rising temperatures will affect weather patterns and the frequency of extreme weather events.

The purpose of this guide is to provide advice to planners, architects and developers on how to address the issue of climate change in relation to new developments and renovations. The document supplements the Core Strategy, in particular Policy CS02 Addressing Climate Change and Flood Risk (See Box One), and will:

- Support the transition to a low carbon future in a changing climate.
- Help shape places so as to cut greenhouse gas emissions.
- Actively support and drive renewable and low carbon energy production.
- Help secure new developments against the impacts of climate change.

It sits alongside and supports the Energy Efficiency and Renewable Energy Supplementary Planning Document (SPD), adopted November 2005 which supports the Local Plan (adopted 2006).

1.2 How to use this document

The information within this document provides criteria within which to consider planning applications. Any development that has not considered the principles outlined may be refused planning permission.

Developers are encouraged to not only read this document but to also source additional information from the references provided.

1.3 The document in context

In addition to the Core Strategy this SPD supports a number of local, regional and national policy documents, namely:

- One Leicester: Reducing our carbon footprint.
- PPS1 Supplement 'Planning and Changing Climate'.
- East Midlands Climate Change Partnership: Regional Programme of Action 2009 – 2011.
- The UK Low Carbon Transition Plan: National Strategy for Climate and Energy.

This SPD builds on the Leicester City Core Strategy's aims for climate change, but does not include issues covered in other documents such as the Local Transport Plan or the Waste Development Framework Core Strategy. Developers should consult these documents separately.

Leicester City Council's Core Strategy states that *"all development must mitigate and adapt to climate change and reduce greenhouse gas emissions"* and PPS1 Supplement identifies climate change as a material consideration in determining planning applications.

Developers are required to show, through their Design and Access Statement [(1)], how the design of their development has mitigated and adapted to climate change and reduced greenhouse gas emissions.

BOX ONE

CS POLICY 2. ADDRESSING CLIMATE CHANGE AND FLOOD RISK

All development must mitigate and adapt to climate change and reduce greenhouse gas emissions. The Council will prepare a Climate Change Supplementary Planning Document to provide more detailed guidance and information on sustainable energy, building methods and climate change adaptation to minimise the impact of development.

The following principles provide the climate change policy context for the City:

1. Code for Sustainable Homes Level 3 will be required where feasible. This will be increased progressively over the plan period where feasible to support the Government's longer term aspiration for new homes to achieve Level 6.

2. Best practice energy efficiency and sustainable construction methods, including waste management, should be incorporated in all aspects of development, with use of locally sourced and recycled materials where possible, and designed to high energy and water efficiency standards.

3. Wherever feasible, development should include decentralised energy production or connection to an existing Combined Heat and Power or Community Heating System.

4. Development should provide for and enable, commercial, community and domestic scale renewable energy generation schemes. Development of large scale renewable energy schemes will be considered in all suitable locations.

5. Development should be directed to locations with the least impact on flooding or water resources. Where development is proposed in flood risk areas, mitigation measures must be put in place to reduce the effects of flood water. Both greenfield and brownfield sites should be assessed for their contribution to overall flood risk, taking into account climate change. All development should aim to limit surface water run-off by attenuation within the site as a means to reduce overall flood risk and protect the quality of the receiving watercourse by giving priority to the use of sustainable urban drainage techniques in development.

6. Development should ensure a shift to the use of sustainable low emission transport to minimise the impact of vehicle emissions on air quality, particularly in Air Quality Management Areas. Development will be located where it is accessible by sustainable transport to support the use of public transport, walking and cycling as an alternative to the car. Higher density development will be located in areas with easy access to local facilities to reduce the need to travel.

7. Green Infrastructure should be used as a way of adapting and mitigating for climate change through the management and enhancement of existing habitats and the creation of new ones to assist with species migration, to provide a source of locally grown food through local allotments and to provide sustainable transport routes, to provide shade and counteract the urban heat island and flood mitigation strategies.

8. Existing development should wherever possible be adapted to climate change and help contribute to the reduction in carbon emissions by, where appropriate, including the introduction of green roofs, microrenewable energy, recycling facilities, building efficiency measures and cycle parking.

