

# Building for Tomorrow Today Sustainable Design and Construction

Leeds Local Development Framework



Supplementary Planning Document  
August 2011

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# Foreword

Leeds is committed to becoming a more sustainable, resource efficient city, resilient to the changes in climate that are predicted for the future. The sustainable design and construction of new buildings throughout the city will be a crucial part of how we maintain Leeds' quality of life for our residents and competitive edge for our businesses.

Working with our partners in the private, public and voluntary sectors, we hope that this document will provide helpful, practical guidance for everyone to play their part in making new developments more sustainable. Applying this guidance will result in buildings that provide healthy, comfortable places to live and work in while minimising their impact on the environment.

Applying this guidance in conjunction with other advice, we are confident that we can maintain Leeds' reputation for high quality sustainable design that will leave a legacy that future generations will thank us for. Local examples and case studies of good practice are used throughout the document to inspire others and we look forward to working with all developers to help us build for tomorrow today.



Cllr Richard Lewis  
Executive Member, Development  
and Regeneration



Cllr Mark Dobson  
Executive Member,  
Environmental Services

# Summary

This Supplementary Planning Document (SPD) on sustainable design and construction encourages developers to support the following aim and objectives:

## Aim

- To provide practical guidance for design and construction projects within Leeds aiming to achieve the highest possible levels of sustainability to support the city in achieving its social, economic and environmental goals.

## Objectives

To support developers in realising projects that:

- Reduce greenhouse gas emissions;
- Successfully adapt to climate change;
- Have a minimal impact on overall environmental quality;
- Provide inclusive development to all users.

## Status

The information contained in this document provides guidance for applicants for major development proposals. The adoption of this guidance means that sustainable design and construction are material considerations to be given weight in considering development proposals and can be the subject of planning conditions and/or obligations in respect of appropriate development. Applicants for planning permission will be expected to have demonstrated that they have considered this SPD and in so doing to have focused on its aims and objectives. Completion of the Checklist for Developers can be used to show how this has been achieved.

## Policy

This SPD summarises the current policy context and establishes the following voluntary standards which are consistent with the policies in the emerging Core Strategy:

### Leeds City Council Voluntary Standards on Sustainable Design and Construction

The council encourages developments of 1,000 or more square metres of floorspace or 10 or more dwellings (either new build or conversion if feasible) to meet at least the standard set by the Code for Sustainable

Homes (for residential development) or BREEAM (for non-residential development) as shown in the table below. A post construction review certificate will also be required.

| Date  | 2010         | 2013         | 2016         |
|---|--------------|--------------|--------------|
| Leeds Code for Sustainable Homes requirement                    | Code level 3 | Code level 4 | Code level 6 |
| Leeds BREEAM standard for non-residential buildings requirement | Very Good    | Excellent    | Excellent    |

### Leeds City Council Voluntary Standard on Climate Change – CO<sub>2</sub> Reduction

The council encourages developments of 10 dwellings or more or over 1,000m<sup>2</sup> of floorspace, whether new build or conversion, to:

- a) reduce total predicted carbon dioxide emissions to 20% less than the Building Regulation Target Emission Rate until 2016 when all development will be expected to be zero carbon; and
- b) provide a minimum of 10% of the predicted energy needs of the development from decentralised, renewable or low carbon energy.

Carbon dioxide reductions achieved in meeting voluntary standard (b) will contribute to meeting voluntary standard (a).

The required percentage reduction may increase as advances in technology enable higher levels of carbon reduction. Details of this will be provided in future versions of this SPD.

If it can be demonstrated that decentralised, renewable or low carbon energy generation is not practical on or near the proposed development, it may be acceptable to provide a contribution equivalent to the cost of providing the 10% which the council will use towards an off-site renewable energy scheme.

The renewable or low carbon energy technologies must be operational before any new or converted buildings are occupied.

## Guidance

The document gives guidance to developers on the following topics, based on the categories and environmental issues covered by the Code for Sustainable Homes and BREEAM:

**Site appraisal** (See section 7)

**Design considerations**  
(See section 8)

**Energy & CO<sub>2</sub> emissions**  
(See section 9)

**Water** (See section 10)

**Materials** (See section 11)

**Surface water run-off**  
(See section 12)

**Waste** (See section 13)

**Pollution** (See section 14)

**Health & wellbeing**  
(See section 15)

**Management** (See section 16)

**Ecology** (See section 17)

The guidance in each of these sections is based on local evidence, existing good practice and includes top tips, a number of local case studies and sources of further information. Where appropriate, each section also highlights the opportunity to adapt development to future climate change, thereby increasing the resilience of Leeds to unavoidable climate change.

# Checklist for Developers

The measures recommended in this SPD do not guarantee compliance with the Code for Sustainable Homes or BREEAM. They are a menu of good practice options that need to be considered for each development on its merits alongside other design principles and guidance set out in other SPD documents. Developers are encouraged to complete this checklist and follow the BRE methodology to demonstrate how their development fulfils the aim and objectives of this SPD by taking a consistent approach to sustainable design and construction. The checklist can be used as a tool to help aid discussions with the planning authority and can also form the basis of a sustainability assessment for the development.

## Standards (see Section 3 page 15)

What standard of sustainable construction (Code for Sustainable homes, BREEAM, etc) does the development achieve?

Does the development reduce total predicted CO<sub>2</sub> emissions to 20% less than the Building Regulation Target Emission Rate?

Does the development provide a minimum of 10% of the predicted energy needs of the development from decentralised, renewable or low carbon energy?

## Site Appraisal (see Section 7 pages 30-32)

Has a comprehensive site appraisal been completed for the development?

## Design Considerations (see Section 8 pages 34-41)

Have the 10 Urban Design Principles been followed?

Are modern methods of construction to be used?

Will the development comply with Building for Life criteria?

Has reuse of existing buildings been considered?

## Energy and CO<sub>2</sub> Emissions (see Section 9 pages 42-65)

What measures have been included to limit emissions of CO<sub>2</sub>:

■ arising from the operation of the building and its services?

■ by limiting heat losses across the building envelope?

■ by providing local energy generation and generation from renewable energy?

■ from appliances?

■ by providing reduced energy means of drying clothes?

■ from lighting?

■ by encouraging cycling?

■ by reducing the need to commute to work?

■ by providing units that show how much energy is being used?

## Water (see Section 10 pages 66-69)

What measures have been included to reduce:

■ internal water use?

■ external water use?

## Materials (see Section 11 pages 70-75)

What measures have been included to:

■ make use of materials with low environmental impacts?

■ specify responsibly sourced materials for basic building and finishing elements?

## Surface water run-off (see Section 12 pages 76-85)

What measures have been included to:

■ avoid, reduce and delay the discharge of rainfall to public sewers and watercourses?

- avoid or reduce the risk of flooding?

- improve sound insulation?

- protect existing ecological features?

### Waste (see Section 13 pages 86-89)

- provide private outdoor space?

What measures have been included to:

- provide adequate indoor and outdoor storage for non-recyclable and recyclable waste?

- construct life-time developments?

- encourage an improvement in ecological value?

- provide facilities for composting waste?

- make most efficient use of land and materials?

Is access sufficient for the residents and waste collection crew?

Does the development have a Site Waste Management Plan?

### Pollution (see Section 14 pages 90-93)

What measures have been included to reduce:

- global warming from insulation materials?

- the emission of nitrogen dioxides (NOx) into the atmosphere?

### Health and well-being (see Section 15 pages 94-99)

What measures have been included to:

- ensure good daylighting and reduce the need for artificial lighting?

### Management (see Section 16 pages 100-103)

Does the development include a user guide?

Will the development operate under the considerate constructors scheme?

What measures have been included to:

- mitigate against construction site environmental impacts?

- design the development so that people feel safe and secure?

### Ecology (see Section 17 pages 104-107)

What measures have been included to:

- enhance the ecological value of the site?

- encourage development on land with limited wildlife value and avoid development on ecologically valuable sites?

### Climate change resilience

References to check that the effects of climate change have been taken into account in the:

- site appraisal (see page 32)
- overall design of the building (see page 41)
- energy efficiency of the building (see pages 49, 50, 53, 55, 56, 57, 62)
- water efficiency of the building (see page 68, 69)
- use of materials in the building (see page 72, 75)
- management of surface water run-off (see pages 83, 84)
- management of waste (see page 88)
- use of solar gain from daylighting (see page 96)
- management of private space (see page 98)
- layout of and services to the development (see page 99)
- ecology of the development (see page 105)

**Look out for this symbol throughout the document to help you with your checklist.**

# 1. Background

- 1.1 This Supplementary Planning Document (SPD) replaces the Sustainable Development Design Guide (Leeds City Council 1998). Under the new planning system for England and Wales that introduces Local Development Frameworks (LDF), SPDs provide further detail to policies in a Development Plan Document (DPD). The requirements for new plan-making have provided the council with the opportunity to work with its partners, the development industry and wider community to strengthen its sustainability policies.
- 1.2 This document does not cover the spatial issues of sustainable development which are covered by government guidance such as PPS1 and PPS6, policies in the Core Strategy and existing SPDs. The issues included in the document cover the design and construction of buildings, once the location has been optimised. Poor location cannot be overcome or mitigated by a development that fully implements the principles of sustainable design and construction. Conversely a well-located development should not ignore the sustainable design and construction principles in this SPD.

- 1.3 Leeds City Council is committed to ensuring inclusion and equality of access for all users. With this in mind, issues for disabled people, older people and all other users are a key consideration within the design and construction process.
- 1.4 The preparation of this SPD has been informed by consultation with the statutory consultees and other stakeholders.
- 1.5 Pending adoption of the Core Strategy, this SPD is supplementary to Unitary Development Plan (UDP) policy GP11: *“Where applicable development must ensure it meets sustainable development principles”* (Leeds City Council 2006c). On adoption of the Core Strategy, this SPD will be supplementary to the relevant Core Strategy policy on sustainable design and construction and may be amended as appropriate.

## 1.6 Aims and objectives

- 1.7 This SPD on sustainable design and construction encourages developers to support the following aim and objectives:

### Aim

- To provide practical guidance for design and construction projects within Leeds aiming to achieve the highest possible levels of sustainability to support the city in achieving its social, economic and environmental goals.

### Objectives

To support developers in realising projects that:

- Reduce greenhouse gas emissions;
- Successfully adapt to climate change;
- Have a minimal impact on overall environmental quality;
- Provide inclusive development to all users.



Bywater Court, Allerton Bywater, Leeds



## 2. How to use this document

Upton eco-housing designed by Gale and Snowdon Architects for Zero C



2.1 Developers are encouraged to support and follow the guidance within this SPD and demonstrate how the aims and objectives have been incorporated into proposals. The sooner that sustainable design and construction principles are incorporated in the design of a development the more successful it is likely to be, with success likely to be further assured through consideration of this guidance at the site appraisal, design, planning and construction phases of the project. Completion of the checklist (see Summary) will help with discussions at pre-application stage.

### 2.2 Status

2.3 The information contained in this document provides guidance for any applicants for major development proposals. It is not intended to be prescriptive nor to restrain the design of development. The adoption of this guidance has been developed in accordance with local, regional and national planning policy. The adoption of this guidance means that sustainable design and construction are material considerations to be given weight in considering development proposals and can be the subject of planning conditions and/or obligations in respect of appropriate development. Applicants for planning permission are expected to demonstrate that they have considered this SPD and in so doing to have focused on its aim and

objectives. Completion of the Checklist for Developers (see Summary) can be used to show how this has been achieved.

2.4 This SPD adopts the standards set out in the national schemes (Code for Sustainable Homes and BREEAM). Developers should note that it is their responsibility to obtain the appropriate post-construction review certificate from a licensed and accredited assessor to demonstrate how the development complies with the requirements of the national schemes.

### 2.5 Checklist for developers

2.6 Developers are encouraged to complete the checklist in the Summary to demonstrate how their development fulfils the aim and objectives of this SPD. The checklist can be used as a tool to help aid discussions with the planning authority and can also form the basis of a sustainability assessment for the development.



## 3. Policy Context

3.1 A widely used definition of 'sustainable development' is "*development that meets the needs of the present population without compromising the ability of future generations to meet their own needs*" established by the World Commission on Environment and Development (1987). Sustainable design and construction of buildings is about producing functional, robust and innovative buildings while minimising their environmental impacts.