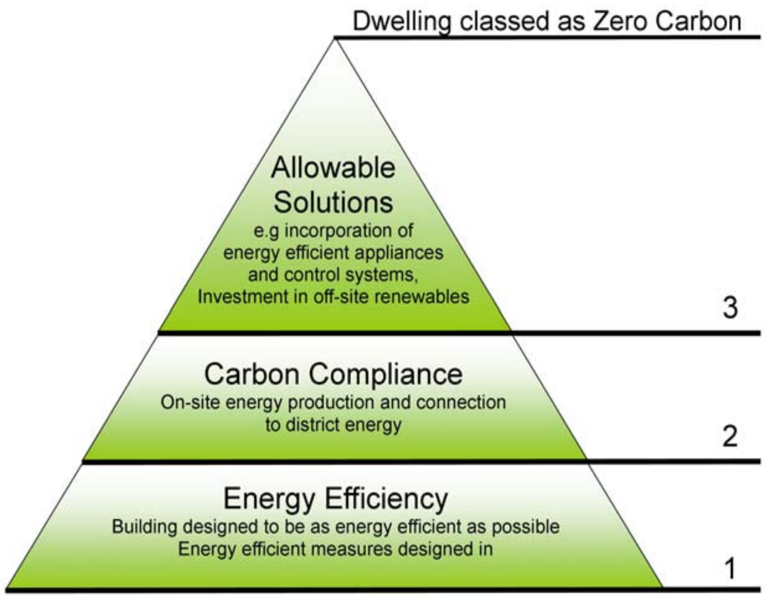
2.0 MITIGATING CLIMATE CHANGE: REDUCING GREENHOUSE GASES

2.1 Development Layout

The orientation of a building has a significant impact on the amount of passive solar gain[2] available. To maximise gain buildings should be oriented with the longest face within 30° of south. South easterly is preferable to south westerly as it maximises early morning gains and reduces overheating in the afternoons. Good integrated design will avoid summertime overheating and provide future adaptation for a rising temperatures.

2.2 The Energy Hierarchy in buildings

All developments should be designed in accordance with the energy hierarchy (below left). The initial building plan should be designed to be as energy efficient as possible with special consideration to orientation, layout (as described in 2.1) and thermal performance.



1. Energy Efficiency
Insulation is crucial to developing an energy efficient building. There should be high levels of fabric insulation in all elements of external and party wall construction. Special attention should be paid to fabric junctions in order to minimize thermal bridging[3] and maximize air tightness.

Once the cost benefit of installing more insulation lessens the thermal mass[4] of the building should be considered. Increased thermal mass allows a building store and release heat gains from the sun and internal appliances. Increased thermal mass can be achieved with a construction of dense concrete block faced with cavity insulation or rendered external wall insulation, ceramic tiled in-situ concrete cement screed floor with insulation below and a concrete warm deck roof where insulation is located externally over or close to the water proofing layer.

2. Carbon Compliance
If the building has been designed to a high level of energy efficiency to achieve greater levels of carbon emission savings then sources of decentralised energy and renewable power should be considered. District heating networks distribute heat generated in a centralised location for residential and commercial heating. These plants provide higher efficiencies and better pollution control than localised boilers and have lower carbon footprint than most other heat generation systems. In addition there are now a number of options available for developers who wish to fit renewable technologies to developments. These options, key information about them and suggested uses can be seen in appendix one.

What To Aim For:

1. All buildings oriented with longest face 30° from south to maximise potential for solar.
2. Improvement of thermal performance by 44% on 2006 Building Regulations, Part L.
3. Maximise the thermal mass of the building.
4. Achieve a minimum of Level 3: Code for Sustainable Homes.
5. Connect to an existing decentralised energy system or develop a stand-alone system.
6. Install onsite renewable technologies.
7. Targets for onsite renewables = page 10, Energy Efficiency and Renewables SPD.

Sources of further information

Leicester City Council Energy Efficiency and Renewable SPD
The Code for Sustainable Homes: Setting the standard in sustainability for new homes
Code for Sustainable Homes: Technical Guide
2006 Building Regulations Part L
Royal Institute of British Architects: Principles of Low Carbon Design
East Midlands Climate Change Partnership: Regional Programme of Action 2009 – 2011
The UK Low Carbon Transition Plan: National Strategy for Climate and Energy.