### 3.2 Policy drivers: National

3.3 The UK Sustainable Development Strategy 'Securing the Future' (Department for Environment, Food and Rural Affairs 2005a) describes a common purpose for sustainable development: "*The goal of sustainable development is to enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations*". Planning Policy Statement 1 (PPS1) sets out the Government's overarching planning policies on the delivery

of sustainable development through the planning system. Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1 sets out how planning,

in providing for the new homes, jobs and infrastructure needed by communities, should help shape places with lower carbon emissions and resilient to the climate change now accepted as inevitable<sup>1</sup>.



Innovate BREEM accredited offices, Thorpe Park, Leeds

## Key Construction Sector Sustainability Targets

### Carbon emissions and greenhouse gasses

- 15% reduction in carbon emissions from construction processes and associated transport compared to 2008 levels by 2012 (UK Strategy for Sustainable Construction);
- Zero-carbon new homes by 2016 (DCLG, Building a Greener Future);
- Zero-carbon new schools by 2016; zero-carbon new public sector non-domestic buildings by 2019 (The Budget 2008);
- Carbon neutrality to be achieved across the central Government office estate by 2016;
- At least 80% in UK greenhouse gas emissions by 2050 (UK Climate Change Act);
- Reducing UK greenhouse gas emissions by at least 26% by 2020 (UK Climate Change Act).

### Water

- 20% reduction in water consumption during construction phase compared to 2008 levels by 2012 (UK Strategy for Sustainable Construction);
- Reduce per capita water consumption in the home to 120 - 130 litres per day by 2030 (UK Climate Change Act).

### Waste

- 50% reduction in construction, demolition and excavation waste sent to landfill by 2012 compared to 2008 (UK Strategy for Sustainable Construction);
- 20% reduction in construction packaging waste by 2012 (UK Strategy for Sustainable Construction).

### Design

- 10% increase year on year from 2007 levels in the proportion of public building projects using Design Quality Indicators (UK Strategy for Sustainable Construction);
- BREEAM 'Excellent' to be achieved on all new builds and 'Very Good' on all major refurbishments procured by central Government (UK Sustainable Procurement Strategy);
- All public sector housing to be built to Lifetime Homes Standard (Lifetime Homes, Lifetime Neighbourhoods) and all residential projects delivered with Housing Corporation or English Partnerships funding to achieve a minimum of Level 3 of the Code for Sustainable Homes.

### Social

- Reduce the incidence rate of fatal and major injury accidents by 10% year on year from 2000 levels (UK Strategy for Sustainable Construction);
- Increase apprenticeships completed to 18,700 annually by 2012 (UK Strategy for Sustainable Construction).

### Environmental

- All projects exceeding £1m capital value to have biodiversity surveys carried out and necessary actions investigated;
- 25% of products used in construction projects to be from schemes recognised for responsible sourcing by 2012 (UK Strategy for Sustainable Construction).

<sup>1</sup> The Government have recently issued a consultation document (Department for Communities and Local Government 2010a) that brings together the Planning and Climate Change supplement to PPS 1 with the 2004 PPS 22 on Renewable Energy into a new draft PPS on Planning for a Low Carbon Future in a Changing Climate. This new PPS will replace the 2007 and 2004 PPS and it is proposed that it will become a consolidated supplement to PPS 1.

The Government have also issued a consultation document (Department for Communities and Local Government 2010b) to bring together related policies on the natural environment and on open and green spaces in rural and urban areas to ensure that the planning system delivers healthy sustainable communities which adapt to and are resilient to climate change and gives the appropriate level of protection to the natural environment. Another objective for the streamlining and consolidation of policy in this area is to deliver, for the first time, planning policy on green infrastructure.

From 'The Value of Sustainable Construction', Drivas Jonas (2008)

3.4 The Government have signalled their intention to drive up standards of sustainable construction in the UK and planning is a key mechanism to achieve this. Building a Greener Future (Department for Communities and Local Government 2007), set out a target for all new homes to be zero carbon from 2016.

The Government announced in Budget 2008 an ambition that from 2019 every new non-domestic building should be zero carbon and, in order to show government leadership in tackling climate change, an additional ambition for new public sector buildings to be zero carbon from 2018.



### 3.5 Policy drivers: Regional

3.6 At a regional level, the Regional Spatial Strategy (RSS)<sup>2</sup> for Yorkshire and the Humber (Government Office for Yorkshire and the Humber 2008), includes policy YH2 on climate change and resource use which states that *“Plans, strategies, investment decisions and programmes should... Help to meet the target set out in the [Regional Economic Strategy] to reduce greenhouse gas emissions in the region in 2016 by 20-25% (compared to 1990 levels) with further reductions thereafter by:*

1. *Increasing population, development and activity in cities and towns*
2. *Encouraging better energy, resource and water efficient buildings*
3. *Minimising resource demands from development*
4. *Reducing traffic growth through appropriate location of development, demand management, and improving public transport and facilities for walking and cycling*
5. *Encouraging redevelopment of previously developed land*
6. *Facilitating effective waste management*
7. *Increasing renewable energy capacity and carbon capture.”*

3.7 Regional targets are set to reduce greenhouse gas emissions from the region in 2016 by 20-25% (compared to 1990 levels); to increase the average home energy rating to SAP 65 by 2016 for all stock; for all publicly funded housing to achieve at least Code for

#### CASE STUDY: ‘Energy Research Building’

Aiming for BREEAM Excellent, this building achieves a low energy consumption target through using energy efficient mechanical and electrical systems. Features include lighting controls with presence detection, low energy fume cupboards and ventilation

systems with thermal wheel heat recovery, low energy lift, and use of natural ventilation where possible and making use of the thermal mass of the structure. There is also a green roof on the outbuildings.

*Designed by Fairhurst Design Group Ltd for Leeds University*

Sustainable Homes level 3; for all new Yorkshire Forward funded development to meet at least BREEAM ‘Very Good’.

3.8 Policy ENV 5 on energy states that the region *“will maximise improvements to energy efficiency and increases in renewable energy capacity. Plans, strategies, investment decisions and programmes should:... Reduce greenhouse gas emissions, improve energy efficiency and maximise the efficient use of power sources by:*

1. *Requiring the orientation and layout of development to maximise passive solar heating*
2. *Ensuring that publicly funded housing, and Yorkshire Forward supported*

3. *development, meet high energy efficiency standards*
3. *Maximising the use of combined heat and power, particularly for developments with energy demands over 2MW, and incorporating renewable sources of energy where possible*
4. *Ensuring that development takes advantage of community heating opportunities wherever they arise in the region, including at Immingham and near Selby*
5. *Providing for new efficient energy generation and transmission infrastructure in keeping with local amenity and areas of demand*
6. *Supporting the use of clean coal technologies and abatement measures.”*

<sup>2</sup> *At the time of writing, only temporary clarification had been reached about how RSS might be treated in decision making. It is the stated intention of the government to formally revoke RSS as part of the Localism Bill currently before parliament; and this intention is currently a material consideration.*



Designed by Rio Architects for Innovate Property

**CASE STUDY: Innovate, Thorpe Park, Leeds**

Innovate Green Office at Thorpe Park is a commercially viable, sustainable building. It has been given the highest BREEAM Excellent rating (87.55%) ever given to a building in the UK. It features a central atrium offering solar gains, solar shading and thermal mass, and over 25% of materials used in its construction are recycled.

that the council has agreed, government, a single shared set of outcomes and priorities for the city. The Leeds Strategic Plan also embraces the Local Area Agreement for the city. The Leeds Strategic Plan includes commitments to:

- Reduced ecological footprint through responding to environmental and climate change;
- Reduce emissions from public sector buildings, operations and service delivery, and encourage others to do so;
- Undertake actions to improve our resilience to current and future climate change;
- Improve the quality and sustainability of the built and natural environment.

3.9 Regional targets are set in advance of targets being set in Development Plan Documents such that *“new developments of more than 10 dwellings or 1000m<sup>2</sup> of non-residential floorspace should secure at least 10% of their energy from decentralised and renewable or low-carbon sources, unless, having regard to the type of development involved and its design, this is not feasible or viable”*; indicative local targets for installed grid-connected renewable energy for Leeds are 11 MW by 2010 and 75 MW by 2021.

3.10 **Policy drivers: Local**

3.11 At a local level, Leeds has a long standing commitment to the principles of sustainable development. The ‘Vision

for Leeds’ (Leeds Initiative 2004), states that the Local Strategic Partnership (LSP) for Leeds will *“develop planning guidance and new policies to make sure we design and construct new buildings that affect the environment as little as possible.”* It also states that the LSP *“will encourage developers and the construction industry to make new buildings more energy-efficient buildings while minimising their environmental impacts and reduce the amount of waste and pollution they produce.”*

3.12 The Leeds Strategic Plan (Leeds City Council 2008b), sets out the priorities for Leeds for 2008 to 2011. The plan is a significant milestone in partnership working in Leeds as it is the first time

3.13 Leeds City Council values emphasise the importance of sustainable development in delivery of all council services.

- Working as a team for Leeds
- Being open, honest and trusted;
- Working with communities;
- Treating people fairly;
- Spending money wisely.

In this context the need for all development to be inclusive is an important aspect of sustainability.

## CASE STUDY: York Environment Centre

The centre is set in St Nicholas Fields Local Nature Reserve, which has been created from a former rubbish tip. The building is a low energy, high thermal mass, passive solar design powered by renewable energy from photovoltaics and a wind turbine. Hot water is pre-heated by solar panels. The need for space heating is reduced to a minimum and is provided by

locally sourced timber, burnt in an efficient wood stove feeding the few radiators from a back boiler. Human sewage is biologically treated through dry compost toilets. Potable water is provided by collecting and purifying rain from the roof.

*Designed by Ecoarc for Friends of St Nicholas Fields*



3.14 The strategic policy framework for this SPD is provided by the adopted revised UDP (Leeds City Council 2006c), specifically Policy GP11 – “*where applicable development must ensure it meets sustainable development principles*”. This revision was endorsed by the inspector’s report on the revisions which stated that “*sustainable design principles are always applicable, even to small-scale development*” (Leeds City Council 2005c).

3.15 A further revision would have required a “*sustainability assessment... to accompany the submission of all applications for major development*” (as per the definition of major development set out in Circular 15/92 ‘Publicity for Planning Applications’). This latter revision was not fully supported by the inspector who recommended that the council should “*encourage*” rather than “*require*” such assessments and that this should be taken forward through a supplementary planning document which this SPD seeks to achieve (see 2.6).

3.16 Leeds has been applying sustainable development principles to significant developments in the city, notably in Holbeck Urban Village (Leeds City Council

2006b), where the planning framework contains detailed policies and guidance covering eco-homes and BREEAM standards for new and refurbished development, sustainable construction materials, sustainable urban drainage (SUDS), water conservation, renewable and low carbon energy, waste management and biodiversity (see [www.holbeckurbanvillage/about/key-documents.htm](http://www.holbeckurbanvillage/about/key-documents.htm) for further information).

3.17 Leeds City Council signed the Nottingham Declaration on Climate Change in 2006 pledging to systematically address the causes of climate change and to prepare the community for its impacts. The Climate Change Strategy for Leeds (Leeds Initiative 2009), includes priorities to:

- Develop and enforce appropriate planning policies and guidance within the LDF and Sustainable Construction Supplementary Planning Document;
- Develop skills in Leeds City Council to advise developers on carbon reductions from major developments and renewables applications.

3.18 Planning Policy Statement: Planning and Climate Change Supplement to Planning Policy Statement 1 (Department for Communities and Local Government 2006), is clear that any “*policy relating to local requirements... for sustainable buildings should be set out in a DPD, not a supplementary planning document*”. It is therefore not appropriate for this SPD to set mandatory standards for sustainable buildings. Any such policies will be set out in the appropriate DPD such as the forthcoming Core Strategy.

3.19 However it is appropriate for this SPD to set voluntary standards that the council will encourage developers to achieve in advance of any policy being established in a DPD. These voluntary standards will set the context for the negotiation of appropriate planning conditions or obligations on a development by development basis with individual developers wishing to work with the authority in delivering a more sustainable future for Leeds.

Therefore, this SPD establishes the following voluntary standards which are consistent with the policies in the emerging Core Strategy:

**✓ Leeds City Council voluntary standards on sustainable design and construction**

The council encourages developments of 1,000 or more square metres or 10 or more dwellings (either new build or conversion if feasible) to meet at least the standard set by the

Code for Sustainable Homes (for residential development) or BREEAM (for non-residential development) as shown in table 3.1. A post construction review certificate will also be required.

**Table 3.1:**

| Date  | 2010         | 2013         | 2016         |
|---|--------------|--------------|--------------|
| Leeds Code for Sustainable Homes requirement                    | Code level 3 | Code level 4 | Code level 6 |
| Leeds BREEAM standard for non-residential buildings requirement | Very Good    | Excellent    | Excellent    |

**✓ Leeds City Council voluntary standards on Climate Change – CO<sub>2</sub> Reduction**

The council encourages developments of 10 dwellings or more or over 1,000m<sup>2</sup> of floorspace, whether new build or conversion, to:

- a) reduce total predicted carbon dioxide emissions to 20% less than the Building Regulation Target Emission Rate until 2016 when all development will be expected to be zero carbon; and
- b) provide a minimum of 10% of the predicted energy needs of the development from decentralised, renewable or low carbon energy.

Carbon dioxide reductions achieved in meeting voluntary standard (b) will contribute to meeting voluntary standard (a).

The required percentage reduction may increase as advances in technology enable higher levels of carbon reduction. Details of this will be provided in future versions of this SPD.

If it can be demonstrated that decentralised, renewable or low carbon energy generation is not practical on or near the proposed development, it may be acceptable to provide a contribution equivalent to the cost of providing the 10% which the council will use towards an off-site renewable energy scheme.

The renewable or low carbon energy technologies must be operational before any new or converted buildings are occupied.

- 3.20 To demonstrate leadership and good practice in this endeavour, the Council Business Plan (Leeds City Council 2008a), includes an undertaking by the council to *“ensure all new buildings and refurbished buildings (where possible) commissioned by the council meet BREEAM excellent standards with maximum energy credits.”*<sup>3</sup>
- 3.21 Leeds has also selected National Indicators 185 (CO<sub>2</sub> emissions from local authority operations) and 188 (Adaptation to Climate Change) as two key performance indicators.

<sup>3</sup> Other organisations are also setting similar requirements: Yorkshire Forward require development that they fund to achieve BREEAM 'Very Good' ratings. NHS Estates now require all new buildings to achieve BREEAM 'Excellent', and all refurbishments to achieve BREEAM 'Very Good' ratings.

## CASE STUDY: Greenhouse

Greenhouse, located in South Leeds, is a pioneering sustainable development of 166 flats together with work spaces, on site gym, video conferencing facilities, deli café and other amenities.

The building won the RIBA White Rose Award for Sustainability in 2010 and is striving for a BREEAM 'Excellent' rating.

The development comprises part refurbishment of a 1930s hostel together with supplemental new build to comprise one of the most sustainable and progressive developments in the UK whereby everything is designed to increase sustainability in the broadest sense.

The building has exceptional levels of insulation vastly reducing the U values of the building envelope. The original brick structure has been externally clad with 120mm of insulation. This, together with an increased level of air tightness significantly reduces the heating requirements of the building.

A ground source heat pump draws water from an aquifer 80m below the building and via a heat pump, provides heating and cooling to all apartments.

Solar thermal panels mounted on the roof provide all of the hot water during the summer months, with the ground source heat pumps providing top up of the solar thermal in the winter. With various means of heat recovery between the different systems the overall result is a very efficient system for heating and hot water.

The two roof top mounted wind turbines provide electricity for powering the communal areas, and with dedicated energy efficient and LED lighting throughout, PIR's to corridors, A/A+ rated appliances and a host of other energy saving means, the overall result is a vastly reduced electricity requirement.

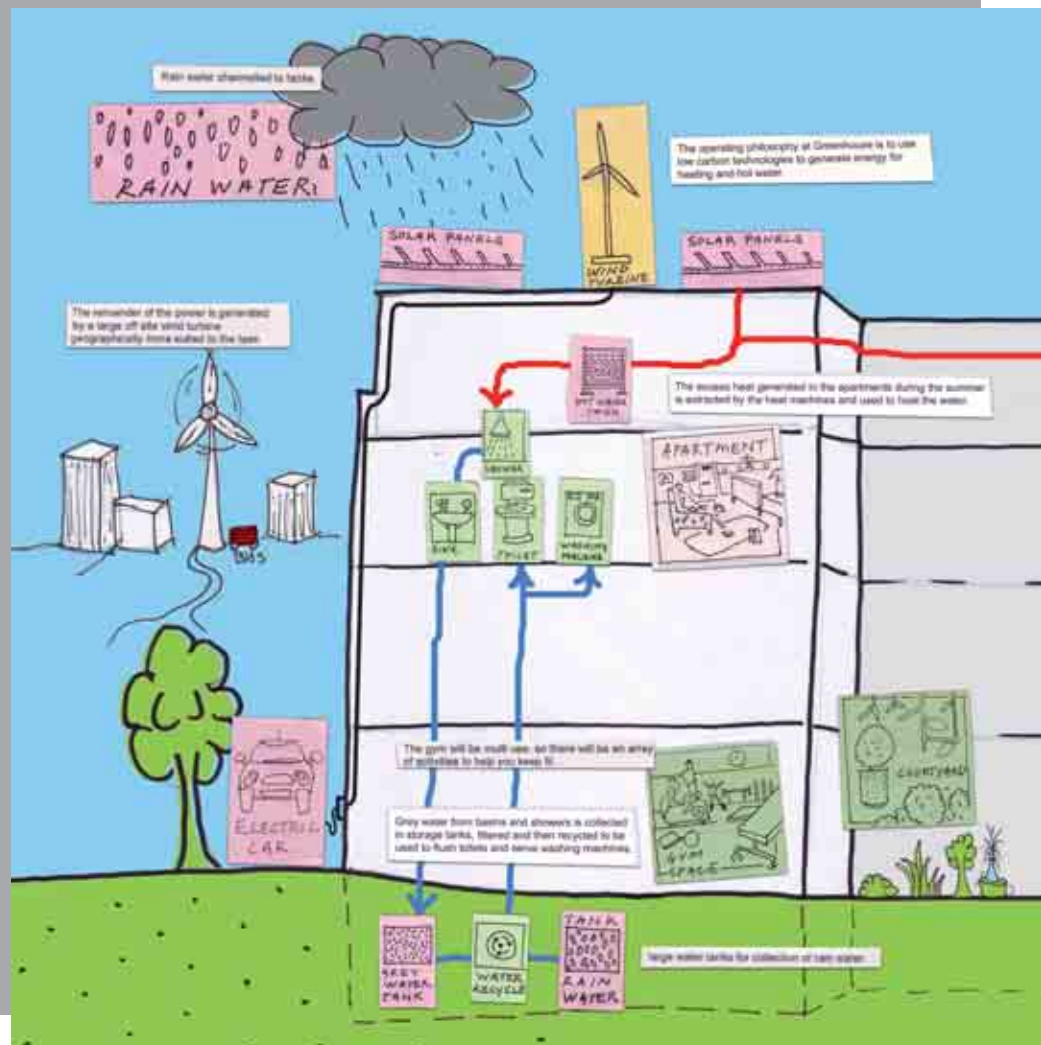
The building boasts a full rain and grey water recycling system which re-uses the recycled water for flushing the dual flush toilets and operating the washing machines. All taps and shower heads are also aerated to reduce the water usage by around 40% from standard fittings. Materials were all carefully chosen with GGBS (Ground Granulated Blastfurnace Slag) concrete, bamboo floors, natural carpets and recycled yoghurt pot signage to name but a few.

The entire building is linked via an IP Network where each apartment or office receives their energy information directly to their TV/ Screen so that real time energy, heating and water usage can be viewed and compared over time to the average. The next generation network provides high speed internet to the building enabling IPTV, video on demand, voice over IP telephony as well as a high speed internet connection.

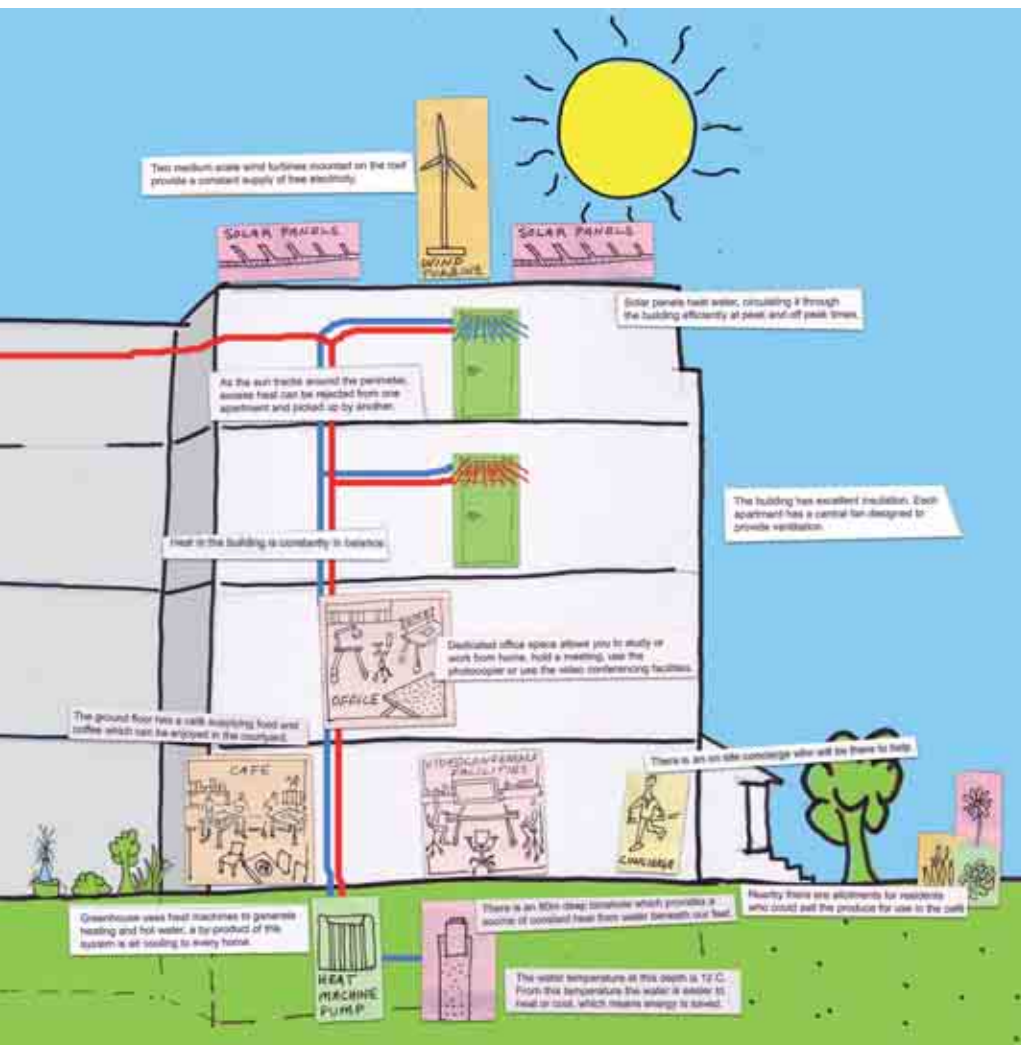


This IP Network also allows people to view real time transport information via their TV's including bus, train and car hire, ultimately making public transport that bit more convenient. There is also a community section on the TV to allow residents to communicate messages to others, for example, what they're growing in the local allotments.

*Designed by West and Machell Architects (and architectural advisors Sturgeon North) for Citu Ltd*







*"At the Greenhouse development, sustainability permeates all aspects of the development and the phrase 'build tight, insulate right' has been the architect's watchword."*

**Robin Machell, West and Machell Architects**

## 4. Code for Sustainable Homes

- 4.1 The structure and content of this SPD is based on the categories and environmental issues covered by the Code for Sustainable Homes and includes the latest proposed amendments (Department for Communities and Local Government 2009).
- 4.2 Since May 2008, all new homes are required to have a rating against the Code for Sustainable Homes (CSH).
- 4.3 From April 2008, all new social housing must be built to a minimum of level 3 of the CSH. The CSH is voluntary for privately built housing except for the elements of the code covered by Building Regulations (principally CO<sub>2</sub> emissions and water), although Leeds City Council is preparing a policy in the Core Strategy of the Local Development Framework which would make performance against all of the standards in the code mandatory for all major development, consistent with the voluntary standards included in this SPD.