3.1 Sustainable Transport: Minimising carbon from transport

A large percentage of carbon emissions come from transport habits of the occupants. Developers should be mindful of this and plan to minimise the need for occupants to use motorised transport through the development and implementation of travel plans and packs, increasing the facilities for low carbon transport such as electric vehicles and localising as many amenities and services as possible.

New developments should complement existing public transport hubs and corridors. The transport assessment/statement submitted with the planning application should address issues around walking, cycling and public transport. Developers should also ensure that there are travel plans for commercial uses, personalised travel plans for larger residential developments and travel packs for smaller residential developments. Development on greenfield land should aim to create new, or enhance existing, public transport hubs and corridors. Comprehensive information can be found from the Department for Transport (www.dft.gov.uk)

The City Council and developers will work in close collaboration with neighbouring Planning Authorities to ensure that all development and Sustainable Urban Extensions adjoining other areas are planned comprehensively. This may involve extending existing public transport routes and incorporating a fully connected highway network to enable all modes of transport including shared use of public sector services by both existing and new communities.

What To Aim For:

1. Promote active travel for shorter journeys via travel packs and plans.
2. Ensure that street widths are sufficient to allow easy walking and cycling, where possible consider formal cycle paths and traffic calming measures.
3. Incorporate electric vehicles charging facilities in garages and parking spaces.
4. Provide secure, covered storage/parking of bikes and pushchairs in public areas.

Sources of further information

Central Leicestershire Local Transport Plan
Leicester City Council's "Leicester City Air Quality Action Plan" (within LTP)
DEFRA'S www.lowemissionstrategies.org
ACT Travelwise: www.acttravelwise.org
Planning Policy Guidance 13: www.communities.gov.uk

4.0 MITIGATING CLIMATE CHANGE: MATERIALS

4.1 Embodied Energy[5]

The energy used in construction and the energy embodied in the materials for a new development or renovation can add considerably to the carbon impact of that project. This can be minimised by careful selection of materials and minimising the use of those that have negative environmental effects. The BRE Green Guide to Specification provides environmental ratings for a variety of widely used construction materials; using sources such as this can help understanding of the environmental impact of the materials used and in doing so environmentally beneficial materials can be chosen. Developers should also bear in mind that existing buildings contain a lot of embodied energy and that renovation can save significant carbon emissions.

4.2 Minimise Consumption: Reduce, Reuse, Recycle

As far as possible use of raw material[6] should be minimised. Reducing the amount used and ensuring that waste is minimised will provide both financial and environmental benefits. To further reduce the use of materials as much as possible ensure that construction, demolition and excavation waste is reused or recycled. For example using recycled aggregate for a sub-base can save on use of raw material and using excavation waste for landscaping can save on waste disposal costs.
Using building elements created off-site rather than built on-site can also reduce carbon emissions. When built in this way the carbon emissions per unit are lower.

4.3 Source Locally and Responsibly

The carbon emissions involved in transporting materials can be high. Sourcing materials as far as possible from local manufacturers and suppliers will reduce the carbon resulting from transporting the materials. In addition, care should also be given to sourcing materials from sustainable resources; for example, Forest Stewardship Council (FSC) certified timber which comes from sustainable sources. Numerous other certification schemes are available for a variety of different materials.

What To Aim For:

1. Minimise use of raw materials
2. Use of 25% recycled/secondary aggregate in the building construction.
3. Use only sustainable certified timber (FSC, PEFC etc) in construction.

Sources of further information

Responsible Sourcing of Materials: www.greenbooklive.com
Building Research Establishment Website: www.bre.co.uk
Reviving Britain's Terraces: www.savebritainsheritage.org

5.0 ADAPTING TO CLIMATE CHANGE: WATER CONTROL

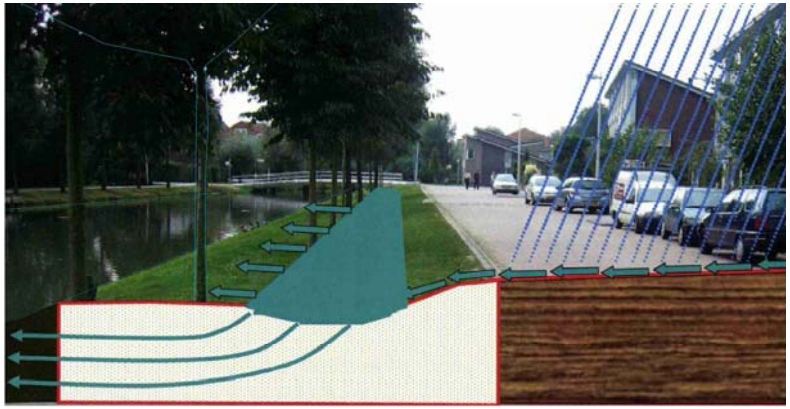
5.1 Flooding

The risk of fluvial flooding (from watercourses) and pluvial flooding (from rain) will increase. Areas at risk from flooding have been highlighted in the Leicester City Council Strategic Flood Risk Assessment. Development should only be proposed in suitable areas and in all cases the Flood Risk Management Hierarchy in Planning Policy Statement 25 (PPS25) should be followed.

If development cannot be avoided designs must show how buildings and occupants are to be protected from the effects of flooding; flood avoidance strategies could include raising the floor level above the flood water level, local bunds, diverting drainage away from buildings, using landscaping to divert floodwater, flood resistant gates, boundaries that are designed to prevent water ingress, storm porches, raised thresholds and using building materials that can tolerate water. When designing it should be noted that 20% should be added to the expected flow of watercourses to allow for the future effects of climate change and it should be ensured that any such proposals do not increase flood risk to others.

5.2 Sustainable Urban Drainage Systems (SUDS)[7]

Development has an impact on the volume of surface water which can contribute to flooding. To minimise potential surface water flooding ***all*** new development will be required to detail their commitment to SUDS within their development and also show the impacts on surrounding areas in the event of extreme flooding has been considered.
SUDS can be designed so that in addition to controlling water quantity they can also improve water quality and contribute to amenity and biodiversity. Ideally a range of SUDS should be considered ranging from water butts and maintaining green areas in gardens through to large scale retention ponds. At this scale they can form part of stormwater attenuation. Where 'soft' land is limited: alternative techniques, for example, below ground water retention tanks can be used. (SUDS in a new development pictured top right)
However, it is unlikely that a fully engineered/below ground approach would be acceptable apart from in exceptional circumstances.



treatment stages
- permeable surfacing
- flat channel edge allows water to flow onto; and through; grass verge
- vegetation slows down surface water speed
- swale picks up most water
- trees take up water and lessen amount/speed at which water hits ground

5.3 Retrofitting SUDS

SUDS should be designed into every new development. When a development is to be extended or modified opportunities to retrofit SUDS should be considered. Retrofitting may only be possible through off site measures. Techniques include separating surface water from foul drainage; and then looking at more local systems to slow surface water; through to providing additional flood storage capacity. (The example pictured right bottom shows a concrete channel with potential for improvement.)

5.4 Using SUDS as flood prevention

The combination of development and erratic weather patterns is leading to situations where flash floods can occur. This can be limited through effective SUDS at a site level and also through wider initiatives such as retrofitting SUDs systems and increasing green infrastructure[8]. The creation of green corridors[9] can ease flooding, improve connectivity and provide wetland habitats to mitigate against climate change impacts.

5.5 SUDS as part of highways

Water run off from impermeable surfaces like highways is artificially fast and can make flooding worse. Therefore developers should incorperate elements of SUDS into roadways to reduce the speed of run off and also provide the potential for local water treatment. (Examples pictured left.)

What To Aim For:

1. Avoid development on areas which have medium and high flood risk.
2. Ensure that flood protection is designed into each building.
3. Control surface water onsite (Aim for run off rates of 5L/sec/ha on greenfield sites and a minimum of existing rates on brownfield sites)
4. Apply varied SUDS opportunities across the site.
5. Incorporate SUDS into highway design.