### 4.4 Rating system

- 4.5 The CSH uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home.
- A 1\* home will be 10% more efficient and 20% more water efficient than most new homes built in 2008. It may also have some of the other features in the CSH such as providing office work space with communication links within the home, secure cycle storage or greater security features;

- A 3\* home would be 25% more efficient and have many more sustainable features than a 1\* home;
- A 6\* home would be highly sustainable, including most of the sustainability features in the CSH and over the course of the year, the net carbon emissions would be zero.

### 4.6 Categories

- 4.7 There are nine categories in the CSH with credits assigned to each category. The code sets minimum standards for energy and water use at each level. The rating a home receives depends on how it measures up in each category.
- 4.8 Each category includes a number of environmental issues which have a potential impact on the environment. The issues can be assessed against a performance target and awarded one or more credits. Performance targets are more demanding than the minimum standard needed to satisfy Building Regulations or other legislation. They represent good or best practice, are technically feasible and can be delivered by the building industry.



**Table 4.1: Categories and environmental issues in the Code for Sustainable Homes**

|  |  |
|--|--|
| <p><b>Energy &amp; CO<sub>2</sub> Emissions</b></p> <ul style="list-style-type: none"> <li>□ Dwelling emission rate**</li> <li>□ Fabric energy efficiency</li> <li>□ Renewable technologies</li> <li>□ Energy labelled white goods</li> <li>□ Drying space</li> <li>□ Lighting</li> <li>□ Cycle storage</li> <li>□ Home office</li> <li>□ Energy display devices</li> </ul> <p><b>Surface Water Run-off</b></p> <ul style="list-style-type: none"> <li>□ Management of surface water run-off from developments*</li> <li>□ Flood risk</li> </ul> <p><b>Health &amp; Wellbeing</b></p> <ul style="list-style-type: none"> <li>□ Daylighting</li> <li>□ Sound insulation</li> <li>□ Private space</li> <li>□ Lifetime homes***</li> </ul> <p><b>Waste</b></p> <ul style="list-style-type: none"> <li>□ Storage of non-recyclable waste and recyclable household waste*</li> <li>□ Construction site waste management*<sup>4</sup></li> <li>□ Composting</li> </ul> | <p><b>Management</b></p> <ul style="list-style-type: none"> <li>□ Home user guide</li> <li>□ Considerate constructors scheme</li> <li>□ Construction site impacts</li> <li>□ Security</li> </ul> <p><b>Water</b></p> <ul style="list-style-type: none"> <li>□ Internal potable water use**</li> <li>□ External water use</li> </ul> <p><b>Materials</b></p> <ul style="list-style-type: none"> <li>□ Environmental impact of materials*</li> <li>□ Responsible sourcing of materials – basic building elements</li> <li>□ Responsible sourcing of materials – finishing elements</li> </ul> <p><b>Pollution</b></p> <ul style="list-style-type: none"> <li>□ Global warming potential of insulants</li> <li>□ NOx emissions</li> </ul> <p><b>Ecology</b></p> <ul style="list-style-type: none"> <li>□ Ecological value of site</li> <li>□ Ecological enhancement</li> <li>□ Protection of ecological features</li> <li>□ Change in ecological value of site</li> <li>□ Building footprint</li> </ul> |
|--|--|

\* Minimum standards exist for four categories – these must be achieved to gain a CSH level 1 rating.

\*\* If the mandatory minimum performance standard is met for the four categories, two further categories need to be considered: energy efficiency and water efficiency have minimum standards that must be achieved at every level of the CSH, recognising their importance to the sustainability of any home.

\*\*\* The Lifetime Homes standards are mandatory at CSH level 6. From 2010 they will be mandatory at CSH level 4<sup>5</sup> and in 2013 at CSH level 3.



**CASE STUDY:**  
Gledhow Bank Eco-Houses

A development of three houses built in a single terrace by the individual owners of the properties. The construction is post and beam timber frame based on the Segal method of construction using materials with low embodied energy, high

energy efficiency through the highest affordable levels of insulation and efficient heating methods. The houses are independent of the mains sewer, featuring compost toilets and reed bed treatment.

*Designed by Jonathan Lindh and LEDA Ltd*

<sup>4</sup> The Government are currently consulting on whether to remove the mandatory requirement for SWMPs (Department for Communities and Local Government 2009).

<sup>5</sup> The Government are currently consulting on whether to postpone making the Lifetime Home Standards a mandatory requirement from Code Level 4 upwards pending a review in 2010 (Department for Communities and Local Government 2009).

**Table 4.2: Mandatory Elements of the Code for Sustainable Homes**

| Category                | Energy & CO <sub>2</sub> emissions   |   | Water                                     |   | Materials   |  | Surface water run-off  |  | Waste |  | Health and wellbeing |  |
|-------------------------|--|---|---|---|---|--|--|--|-------|--|----------------------|--|
|                         | Minimum percentage reduction in Dwelling Emission Rate over Target Emission Rate | Maximum potable water (litres/person/day) | Maximum potable water (litres/person/day) | Environmental impact of materials   | Management of surface water run-off from developments   | Storage of non recyclable waste and recyclable household waste   | Construction site waste management <sup>6</sup>  | Lifetime Homes   |       |  |                      |  |
| <b>Level 1 (*)</b>      | 10   | 120                                       | 120                                       | At least 3 of the following 5 key elements achieve a relevant Green Guide rating from the 2008 version of The Green Guide of A+ to D <ul style="list-style-type: none"> <li><input type="checkbox"/> Roof</li> <li><input type="checkbox"/> External walls</li> <li><input type="checkbox"/> Internal walls (including separating walls)</li> <li><input type="checkbox"/> Upper and ground floors (including separating floors)</li> <li><input type="checkbox"/> Windows</li> </ul> | The peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site.<br><br>The additional predicted volume of rainwater discharge caused by the new development, for a 1 in 100 year event of 6 hour duration including an allowance for climate change, should be reduced using infiltration and/or made available for use in the dwelling as a replacement for potable water in WC flushing or operating a washing machine. | The space allocated for household waste storage should be able to accommodate containers with at least the minimum volume recommended by BS 5906 based on a maximum collection frequency of once per week.<br><br>A local authority recycling scheme offering containers may meet the requirement (see technical guidance).<br><br>All containers must be accessible to disabled people, particularly wheelchair users, and sited on a hard, level surface. To ensure easy access, the containers must not be stacked. | A Site Waste Management Plan (SWMP) must be developed and implemented.<br>This will require monitoring and reporting of waste generated on site in defined waste groups and compliance with legal requirements as set in SWMP regulations 2008 for and with best practice. The plan should include the setting of targets to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DTI. | All principles of Lifetime Homes, applicable to the dwelling being assessed have been complied with. |       |  |                      |  |
| <b>Level 2 (**)</b>     | 18   | 120                                       |   |   |   |  |  |  |       |  |                      |  |
| <b>Level 3 (***)</b>    | 25   | 105                                       |   |   |   |  |  |  |       |  |                      |  |
| <b>Level 4 (****)</b>   | 44   | 105                                       |   |   |   |  |  |  |       |  |                      |  |
| <b>Level 5 (*****)</b>  | 100  | 85  |   |   |   |  |  |  |       |  |                      |  |
| <b>Level 6 (******)</b> | Zero carbon home   | 85  |   |   |   |  |  |  |       |  |                      |  |

<sup>6</sup> The Government are currently consulting on whether to remove the mandatory requirement for SWMPs (Department for Communities and Local Government 2009).

<sup>7</sup> The Government are currently consulting on whether to postpone making the Lifetime Home Standards a mandatory requirement from Code Level 4 upwards pending a review in 2010 (Department for Communities and Local Government 2009).

Apart from these minimum requirements, the CSH is completely flexible. Developers can choose which and how many standards they implement to obtain credits under the CSH in order to achieve a higher sustainability rating.

#### 4.9 Building Regulations

4.10 The CSH is closely linked to Building Regulations which are minimum building standards required by law. In 2006 the Government announced a 10-year timetable towards a target that all new homes from 2016 must be built to zero-carbon standards, to be achieved through a step-by-step tightening of the Building Regulations (Department for Communities and Local Government 2007). The CSH signals the future direction of Building Regulations in relation to carbon emissions from and energy use in homes, providing greater regulatory certainty for the homebuilding industry.

4.11 The most recent consultation (Department for Communities and Local Government 2009) proposes the timetable set out in table 4.3.

#### 4.12 Assessment

4.13 A CSH assessment can only be carried out by a licensed and accredited CSH assessor. This ensures the rating is independent and trustworthy. In order to build to the CSH, a builder needs to hire the services of the CSH. Leeds City Council offer CSH Assessment at different stages of a development project tailored to clients' and project requirements. Early involvement is important to provide advice and assurance about how the project will meet the required code level. Contact [building\\_control@leeds.gov.uk](mailto:building_control@leeds.gov.uk) or call 0113 247 8106 for more information and assistance. Leeds City Council also offer SAP calculation which will have an impact on code ratings.

4.14 Further information on the CSH, the assessment process and the performance standards required for the CSH, is set out in 'The Code for Sustainable Homes: Setting the standard in sustainability for new homes' (Department for Communities and Local Government 2008a), available from the Department for Communities and Local Government ([www.communities.gov.uk](http://www.communities.gov.uk)).

4.15 Full details on how to assess a home against the CSH is set out in Technical Guidance which provides more detailed information on the evidence needed to meet the performance standard and relevant references. The Technical Guidance is amended as necessary on a six-monthly basis (April and October) to reflect changes in materials, building techniques and as a result of feedback from assessors and industry. The latest version is available from the Department for Communities and Local Government ([www.communities.gov.uk](http://www.communities.gov.uk)).

**Table 4.3: Proposed implementation of the Code for Sustainable Homes**

| CSH Level | Current energy standard (Percentage Improvement over 2006 Part L)                            | Date change to regulations takes place | 2009 Code consultation proposals (Percentage Improvement over 2006 Part L) |
|-----------|--|--|--|
| 1         | 10%  |  | 25%  |
| 2         | 18%  |  | 25%  |
| 3         | 25%  | 2010                                   | 25%  |
| 4         | 44%  | 2013                                   | 44%  |
| 5         | 100% regulated emissions   |  | 70% onsite + 30% allowable solutions                                       |
| 6         | zero carbon onsite – 100% onsite plus appliances (equivalent to approximately 150% in total) | 2016                                   | 'Zero Carbon Home' – 70% onsite + allowable solutions to reach zero carbon |

*Other case studies to refer to:*  
 – Greenhouse p16  
 – Allerton Bywater p33  
 – Oxford Eco-house p54  
 – Denby Dale Passivhaus p60

## 5. BREEAM

5.1 The Building Research Establishment Environmental Assessment Method (known as BREEAM) is an independently accredited scheme that tests the sustainability of a development. Using BREEAM, buildings are given a score which provides an indication of their environmental impact. Issues considered include management, health and wellbeing, energy, transport, water, materials and waste, land use and ecology and pollution in a very similar manner to the CSH.

### CASE STUDY: White Willows, Dyche Road, Jordanthorpe, Sheffield

Through close cooperation between the client, contractor and design team, the Extra Care Housing scheme's intention has been to incorporate an 'Excellent' BREEAM Multi Residence rating. The main sustainable design and construction features include the use of natural light within an orientated building with solar gain and a night cooling system reducing service input. An increase in insulation, efficient use of under floor heating and photovoltaic panels all

helped to maximise and retain energy input. A 'green' sedum roof compliment the photovoltaic panels, increasing insulation, helping store water run off and attracting wildlife to the whole site. Harvested water is held in a reservoir incorporated into the sanitation of the building while also being integrated into the 'fire engineering' operation which uses a fire sprinkler and misting system.

*Designed by West & Machell Architects for South Yorkshire Housing Association*



**Table 5.1: Summary of BREEAM categories and main issues**

**Management**

- Commissioning
- Construction site impacts
- Security

**Health and wellbeing**

- Daylight
- Occupational thermal comfort
- Acoustics
- Indoor air and water quality
- Lighting

**Energy**

- CO<sub>2</sub> emissions
- Low or zero carbon technologies
- Energy sub metering
- Energy efficient building systems

**Transport**

- Public transport network connectivity
- Pedestrian and cyclist facilities
- Access to amenities
- Travel plans and information

**Water**

- Water consumption
- Leak detection
- Water reuse and recycling

**Waste**

- Construction waste
- Recycled aggregates
- Recycling facilities

**Pollution**

- Refrigerant use and leakage
- Flood risk
- NOx emissions
- Watercourse pollution
- External light and noise pollution

**Land use and ecology**

- Site selection
- Protection of ecological features
- Mitigation/enhancement of ecological value

**Materials**

- Embodied life cycle impact of materials
- Materials reuse
- Responsible sourcing
- Robustness

**Innovation**

- Exemplary performance levels
- Use of BREEAM Accredited Professionals
- New technologies and building processes



**CASE STUDY: City House**

The 14 storey City House is located in the heart of Leeds, directly above the train station. The developer, Bruntwood, is targeting a BREEAM 'Excellent' rating for a re-development of the building that aspires to regenerate the internal

space to provide flexible office accommodation for businesses of all sizes while ensuring the protection of the buildings landmark status through a vibrant re-imagining of the structures' external appearance.