Sources of further of information

Leicester Strategic Flood Risk Assessment www.leicester.gov.uk
Leicester Surface Water Management Plan (In preparation)
Government Policy: Planning Policy Statements 3 and 25 (PPS3 and PPS25)
The SUDS Manual (CIRA publication C697)
Site handbook for the construction of SUDS (CIRA publication C698)
Flood Water and Management Act 2010

6.0 ADAPTING TO CLIMATE CHANGE: GREEN INFRASTRUCTURE

6.1 The Urban Heat Island effect (UHI) [10]

Urban areas tend to be hotter that their surrounding rural area. It is anticipated that rising temperatures in the future will intensify this problem. There is a need to ease this effect so that the city centre does not become uncomfortable for people to use. This can be done effectively by using reflective surfaces and increasing green infrastructure[8] (GI). GI has a number of other benefits including reducing surface water run-off and increasing areas for biodiversity.

6.2 Greenfield and brownfield sites

Where possible, brownfield sites should be developed in preference to greenfield sites by achieving higher densities on existing sites closer to the city centre. However, brownfield sites should be developed with care and sensitivity to emerging habitats.

6.3 Outdoor spaces

It is anticipated that with rising temperatures there will be increased demand for green spaces. When designed carefully these spaces can provide multiple functions for amenity, sport, food growth, flood alleviation and wildlife habitats. The size, location and connectivity of the outdoor spaces to other surrounding areas of green space will be an important consideration. Developers should incorporate green infrastructure into their developments and design to connect with surrounding green spaces. When designing the layout developers should be sensitive to other issues such as community safety. Guidance can be taken from ‘Secured by Design’ (see below)

6.4 Planting

Even modest increases in tree cover contribute to lowering the heat island effect. Mature trees and green spaces have far greater benefit than newly planted trees and so these should be preserved where possible. Leicester City Council has made a pledge to plant 10,000 trees within the city which developers can further contribute to reduction of UHI[10] by considering new trees in their designs not only in open spaces but also along highways and pavements. (See examples of pavement planting above right and retention of mature trees left.)

6.5 The Individual Building

Green spaces are relatively easy to provide for housing developments through gardens. However, developers should ensure the size of these gardens allow for multiuse (growing food, recreation, drying washing etc). Providing useful outdoor spaces for more urban developments can be a challenge; however plazas, allotment areas, courtyards and green/brown roofs will help to reduce UHI and provide a mosaic of habitats for wildlife in the City.

6.6 Sustainable planting

With anticipated increase in drought conditions it is very important not to choose plants that do not require a large amount of water. Therefore plant choice and planting methods are important to consider. Developers should use plants native to the area that are not dependent on additional watering. There is guidance available on suitable plants from national organisations such as Royal Horticultural Society. Mulching should also be used to increase soil moisture retention. (Example of green/brown roof pictured right)

What To Aim For:

1. Retain any existing trees and green spaces.
2. Design green infrastructure into every development.
3. Ensure that every inhabitant can benefit from creation of positive green spaces.
4. Select plant species so that irrigation is not necessary for survival.
5. Use mulch to retain ground moisture.
6. Create green spaces on flat roofs by developing green/brown roofs.
7. Explain in design and access statements how green spaces are to be used.
8. Connect developed green areas to surrounding existing green areas.

Sources of further information

Leicester City Council Green Spaces SPD (due to be published 2011)
Leicester City Council Green Infrastructure Strategy (in preparation)
Leicester City Council Biodiversity Action Plan 2006-09 (current) 2010-20 (TBA)
Leicester City Council Green Space Strategy 2008-2015 (2007)
East Midlands Landscape Strategy (Natural England 2010)
EMRA – A Biodiversity Strategy for the East Midlands
EMDA – Regional Spatial Strategy for East Midlands (2009)
Natural England – Green Infrastructure Guidance (2009)
Secured by Design (Association of Chief Police Officers (www.securedbydesign.com)
Planning Policy Guidance 17 Open Space Study (2007)

7.1 Subsidence

It is anticipated that extended periods of drought will be one of the effects of climate change to affect Leicester. This could lead to an increased risk of subsidence to properties on clay soils during prolonged dry spells. As such some new buildings could require deeper foundations, depending on ground properties, the proximity, size and species of adjacent trees. Initial construction costs of deeper foundations will be much less than the later corrective action of underpinning.

7.2 Building Heat Gain

There is a balance to be made between the benefits of minimising heat loss in winter with the risk of excessive solar gain during the summer. Careful consideration should be given to site orientation/layout to ensure the benefits of solar energy, passive solar gain, natural ventilation and natural light have been optimised. Landscapes can help by providing shelter to minimise heat losses in winter and provide adequate shade in summer. (Example pictured right)

shade provided by tree and overhanging eaves in summer
in winter lower sun angles and leaf fall allows light into buildings

7.3 Building Adaptability

Buildings should be designed to be as flexible as possible. Developers should keep in mind that with changing climate the use of the building may need to change over time. Therefore layouts should be designed to be flexible and lend themselves to conversion from one use to another. Developers should take guidance from the Lifetime Homes Standard.

7.4 Reducing water demand

As periods of drought increase it will become more important to reduce water demand and use water more efficiently. Reduction of demand can be achieved through the use of water efficient devices and striving to change the behaviour of the inhabitants.

Developers should design water efficient devices into their development. There are many options for this such as low flow shower heads, variable flush lever on toilets, efficient taps, water meter, save a flush in toilets, water efficient appliances, water butts and rainwater harvesting – for water re-use etc.

A development can minimise water use both through inclusion of devices as listed above and through the design of its infrastructure. In the designs for a particular site should take into account the local availability of water and the potential impacts of storage of water on site; above ground rather than in tanks.

Developers should provide encouragement for occupants to be as water responsible as possible. This could be in the form of providing information packs, making a feature out of the water meter or simply providing information on the water saving devices that have been installed in the development. (Examples of behavioural change campaign is pictured right)

What To Aim For:

1. Ensure depths of foundations are suitable for ground structure.
2. Improve microclimate using landscaping and layout.
3. Apply the water consumption reduction targets in Code for Sustainable Homes.
4. Exceed minimum targets laid down in current Building Regulations.
5. Create materials to encourage occupants to use water responsibly.

Sources of further information

Climate Change by Adaptation by Design – Town and Country Planning Association
Planning to Live With Climate Change - The Royal Town Planning Institute
Building Regulations Part G 2010
Water Efficiency Calculator for New Dwellings: found through www.planningportal.gov.uk
Water Efficient Buildings website: www.water-efficient-buildings.co.uk
Waterwise website: www.waterwise.org.uk
Lifetime Homes Standard: www.lifetimehomes.org.uk

8.0 SPECIAL CONSIDERATION: HERITAGE BUILDING MANAGEMENT

8.1 Heritage Buildings

Leicester has a number of important heritage buildings which are a limited resource and alterations can result in a building losing its heritage value. Therefore any alterations to these buildings to mitigate against climate change have to be very carefully considered, not only aesthetically but also in the way the building performs and their historic fabric.

All development should be sympathetic to the special interest of the heritage asset, however, climate change mitigation and adaptation strategies should still be installed where suitable. If the building in question is listed or in a conservation area consent may be required before any kind of works commence. For buildings as unique as heritage buildings there is no ‘one size fits all’ approach and therefore professional advice should be sought in every case.

8.2 Mitigating climate change

When dealing with heritage assets creative thinking is required. Alterations and installations need to be properly considered so that the significance of the asset is not affected. Small actions such as fitting heavy weight curtains, using carpet rather than bare boards and fitting insulation (from appropriate materials such as sheep’s wool) can all have a positive impact and many are feasible at heritage sites. If planned and installed correctly these “small actions” can have as large an impact as “bigger actions” like installing double glazing or solar panels. When planning any mitigation measures it is important to note that historic buildings often require free air circulation, this should always be taken into consideration.