*Designed by Sheppard Robson for Bruntwood*

More information is provided in Table 5.1. BREEAM versions are available for homes (now replaced by the CSH), offices, retail, industrial units, schools and health buildings, and other buildings are covered by bespoke assessments.<sup>8</sup>

5.2 In a similar manner to the CSH, BREEAM is based on a system of credits and developers must obtain a certain number of points to achieve a specific rating: 'Pass', 'Good', 'Very Good', 'Excellent' or 'Outstanding'. The operation of BREEAM is overseen by an independent Sustainability Board, representing a wide cross-section of construction industry stakeholders.

<sup>8</sup> BRE Global is developing a new standard to enable the sustainable refurbishment of existing housing titled BREEAM Domestic Refurbishment. The standard aims to provide a single standard in order to assess the environmental performance of housing refurbishment works



*"We have found the discipline of undertaking the BREEAM assessment to be helpful to the project delivery team and not difficult to satisfy given the background and approach to the student residential concept, which is based on sustainable principles."*

**John Wybor**, Director,  
GWP Architecture

#### CASE STUDY: Rose Bowl

Commissioned by a local university, this aspirational city centre new build educational development had clear leadership goals to meet tough BREEAM 'Excellent' credentials and be a design landmark educational building with lecture halls and conference facilities.

Meeting the BREEAM criteria, this building has lowered energy requirements, uses highly efficient cooling, and low water use fittings and rainwater harvesting /grey water use for WCs.

*Designed by Shepherd Robson for Leeds Metropolitan University*

*Other Case Studies to refer to:*  
– Innovate p13  
– Town Centre House p75  
– Fearn's Wharf p84

- 5.3 The BREEAM scheme can be used to assess the environmental impacts arising as a result of an individual building development (including external site areas) at the following stages:
  1. Design Stage (DS) - leading to an Interim BREEAM Certificate.
  2. Post-Construction Stage (PCS) – leading to a Final BREEAM Certificate.
- 5.4 For more information on BREEAM: BRE Environmental Assessment Method see [www.breeam.org](http://www.breeam.org)





#### CASE STUDY: Carnegie Village

An aspirational and innovation-based student accommodation development (480 rooms) with a target of BREEAM 'Excellent' and a Passivhaus design for one of the blocks of highly insulated flats that will be monitored by the University's Department of Building Studies. Built with timber frame and pre-fabricated pods they aimed for a very low waste construction site, with 13% recycled material content in construction materials. The aim was to deliver a landmark scheme for low

carbon and energy efficient student accommodation, incorporating motion controlled lights, rainwater harvesting, solar thermal heating, water saving taps, heat recovery ventilation systems, sustainable sourced materials and A+ rated white goods. The construction company was recognised for its high standard of Corporate Social Responsibility. Solar thermal collectors generate up to 70% of each building's annual hot water requirements and also provide central heating support.

*Designed by GWP Architects for Leeds Metropolitan University*



*Designed by Fielden Clegg Bradley Studios for Downing and Leeds Metropolitan University*

#### CASE STUDY: Broadcasting Place

A well considered sustainable approach with six key design principles of flexibility, orientation and glazing angles, use of natural light, 10% target for use of renewable energy, stringent acoustic requirements with effective mechanical ventilation, and a car free, bike friendly emphasis, with sheltered cycle storage and changing and shower facilities. The building has achieved a BREEAM 'Very Good' rating, with at least 10% of the university's energy use from renewable sources by introducing a ground source heat pump and a flexible design to allow for a variety of uses and adaptable enough to ensure it can be used effectively over a long lifespan.



## 6. Guidance

- 6.1 The guidance follows the structure of the CSH, but also recommends special attention is paid to the crucial initial stage of site appraisal and overall design considerations. Many of the suggestions included in the guide are equally applicable to non-residential developments. Where appropriate, specific recommendations for non-residential developments have been included in the text.
- 6.2 The measures recommended in this guidance do not guarantee compliance with the requirements of the Code for Sustainable Homes or BREEAM. They are a menu of good practice options that need to be considered for each development on its merits alongside other design principles and guidance set out in other SPD documents.
- 6.3 The council recognise that not all elements of the Code for Sustainable Homes or BREEAM are suitable for all development proposals. The guidance in this SPD can be used to negotiate the appropriate minimum standard for each development.
- 6.4 Nevertheless, the guidance is designed to encourage developers to follow the council's lead in this area and aim towards the higher standards of CSH and BREEAM. It is only recently that issues such as climate change, ecological capacity, quality of life, resource scarcity and efficiency have started to emerge as key drivers for future prosperity and competitiveness (Porritt 2007). The future is likely to favour cities which are resource efficient and resilient to climate change. Leeds aims to continue to develop and remain a competitive and economically successful city and encouraging developers to design their development to high standards of sustainable construction will be a key component of this future success.
- 6.5 **Benefits of sustainable design and construction**
- 6.6 The Stern Review (Stern 2007), found that the benefits of strong and early action on climate change far outweigh the economic costs of not acting. The review estimates that if actions are not taken to combat climate change, the overall costs and risks from climate change impacts will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and for the foreseeable future. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of the action required to reduce emissions to a level which would avoid the worst impacts of climate change can be limited to around 1% of global GDP each year. Land use planning has a role to play in ensuring these actions are taken.
- 6.7 The results of a recent survey conducted by the Commission for Architecture and the Built Environment (CABE) and the World Wildlife Fund (WWF 2006), suggests that undertaking sustainable practices benefit both the developer and consumer. The survey found that 87% of house buyers would have liked higher quality information about the environmental performance of the property they were considering for purchase. Furthermore, 84% claimed they would be prepared to pay up to 2% more for a sustainable home.



#### CASE STUDY: Trinity

The Trinity Leeds development is a new retail and leisure development intended to transform the retail quarter around Briggate, Commercial Street, Albion Street and Boar Lane through the removal and regeneration of existing retail stock and the encasement of the entire development under a glazed roof.

The development is projected to achieve a BREEAM 'Excellent' rating through a number of initiatives including a process of generating energy through waste and by ensuring the project achieves it's goal of sending zero waste to landfill, a target achieved by the developer at six previous sites.

*Designed by Chapman Taylor for Land Securities*



*as a result of dwelling type, development type and site characteristics (eg ecological value and flood risk)... Lowest costs are typically seen for those developments where there is potential to use site wide carbon saving technologies (eg CHP systems), these are typically sites with relatively high numbers and densities of development... It is expected that costs of compliance will fall over time and that by 2016 they could have reduced by between 16 and 25 per cent depending on Code level."*

6.8 The Government have introduced feed-in tariffs (FIT) to encourage the uptake of small-scale low-carbon energy technologies by guaranteeing a price for a fixed period for electricity generated (for instance by wind, solar PV, hydro, anaerobic digestion, biomass and biomass combined heat and power (CHP) and non-renewable micro CHP) and intend to introduce a renewable heat incentive (RHI) for heat generated by small scale installations (for instance biomass, solar hot water, air-and ground-source heat pumps, biomass CHP, biogas).

6.9 An analysis of the additional costs associated with achieving higher levels of the CSH (Department for Communities and Local Government 2008b) suggests that the greatest additional construction costs are associated with achieving the carbon reduction requirements of code levels 5 and 6. Although this does not take into account the benefit of zero stamp duty associated with achieving the zero carbon standard.

6.10 The report concludes that "the costs of achieving the higher code levels can vary quite substantially

6.11 This conclusion is consistent with the Council's position of encouraging high standards of sustainable construction on major developments where the economies of scale are more likely to be favourable.

6.12 More recently government research has shown (Department for Communities and Local Government 2009), that "for Code level 3, the most common level built, there has been [a] reduction in additional costs of around 6 per cent since 2007 as builders gain experience and supply chains are established."



### CASE STUDY: 'The Green Building', Holbeck Urban Village, Leeds

The four storey office building is to be constructed on the site of the former David Street Café and will, it is hoped, achieve the BREEAM 'Excellent' that it has been accredited with via the implementation of an energy conscious design. The main features are:

- an aim to deliver CO<sub>2</sub> emissions reduction that is 30% better than the level laid down in Building Regulations, and 24% better than the level laid down in Holbeck Urban Village Revised Planning Framework (which proposes a 52% reduction from the Kyoto protocol baseline);
- an insitu concrete frame for fabric energy storage (FES);
- the primary energy supply being a biomass burner;
- the building having a narrow footprint and optimising on the position, scale and height of glazing to allow maximum use of natural daylight, ventilation and solar heat control;
- recycling of 'grey' rainwater run-off in WCs;
- the use of locally sourced materials, plus at least 10% recycled materials in the construction, with materials reclaimed from the demolition of David St Cafe being used in the hard landscaped courtyard to the north of the building;
- a loose-fit, long life design approach to allow flexibility and adaptability of use.

*Designed by BDP Architects for Igloo Regeneration Ltd and CTP St James Ltd*



6.13 Individuals are becoming increasingly aware of the long-term benefits of sustainable buildings, in terms of cheaper bills, health benefits, more pleasant indoor environments, as well as greater productivity in sustainable offices. In addition, large energy users now have to comply with the requirements of the CRC Energy Efficiency Scheme while Energy

Performance Certificates (EPCs) giving information on the energy efficiency of dwellings have been mandatory since 2007. There is also a requirement for EPCs on the sale, rent or construction of buildings other than dwellings with a floor area greater than 500m<sup>2</sup> from 6 April 2008. From 1 October 2008 all large public sector buildings in England and Wales will have to display a

Display Energy Certificate (DEC) which will show up to three years data on the energy used in that building. The sustainable development guidance contained in this document therefore make social and economic as well as environmental sense.

#### 6.14 Evidence

6.15 The local evidence supporting the need to aim to higher standards of sustainable construction is included and examples of successful developments that adhere to the expected standards are highlighted throughout this document along with sources of further information.

Evidence is drawn from:

- Leeds' participation in the Managing Urban Europe (MUE25) project which was a European funded research project in response to legislation which encourages cities to prepare an environmental management plan for their administrative area. More information on the project can be found at [www.mue25.net](http://www.mue25.net);
- One of the outcomes of the MUE25 project was an improved and more systematic approach to gathering and managing baseline information for the purposes of Sustainability Appraisal (SA) and Strategic Environmental Assessment (SEA). Examples of baseline information can be found in SAs of LDF documents on the Leeds City Council website;
- The Natural Resource flow analysis (Leeds City Council 2008d), prepared to support the development of Leeds City Council's Natural Resources and Waste Development Plan Document (NRWDPD);

- Carbon footprint of housing in the Leeds City Region – A best practice scenario analysis (Stockholm Environment Institute 2008), commissioned by the Environment Agency. This study determines the ability of the Leeds City Region to meet the 80% by 2050 challenge of energy efficiency in the housing sector;
- The sustainability appraisal of the Core Strategy concluded that higher standards for sustainable design and construction are necessary to mitigate the impacts of increased development levels in Leeds.



## 6.16 Climate change resilience

6.17 Even if carbon emissions were drastically reduced tomorrow, there is so much additional greenhouse gas already in the atmosphere that a certain amount of climate change is inevitable. Indeed, the average global temperature has been rising rapidly for a number of years already. The Climate Change Strategy for Leeds (Leeds Initiative 2009) sets out the evidence on the impacts of future climate change including local data from the Leeds Weather Centre and Leeds City Council Met Station. The broad trends to be expected are that winters get warmer and wetter; summers become hotter and drier and that rainfall and other precipitation becomes more intense.