8.3 Adapting to climate change

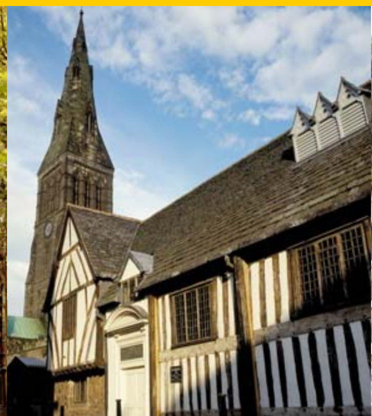
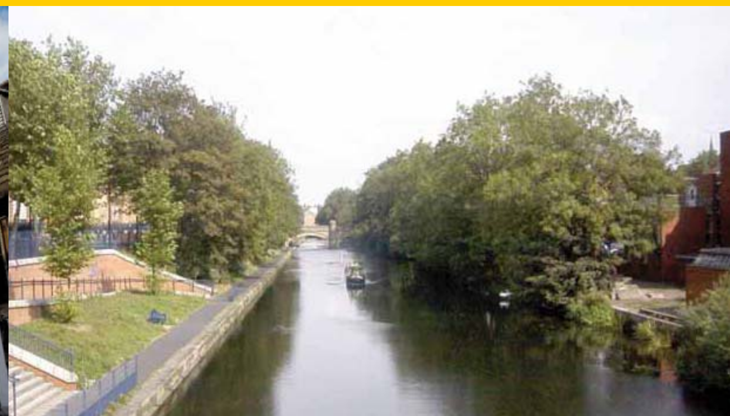
Adapting an existing building to be resilient to the effects of climate change can be a challenge. However, some existing buildings lend themselves to some of the strategies we have seen in previous sections such as increasing green infrastructure, reducing water and energy demand by fitting efficient appliances.
Thought should also be given to protection of buildings from the effects of climate change. For example the damage to a heritage building from flooding can be catastrophic and guidance is available on how this is best dealt with from English Heritage (see below)

What To Aim For:

1. Incorporate efficient appliances to reduce water and energy demand.
2. Increase green infrastructure both on and around the building.
3. Alterations should cause minimum intervention to the heritage asset.
4. Provide details of efficiency measures and their impact in planning submissions.

Sources of further information

Leicester City Council Conservation Team (0116) 252 7218
Government Policy: Planning Policy Statement 5 (PPS5)
English Heritage climate change website: www.climatechangeandyourhome.org.uk
Various English Heritage Publications available on the website relating to renewables
Building Conservation website: www.buildingconservation.com
Heritage Environment Local Management: www.helm.org.uk
English Heritage Flood Advice: www.english-heritage.org.uk/publications


Outline of Key Renewable Technologies

Technology Uses		**Methods**	**Advantages**
Solar Thermal Energy	For water heating	Can offset a large percentage of the hot water requirements of a dwelling	Easily installed Needs back up from the grid Particularly suitable for large water users e.g. leisure centres and swimming pools
Photovoltaic Generation	For electricity generation	Panels can supply a significant amount of energy if correctly sited on an un-shaded south facing roof	Can be incorporated into most buildings Will benefit from Feed-In-Tariffs Should be maintenance free
Wind Generation	For electricity generation	Free standing turbines can provide a good amount of energy	Need a relatively large area of open space Requires some maintenance Will benefit from Feed-In-Tariffs
CHP and CCHP*	For heat and power	CHP provides simultaneous generation of heat and power in a single process and can also provide cooling where required	Very efficient with a fuel efficiency of around 70-80% Can be fitted on a small or large scale to most kinds of buildings
Ground/Air Source Heat Pump	For heat provision	Uses the constant heat of the Earth/air which is transferred via underground pipes to the building	Heats in the winter and cools in the summer Best used in conjunction with under-floor heating
Biomass and Energy Crops	For heat provision	Biomass boilers use chipped or pelleted wood products to supply heat	There is a type of boiler to suit every development Maintenance is low Installations have proved effective in all types of buildings from homes to schools
Energy From Waste	For heat and power	Decomposable waste can be processed in an anaerobic digester that produces gas which can be either directly burned or used in a CHP system, which is considerably more efficient	As a direct burn renewable fuel or CHP

Combined Heat and Power, Combined Cooling Heat and Power

Glossary of Terms

1. **Design and Access Statement:** A statement that must accompany planning applications for outline and full planning permissions and for listed building consent. It is a short report accompanying and supporting a planning application to illustrate the process that has led to the development proposal, and to explain and justify the proposal in a structured way. It must explain and justify the proposal in a structured way, relating the development to current planning policies. For more information on what is expected visit www.leicester.gov.uk.
2. **Passive Solar Gain:** Refers to the increase in temperature in a space, object or structure as a result of solar radiation. The amount of solar gain increases with the strength of the sun, and with the ability of any intervening material to transmit or resist the radiation. In the context of passive solar building design the aim of the designer is normally to maximise solar gain within the building in the winter (to reduce space heating demand), and to control it in summer (to minimise cooling requirements). In direct solar gain systems, the composition and coating of the building glazing can also be manipulated to optimise the greenhouse effect, while its size, position and shading can be used to optimise solar gain.
3. **Thermal Bridging:** A thermal bridge is created when materials that are poor insulators come in contact, allowing heat to flow through the path created. Insulation around a bridge is of little help in preventing heat loss or gain due to thermal bridging; the bridging has to be eliminated, rebuilt with a reduced cross-section or with materials that have better insulating properties, or with an additional insulating component (a thermal break). Concrete balconies that extend the floor slab through the building envelope are a common example of thermal bridging.
4. **Thermal Mass:** Thermal mass is the capacity of a body to store heat. Thermal mass as a concept is most frequently applied in the field of building design. In this context, thermal mass provides "inertia" against temperature fluctuations. For example, when outside temperatures are fluctuating throughout the day, a large thermal mass within the insulated portion of a house can serve to "flatten out" the daily temperature fluctuations, since the thermal mass will absorb heat when the surroundings are hotter than the mass, and give heat back when the surroundings are cooler.
5. **Embodied Energy:** Defined as the commercial energy (fossil fuels, nuclear, etc) that was used in the work to make any product, bring it to market, and dispose of it. Embodied energy is an accounting methodology which aims to find the sum total of the energy necessary for an entire product lifecycle. This lifecycle includes raw material extraction, transport, manufacture, assembly, installation, disassembly, deconstruction and/or decomposition.
6. **Raw Material:** A raw material is something that is for use as a building material to create some product or structure. Often the term is used to denote material that came from nature and is in an unprocessed or minimally processed state.
7. **Sustainable Urban Drainage System:** Systems that are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges. The idea behind SUDS is to try to replicate natural systems that use cost effective solutions with low environmental impact to drain away dirty and surface water run-off through collection, storage, and cleaning before allowing it to be released slowly back into the environment, such as into water courses. The essences of SUDS solutions should be that of a system that is easy to manage, requiring little or no energy input (except from environmental sources such as sunlight, etc.), resilient to use, and being environmentally as well as aesthetically attractive. Examples of this type of system are reed beds and other wetland habitats that collect, store, and filter dirty water along with providing a habitat for wildlife.
8. **Green Infrastructure:** Comprises of a network of multi-functional greenspace which sit within, and contribute to, the type of high quality natural and built environment required to deliver ‘sustainable communities’. Delivering, protecting and enhancing these networks require the creation of new assets to link with river corridors, waterways, woodlands, nature reserves, urban greenspace, historic sites and other existing assets. In particular there is an emphasis on the "life support" functions provided by a network of natural ecosystems, with an emphasis on interconnectivity to support long term sustainability.
9. **Green Corridors:** A wildlife corridor or green corridor is an area of habitat connecting wildlife populations separated by human activities (such as roads or development). This allows an exchange of individuals between populations. Wildlife corridors are important for large species requiring significant sized ranges; however, they are also vital as connection corridors for smaller animals and plants.
10. **Urban Heat Island Effect (UHI):** A UHI is an urban area which is warmer than its surrounding rural areas. The main causes of UHI are modification of the land surface by urban development which uses materials which effectively retain heat (such as concrete and tarmac) and tall buildings which retain heat and block wind preventing cooling by convection. Waste heat generated by energy usage is a secondary contributor. As population centres grow they develop a greater and greater area of land and have a corresponding increase in average temperature. Additional effects of an UHI include increased rainfall in cities, increased length of growing seasons and, more seriously, increased death rates during heat waves and decreased air quality (due to increased production of pollutants). Mitigation of the urban heat island effect can be accomplished through the use of green infrastructure and the use of lighter-coloured surfaces in urban areas, which reflect more sunlight and absorb less heat.

Leicester
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If you require assistance with the contents of this supplementary planning document or would like more advice on the issues or funding possibilities please use the contact details below.

Urban Design Team: 0116 252 7222

Planning Management and Delivery: 0116 252 7249

Planning Policy: 0116 252 7233

Environment Team: 0116 252 7328

Travel Planning: 0116 252 7272