6.18 To help the council and other organisations prepare for the predicted effects of climate change, past extreme weather events and their consequences have been examined. This information is available in Leeds' Local Climate Impacts Profile (LCLIP) which can be downloaded from [www.leedsinitiative.org/environment](http://www.leedsinitiative.org/environment)

From the LCLIP patterns can be seen in Leeds' weather that mirrors UK climate change projections. Leeds can expect to see:-

- seasonal warming, greatest in autumn and winter;
- more wet months;
- more intense, short-periods of rainfall;
- less air frost and snowfall; and
- more winter gales.

6.19 LCLIP show that high winds, flooding and winter conditions affected the road network the most. Flooding caused the most damage with wind damage also causing severe problems. Flooding and high temperatures affected the rail network. Power cuts were caused by flooding and strong winds and an increased demand for power during a heatwave was caused by more people using air conditioning. Sporting and leisure events were disrupted by high winds and flooding. Schools had to close because

of flooding, high winds and wintry conditions. Using this information from severe weather events, and looking at the way organisations and communities have responded, can help to identify areas in Leeds and services that could be vulnerable and will help to target the most cost effective ways to adapt infrastructure and working practices to increase Leeds' resilience to severe weather events in the future.

6.20 The business case for resilience to climate change is set out in *Adapting to climate change: A checklist for development* (South East Climate Change Partnership 2005) and covers the opportunities (financial, market differentiation, risk management, staff retention, innovation, social responsible investment) and risks (operational/financial, consumer expectations, legislation, funding, reputational risk, weather risk, delayed action and loss of productivity).

*Throughout this guidance, opportunities to improve a development's resilience to future climate change impacts are highlighted in these boxes, many of which are drawn from the South East checklist<sup>9</sup>.*

<sup>9</sup> A further source of guidance is "Adapting to the impact of climate change on buildings, neighbourhoods and cities: A Briefing Guide for the North West" available from [www.climatechangenorthwest.co.uk](http://www.climatechangenorthwest.co.uk).

# 7. Site appraisal

7.1 A shift to more sustainable forms of development will require a wider approach, embracing global as well as local environmental concerns and a lifecycle approach to individual schemes. Prior to submission of any proposal for development it is important that the wider context of a site is examined in a site appraisal which identifies both the constraints and opportunities for sustainable development. The site appraisal should examine both the site and its surroundings and include an assessment of accessibility particularly public transport, walking and cycling.

7.2 In terms of this guidance Site Appraisal shall mean "assessing the site with a particular emphasis on those attributes that can lead to a successful sustainable scheme". A good site appraisal is likely to reduce problems and conflicts at later stages in the planning process, see Figure 7.1.

7.3 Key decisions can be made at this early stage that can guide the whole course of the development. For instance a decision might be made to

orientate the access roads in a housing scheme along an East-West axis to facilitate the buildings facing south and therefore maximising passive solar gain.

7.4 Another example would be where the SUDS drainage strategy might be guided by the discovery of an area of water permeable ground. The need for a new cycleway could be identified early to link the site into the local network and help meet sustainable travel targets. If opportunities are missed at the Site Appraisal stage it may not be possible to go back as the scheme progresses.

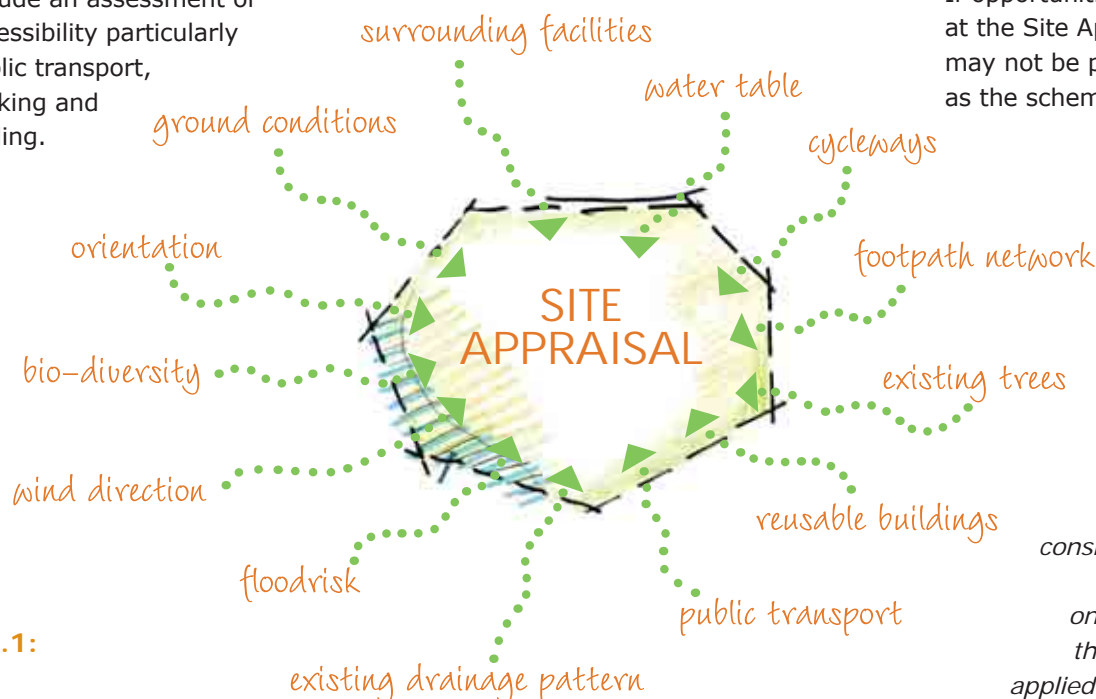


Figure 7.1:

Table 7.1 illustrates the typical factors to consider at Site Appraisal stage and figure 7.2 on page 32 shows how this approach could be applied to a theoretical site.



*“The greatest energy savings from a passive solar estate layout are achieved by using houses specifically designed for passive solar applications. Up to half the savings come from the estate layout with the remainder coming from designing the house itself to take advantage of solar gains.”*

*Passive solar estate layout (1997 edition)  
produced by The Energy Saving Trust*

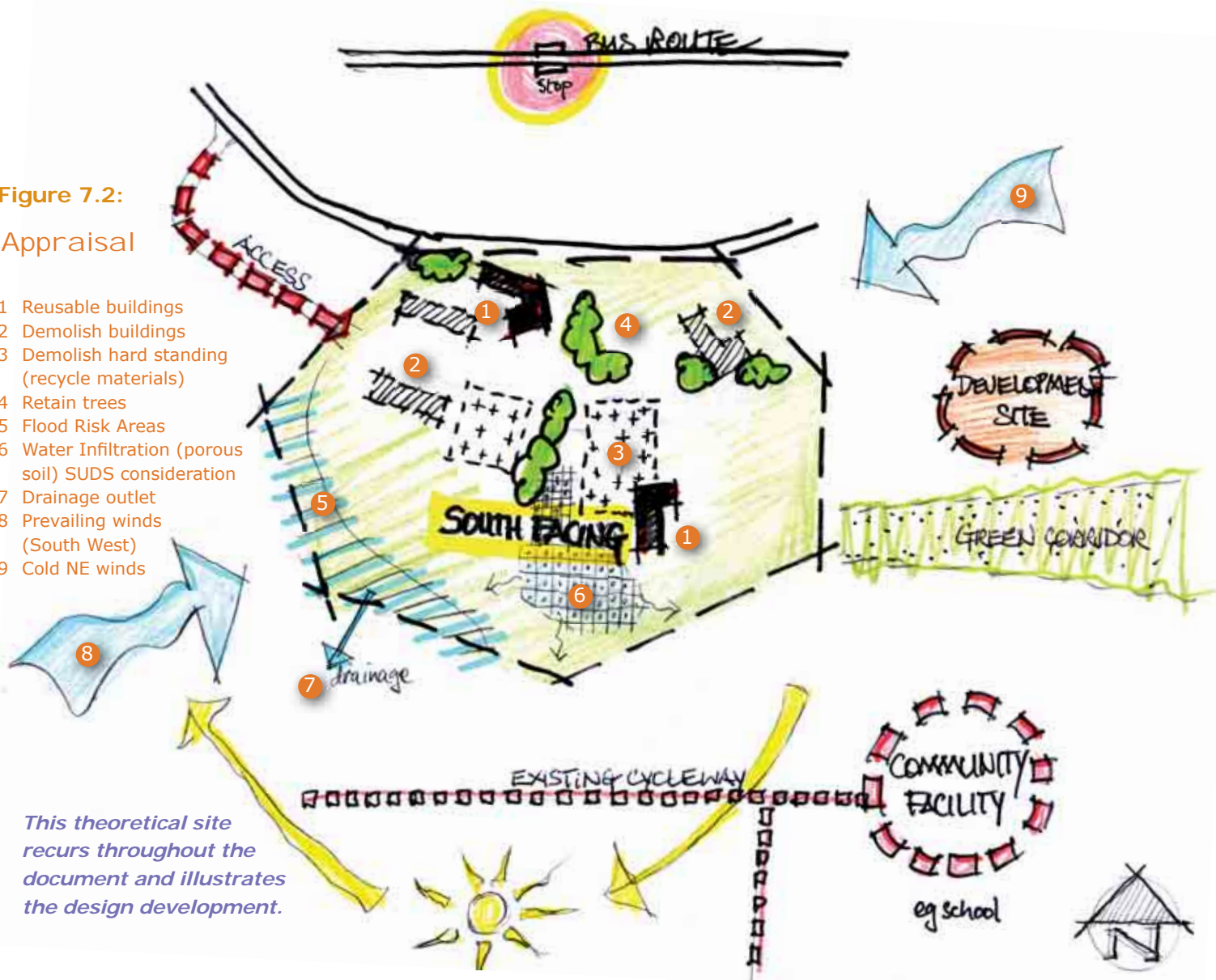


**Table 7.1: Site Appraisal**

| Examples of Site appraisal factors  | Examples of related environmental issues  |
|---|---|
| Solar orientation   | <ul style="list-style-type: none"> <li>□ Passive solar gain</li> <li>□ Renewable energy (eg orientation must meet requirements for solar panels)</li> <li>□ Daylight to primary rooms</li> </ul>  |
| Existing drainage and permeable soil  | <ul style="list-style-type: none"> <li>□ Reduction of surface water run-off</li> <li>□ Opportunities for sustainable urban drainage</li> <li>□ Pollution reduction (filtering out water borne contaminants)</li> <li>□ Water recycling</li> </ul>   |
| Prevailing winds and microclimate   | <ul style="list-style-type: none"> <li>□ Opportunities for renewable energy / reduction in energy losses</li> </ul>   |
| Floodzones  | <ul style="list-style-type: none"> <li>□ Development location in relation to flood risk</li> </ul>  |
| Biodiversity, trees, existing vegetation and features of nature conservation interest. All watercourses, waterbodies and associated habitats within and adjacent to the site  | <ul style="list-style-type: none"> <li>□ Ecological value of site</li> <li>□ Protection of ecological features</li> <li>□ Measure change in ecological value of site</li> <li>□ Outdoor space</li> </ul>  |
| Local transport network – cycleways, footpaths and public transport   | <ul style="list-style-type: none"> <li>□ Access to public transport</li> <li>□ Sustainable travel opportunities</li> <li>□ Facilities for cyclists</li> <li>□ Proximity to local amenities</li> <li>□ Creating walkable neighbourhoods</li> <li>□ Identification of any current or proposed barriers for disabled people and wheelchair users</li> </ul>    |
| Character of the surrounding area, gradients and significance of the site to the area including any boundary features or features of archaeological or historic interest, both in and close to the site, including the setting of a listed building | <ul style="list-style-type: none"> <li>□ Design considerations and opportunities for building and landscape enhancement</li> <li>□ Existing ecology and opportunities for improvement</li> <li>□ Potential to contribute to improved health and wellbeing</li> </ul>  |
| Existing buildings and structures   | <ul style="list-style-type: none"> <li>□ Potential to reuse existing buildings</li> <li>□ Construction site impacts – saving on embodied energy</li> </ul>  |
| Demolition materials and other materials on or near the site  | <ul style="list-style-type: none"> <li>□ Re-using and local sourcing of materials</li> <li>□ Reducing construction waste</li> </ul>   |
| Site stability and any contamination  | <ul style="list-style-type: none"> <li>□ Note that this SPD does not provide guidance on land contamination and remediation. For advice on this please see the land contamination pages on <a href="http://www.leeds.gov.uk">www.leeds.gov.uk</a>. The Coal Authority has detailed coal mining information which may be useful in site appraisal</li> </ul> |
| Levels of atmospheric pollution, noise etc  | <ul style="list-style-type: none"> <li>□ Identification of any current or proposed barriers to recycling and waste collections</li> </ul>   |
| Neighbourhood opportunities – sustainable energy supply   | <ul style="list-style-type: none"> <li>□ Opportunities to link to nearby local energy schemes and networks (such as combined heat and power)</li> </ul>   |

**Figure 7.2:**  
Appraisal

- 1 Reusable buildings
- 2 Demolish buildings
- 3 Demolish hard standing (recycle materials)
- 4 Retain trees
- 5 Flood Risk Areas
- 6 Water Infiltration (porous soil) SUDS consideration
- 7 Drainage outlet
- 8 Prevailing winds (South West)
- 9 Cold NE winds



*This theoretical site recurs throughout the document and illustrates the design development.*

*“Mixtures of deciduous and evergreen species planted as hedges demarcate boundaries, absorb noise and provide shelter. Studies show that hedges planted on north boundaries reduce wind speed substantially – and can cut heating bills in winter by between 10 and 25 percent, an important contribution to more sustainable living.”*

**Tony Kirkham,**  
Head of the Arboretum,  
Royal Botanic  
Gardens, Kew



7.5

Particular attention should be paid to the site's vulnerability to the effects of future climate change by considering details of:

- Solar path information
- Wind speed and direction
- Temperature
- Flood risk
- Microclimate, soil type, water drainage and water table

7.6



Through pre-application discussions and negotiations, developers will be encouraged to submit a **site appraisal** which considers the factors in Table 7.1. These factors are likely to have a bearing on the determination of the planning application.





#### CASE STUDY: Allerton Bywater Millennium Community

Bywater Court uses a light steel frame system and has achieved an EcoHomes 'Excellent' rating with a range of highly energy efficient features, cycle storage and the potential for home office working. At least 75% of the timber and timber products are reused, recycled or come from renewable sources with a low environmental impact and during build construction waste was reduced by 50%.

The energy efficient features include; low emission gas boilers, solar hot water for domestic use and a sustainable drainage system. Bywater Court also aims to improve daylight reach within each home, improve noise proofing and increase fire safety measures.

*Designed by PRP Architects for Fleming Developments UK Ltd*

## 8. Design considerations

- 8.1 The character of our local environment has an important influence on quality of life. This character has been shaped by previous generations and it is our responsibility to ensure that future generations inherit an environment of at least equal quality. Listed buildings form one element of the historic environment. However, perhaps of greater importance is the wider environment and more 'ordinary features' which combine with the landmark buildings to create local distinctiveness. The appearance of new buildings can play a major part in the overall character and quality of an area and they can also do much to shape the image of the city. Good design of buildings is therefore extremely important. There is no simple definition of what constitutes good design. The best buildings are only ever produced by designers of real ability.
- 8.2 Successful developments are more than a collection of buildings and their car parks and service areas. The character of the space around buildings is vital in defining a development's quality, creating an attractive setting, relating to the wider townscape or



Allerton Bywater- Millennium Community

landscape and, if possible, creating habitats. The design of external spaces in association with new built development should be regarded as an integral part of the design process for all but the smallest developments. Well landscaped sites can provide several benefits, including a setting for buildings, attractive spaces for a range of activities, provision of accessible waste and recycling storage facilities, screening of unattractive areas, the visual assimilation of developments into the landscape, a contribution to the visual amenity of the locality as well as a crucial component of improving climate change resilience, as shown in Figure 8.1.

- 8.3 A high quality environment is also important to the economic well being of the district. As a consequence Leeds should be recognised as a good place in which to live, work, visit and invest, as much for its quality of life as its economic performance.
- 8.4 In acknowledgement that good design helps to make communities more sustainable, Leeds City Council adopted the **Ten Urban Design Principles** as policy guidance in 2005 (see Appendix 1). Guidance on important issues such as urban grain, density and scale in scheme designs is covered in Neighbourhoods for Living: A Guide to Residential Design in Leeds (Leeds City Council 2007).



**Figure 8.1:**

**WELL DESIGNED LAYOUT**

- 1 **Buildings retained** (refer to 8.14)
- 2 **East west roads** - maximises potential for passive solar gain
- 3 **Orientation** - main glazed elevations within 30° of south for passive solar gain. Also suitable for solar panels (roof pitch 35-40°)
- 4 **Overshading** - larger buildings to the north (south elevations not obstructed by other buildings)
- 5 **Shelterbelt** - shelter from prevailing SW winds (planted on Flood Risk area)
- 6 **Shelterbelt** - shelter from cold winter NE winds (linking site to Green Corridor)
- 7 **SUDS** - wetland pond
- 8 **Pedestrian/cycleway Links**
- 9 **Food production** - allotments, orchards etc.



Homes and Communities Agency "Carbon Challenge" zero-carbon development, Hanham Hall, Bristol. Designed by HTA Architects for Barratt Developments.



## CASE STUDY: Ice Works

Developed jointly by the Urban Edge Group and Yorkshire Housing, this regeneration project occupies a prominent corner location on a brownfield site in the Exchange Quarter of Leeds City Centre.

The scheme provides 54 one and two bedroom apartments for sale and 25 apartments for rent to help meet the shortage of quality, affordable housing in Leeds. At over 30%, this project has the highest provision of affordable housing in the centre of Leeds.

The apartments for rent were developed by Yorkshire Housing and built using offsite construction to reduce the programme time and to help overcome some of the constraints of this tight city centre site. Ice Works also used modular bathroom pods to further reduce time spent on site.

*Designed by Cartwright Pickard for Urban Edge Group and Yorkshire Housing Association*

### 8.5 Building design

8.6 The design of individual buildings for sustainability requires consideration of such issues as use of materials, energy efficiency, adaptability for future uses and resilience to future climate change. In general terms, vernacular styles of architecture will tend to produce more sustainable buildings than monumental styles due to the materials used and size and form of buildings.

8.7 A general principle for sustainable buildings is that they should be designed to be long life, low maintenance, energy efficient, adaptable to meet changing needs and climate and constructed of low energy, locally produced, renewable materials. A sustainable building should also be accessible.

8.8 Flexibility is a key element of sustainability, as buildings are more likely to be reused if they can be easily adapted to meet changing needs. "Long life - loose fit" developments will be encouraged. A building height of 4 storeys is normally sufficient to allow most activities whilst remaining compact

and at a human scale and avoiding a reliance on the use of lifts. A mix of uses within a building can make efficient use of space, such as living accommodation above shops.

8.9 When designing buildings, there is much guidance available on minimum standards to be achieved. In the case of structural design, for instance, this includes such items as minimum design loads, minimum levels of fire protection etc. However, there is little guidance on maximum standards. Hence, buildings can often be over specified, which will have a significant impact on sustainability (oversized foundations etc). Developers are therefore encouraged to be guided towards using maximum imposed loads as per the British Standard.

### 8.10 Modern methods of construction

8.11 Pre-fabricated buildings are nothing new but they are experiencing a renaissance due to the high level of control they provide through the building process. Components are constructed offsite using a streamlined manufacturing process that minimises waste and complications. Various configurations can be used and

once completed modules are transported from factory to site and constructed quickly and simply.

### 8.12 Building for Life

8.13 Building for Life has become the national standard for well-designed homes and neighbourhoods and is run by CABE and the Home Builders Federation in partnership with Design for Homes. Building for Life is informed by 20 criteria that embody the partners' vision of what housing developments should be: attractive, functional and sustainable. These principles are founded on government policy and on guidance developed by CABE in partnership with Design for Homes. Over 200 local authority officers have been trained to use the 20 questions in the planning process. House builders are using Building for Life to formalise their commitment to design quality. The Government now asks all local authorities to use Building for Life to measure progress in improving design quality. The Homes and Communities Agency have now set out in their proposed core housing design and sustainability standards consultation plans to make achieving 14/20 of the Building for Life criteria mandatory.



#### CASE STUDY: Round Foundry

Round Foundry is a mixed-use regeneration project in Holbeck Urban Village, Leeds. Derelict industrial buildings have been conserved and new ones added which together combine residential, leisure and commercial uses in a vibrant location. Round Foundry

is thought to be the oldest surviving engineering works in the world and its careful conservation has contributed to its special sense of place. Here is a project which shows all the strands of sustainable development - economic, environmental and social.

*Designed by BDP Architects for CTP*

#### CASE STUDY: Hands On

Hands On, run by Leeds Action to Create Homes (LATCH), has seen a derelict grade two listed former coachhouse in Chapeltown eco-renovated by volunteers and is now home to an innovative project teaching construction skills. The main aim of the project was to renovate the coachhouse so that it is highly energy and resource efficient but still maintains the historic character of the building. This was achieved by using reclaimed, recycled and natural materials and preserving many of the buildings original features. The building is very well insulated with timber frames constructed inside the roof and walls and filled with sheep's wool. The walls are plastered with traditional lime or clay plaster to enable the walls to be fully breathable,

helping to regulate moisture levels and reduce damp problems. The building is heated by a clean-burning wood stove that provides heating and houses a kitchen work top that is made from recycled plastic from fridges. The project involved volunteers in the renovation, giving them the opportunity to develop construction skills, while people attending courses can also learn how to reduce the environmental impact of their daily lives with practical information and training on topics like energy efficiency at home. The decision was made to focus on energy conservation rather than energy generation, partly due to the unsuitability of the building for renewable energy and partly to demonstrate that on a small building reducing demand is more important than generating energy.



*Building renovated by LATCH and volunteers*

#### 8.14 Reusing existing buildings

8.15 The extraction, processing, manufacture and transport of building materials can have a significant environmental impact. The reuse of existing buildings should therefore be a priority. Most buildings are suitable for refurbishment which, in addition to reducing the need for construction materials, can offer an opportunity to upgrade insulation standards and heating, lighting and ventilation.

Conserving buildings wherever possible is encouraged for many reasons, including saving the energy embodied in the building fabric and increasing the financial returns on the initial investment. When designing a new building though, architects should think about its legacy to future generations by looking beyond the utilitarian and fashionable, and considering how to create a building that people will identify with, making it valued and reused over time.

8.16 Many historic buildings are now being reused for uses completely different from their original use. This is largely because they were not built to minimal space standards and ceiling heights; they avoided the debilitating effect of being designed too tightly to their function and having such little character that they became inflexible. They were designed under what is now termed 'long-life, loose-fit'.

8.17 They were created with materials that have a long life that may even aesthetically improve over time. Robust materials that mellow with age and weathering are encouraged and such properties are generally found in materials with a low embodied energy and from renewable sources. New developments are encouraged to follow their example and be adaptable to, yet set a framework for, change in the future.

8.18 Historic buildings are inherently sustainable by their very nature. Produced using natural materials and built to last. By 2050 a quarter of homes in Britain are expected to have employed traditional building methods. The refurbishment and reuse of historic buildings is a sustainable method of developing housing stock due to the retention of the embodied carbon in the buildings and also help preserve the character and 'sense of place' which is so important to a local environment.



#### CASE STUDY: Back to Backs in Leeds

As part of the 'Back to back' strategy, Leeds, in partnership with the Building Research Establishment, looked at options to improve the thermal efficiency of a pre-1919 back to back property in Beeston Hill. Testing of the property showed poor thermal efficiency and air tightness, with significant heat loss through all of the external elevation. A system of works was developed to bring the property up to the highest possible standard within a realistic budget. Works included sealing the new roof with breathable foam to improve the air tightness and insulation, installation of 'A' rated windows and a highly thermally efficient door with triple glazed fanlight. External cladding was considered initially

to improve the thermal efficiency of the walls. However neither the initial thermal render or the proposed brick slips proved to be suitable for the external covering of the building. It had been hoped that this could be carried out sensitively while preserving or replicating architectural detail. Unfortunately neither could be satisfactorily developed within the time scales available for the project so internal insulation was used with new material so as to improve the U value without too much egress into the limited living space of the back to back. It is hoped that external cladding of some form will be undertaken in the near future on similar properties to allow the effectiveness of this form of treatment on the pre-1919 stock to be tested.

#### CASE STUDY: Solar panels on council houses

Leeds City Council is taking full advantage of the benefits of solar power and feed-in tariffs to install solar photovoltaic panels on a minimum of 5,000 council owned homes.

Tenants will be able to use the electricity generated for free, reduce their energy bills and CO<sub>2</sub> emissions. It is estimated that this will cumulatively save tenants around £455k a year on fuel bills and reduce CO<sub>2</sub> emissions by around 8,500 tonnes a year.

The feed-in tariff generated will cover the installation, plus the maintenance costs of the panels for 25 years. The remaining income from the feed-in tariff once the solar panels are paid for will be used to finance a free cavity wall and loft insulation scheme for around 13,000 private homes in Leeds, which could save residents over £2.2m in energy bills per annum.





#### CASE STUDY: Mill Green Place, Leeds

Work at Mill Green Place focused on a combination of energy efficiency measures and aesthetic improvement to the properties:

- Brick effect insulating render to the ground floor with coloured pebble-dashed insulating render at the first floor;
- New high efficiency upvc sealed unit double-glazed windows;
- Powder coated vented aluminium eaves provide an improved design for prevention, ingress and exposure to inclement weather (the previous barge board was difficult to cloak against the weather). This has resulted in lower maintenance costs.



8.19 If carbon targets are to be met the continued use of historic buildings is vital. The upgrading of historic buildings to modern standards can be approached sympathetically to improve the energy performance of a building whilst still retaining the special character that makes a positive contribution to its locality.



#### CASE STUDY: A Zero-Carbon Victorian Semi, Manchester

This 1897 Victorian terraced house in Manchester has been transformed through retrofitting, with the following features incorporated:

- Existing windows have been retained and double glazed except stained glass panels which have received secondary glazing. New windows are triple glazed and all windows are fully draft sealed;
- The timber is FSC approved throughout;
- Nearly Carbon Neutral Heating using a gasifying wood burner, which burns logs as well as waste timber, sucking the flames into a chamber beneath the logs which ensures a very hot clean burn with minimal ash. Heat from this and 10m<sup>2</sup> of solar thermal tubes is stored in thermal accumulators (water tanks);
- Gable wall has been insulated externally with wood fibre with a low U-value. Spacetherm has been used internally on the front and back but is very costly;
- Attic roof insulation uses vapour permeable construction with Thermafleec except where space was too tight when Spacetherm and glass wool was used;
- The loft has 400mm of glass wool;
- The ground floor is insulated with hemp between the joists except above the burner where glass wool is used;
- Gutters are made from recycled plastic.

This combination of features has provided an 81% reduction on CO<sub>2</sub> at a cost of £39,000 for the heating, insulation and draft proofing.

*Designed by Urbed. <http://superhome.urbed.coop>*



8.20 There are currently a range of tax relief and capital allowances available on the refurbishment of existing commercial buildings. Consult professional advice for more information on these.

8.21 The following guidelines should be applied:

- ✓ All new development should respect unique and positive local characteristics and, where appropriate, the cultural background of the locality;
- ✓ All features of historic, cultural and aesthetic value should be retained and enhanced, wherever possible;
- ✓ Special attention should be given to development affecting the character of Listed Buildings or Conservation Areas. The aim should be to enhance the setting and safeguard the survival of historic buildings and features;
- ✓ Buildings should be designed for safety, security and comfort;
- ✓ All buildings/developments should embrace the principle of being accessible and inclusive to all users and dwellings should enable someone to stay in their home should individual circumstances change;
- ✓ Over-specification for the building's intended purpose should be avoided;
- ✓ Wherever possible, existing buildings should be retained and refurbished;

#### CASE STUDY: Broad Gate, The Headrow, Leeds

Originally built in 1932, the redevelopment of Broad Gate has been carefully undertaken to consider sustainability principles throughout all stages of the design and construction. Key sustainability highlights of the project include the refurbishment of an existing building, reuse and recycling of materials and energy and water efficient fittings.

Over 80% of the existing building structure has been retained and two thirds of the existing building façade. As a result, fewer materials have had to be imported to the site resulting in a reduced resource and energy usage.



*Designed by Fairhursts Architects for Highcross*

- ✓ Think before you demolish. Can the building be adapted to meet present day needs? Is there an opportunity to improve the energy efficiency of an existing building? Thermal imaging will help to show where a building's thermal insulation can be improved;
- ✓ External insulation does often require planning permission and must comply with building regulations. Guidance in this area is developing and Leeds is leading a Yorkshire and Humber project that will result in further advice and good practice in this area.

In general terms, internal insulation treatments are preferred. However external insulation may be acceptable in less sensitive properties or in treating areas such as rear elevations and gables;

- ✓ All conversions and refurbishments should be designed to reduce energy use in proportion to the embodied energy of new materials used;
- ✓ Many existing buildings are suitable for retrofitting of renewable energy technology, such as solar hot water panels. Care must be taken on listed buildings and in conservation areas and further advice is provided in section 9.57;





Horsforth Town Street



Pudsey Town Centre



- 8.22
- New buildings should be designed to be durable, easily adaptable to change, resilient to future climate change and use low amounts of energy, both embodied and in use (ie, be designed for 'long life - loose fit' and low energy). This generally means that they should not be too closely tailored to individual needs.
  - The foundation design used for new properties will have to allow for the increased risk of subsidence caused by the potential for shrinkage of clay soils.
  - The effect of climate change on wind speeds is uncertain. Speeds may be higher in the future, and thus structures, especially tall ones may need to be stronger or able to be strengthened.
  - As rainfall becomes more seasonal, certain types of soil will experience more extreme cycles of wetting and drying. Trees, which are valuable for shade, windbreaks and heat and water absorption, may aggravate this in certain soils.
  - The thermal massing of a building is important in how it responds to heat losses and gains. Heavy construction can help to regulate temperatures, but lightweight (eg pre-fabricated) construction can heat and cool quicker. Materials such as concrete, stone and tiled floors will soak up unwanted heat during the day. The choice of appropriate thermal mass will depend to some extent upon expected use and occupancy.

8.23 **Further information**

- For more information on Leeds City Council's approach to design, landscape and heritage issues including guidance on distances to trees, the 10 Urban Design Principles as well as the City Centre Urban Design Strategy and Neighbourhoods for Living: A Guide for Residential Design in Leeds see [www.leeds.gov.uk](http://www.leeds.gov.uk).
- Building for Life: <http://www.buildingforlife.org>
- Sustainability checklist for development: <http://southeast.sustainabilitychecklist.co.uk>
- English Heritage: [www.english-heritage.gov.uk](http://www.english-heritage.gov.uk)
- The UK Green Building Council has been established to "dramatically improve the sustainability of the built environment by radically transforming the way it is planned, designed, constructed, maintained and operated" [www.ukgbc.org](http://www.ukgbc.org)
- 'Adapting to climate change: A checklist for developments', South East Climate Change Partnership November 2005: [www.climatesoutheast.org.uk/images/uploads/Adaptation\\_Checklist\\_for\\_Development\\_Nov\\_2005.pdf](http://www.climatesoutheast.org.uk/images/uploads/Adaptation_Checklist_for_Development_Nov_2005.pdf)
- Existing buildings survival strategies. A guide for re-energising tired assets and reducing operating costs: [http://www.ukgbc.org/site/document/download/?document\\_id=626](http://www.ukgbc.org/site/document/download/?document_id=626)
- English Heritage has published a series of guidance documents which look at a range of improvements that can be made to improve the energy performance of existing buildings and how renewable energy technologies might be used on historic properties. These documents can be downloaded from [www.helm.org.uk](http://www.helm.org.uk).

# 9. Energy and CO<sub>2</sub> emissions

## 9.1 Background information on the current situation in Leeds

9.2 Climate change is now the world's most important sustainability issue, which has far reaching consequences for society and the world's economy. There are several natural causes of climate change; however, concern has been growing in recent years that human activity is increasingly contributing to the change. Evidence emerging from scientific studies suggests human activity over the last 150 years is causing a significant acceleration in the rate of change of our climate. The reason for these changes is largely due to the introduction of 'greenhouse gases' into the atmosphere through industrial and other human processes such as farming, feeding society's demand for energy and resources in the modern age (Leeds Initiative 2008).

9.3 The burning of fossil fuels such as oil, coal and gas to produce energy and fuel for transport, together with intensive farming, are all releasing greenhouse



gases into the atmosphere while deforestation limits the natural carbon sink to absorb carbon dioxide. These gases trap heat from the sun, causing 'global warming' and changing weather conditions across the globe. The main greenhouse gas is carbon dioxide (CO<sub>2</sub>), although other gases including methane and nitrous oxides are also culpable (Leeds Initiative 2008).

9.4 The scientific evidence is now overwhelming. Since 1990, global temperatures have risen by 0.2°C and atmospheric carbon dioxide concentrations have increased from 354 parts per million to over 380 parts

per million and are still rising. If the anticipated growth in emissions is left unchecked, global average temperatures could be as much as 5.8°C higher by the end of this century, with a devastating impact on our economy and natural world, in the UK and, above all, in the most vulnerable developing countries (Leeds Initiative 2008).

9.5 Climate change is becoming an increasing concern, and the energy supply sector is the biggest single contributor to the UK's carbon dioxide emissions. The sector was responsible for around 58 million tonnes of



**CASE STUDY: Skelton Grange Environment Centre**

Winner of the Leeds Architecture Award 2004 for Sustainability and Landscape, BTCV's demonstration centre is an innovative environmental education project that showcases sustainable solutions. The centre uses waste heat from National Grid's mains power cable serving Leeds. A south facing conservatory space acts as a sheltering layer and passive solar collector, with photovoltaic cells on the roof and a 2.5kw wind turbine.

*Designed by LEDA Ltd for BCTV*



carbon in 2004 (38% net CO<sub>2</sub> emissions). Three MtC of methane emissions were also emitted by the sector in 2004 from natural gas transmission/distribution, coal mining and offshore oil and gas production (Department for Energy Food and Rural Affairs 2006).

- 9.6 There has been a significant change in the way electricity is generated in the UK since 1990, with a shift away from more carbon intensive fuels such as coal and oil towards lower or zero emissions fuels such as gas, nuclear and renewables (Department for Energy Food and Rural Affairs 2006). The

UK Renewable Energy Strategy (Department for Business, Enterprise & Regulatory Reform 2008) recently consulted on how to increase the proportion of electricity provided by renewables to 15% by 2020.

- 9.7 Energy consumption has been following an upward trend for many years. Despite a policy shift towards the use of lower carbon fuels since 1990, increasing energy demand has resulted in the energy supply sector still being the single biggest emitter of greenhouse gases in the UK (Department for Energy Food and Rural Affairs 2006). This pattern is reflected in energy studies for Yorkshire and the Humber region which show an increase of 2.9% in domestic consumption and 1.3% in commercial consumption in the period 1999-2003 according to the Yorkshire and Humber Regional Energy Strategy. Currently, only 1.5% of regional electricity consumption comes from renewable sources. Following a report by the Government Office for Yorkshire and the Humber (Government Office for Yorkshire and the Humber 2002) suggesting the region could realistically generate 9.4% renewable energy by 2010 and 22.5% by 2021, there is clearly capacity for change.

- 9.8 Total energy consumption for Leeds in 2003 was 1778.5 Ktoe (thousand tonnes of oil equivalent), accounting for 11.4% of Yorkshire and the Humber's energy consumption and 1.4% of England's energy consumption. The dominant fuels used in Leeds are petroleum products (primarily for road transport), natural gas and electricity. Renewable sources account for only 0.25% of the total energy consumed in Leeds (Department for Trade and Industry 2005).

- 9.9 To date, there are only a few examples of decentralised energy in Leeds and most of these are small scale. The largest site is the combined heat and power plant at Leeds General Infirmary, which has been providing heating, cooling and electricity to both the hospital and parts of the University of Leeds since the 1970s. The other large examples are the five landfill sites in Leeds that have the capacity to provide 10MW of electricity – enough for about 5,000 homes. There are also small generators, such as the hydroelectric plant in Otley, the photovoltaic panels on Park Lane College, a mix of technologies including biomass heating at the University of Leeds and demonstrations of technologies at the Meanwood Valley Urban Farm and Skelton Grange.

- 9.10 A study is underway to assess the potential for renewable and low carbon energy in Yorkshire and Humber. See further information for more details on page 65.
- 9.11 According to 'Climate Change: The UK Programme 2006' (Department for Environment, Food and Rural Affairs 2006), the domestic sector is responsible for about 30% of total UK energy use and about 27% of CO<sub>2</sub> emissions on an end user basis. That energy is being used by a wide range of appliances in the home; around 60% for heating, 20% for hot water and the remainder for lighting and other appliances. Improving the efficiency of homes will combat this. Typical energy costs per household per year<sup>10</sup> are currently around £850.
- 9.12 The business sector is responsible for around 40% of total CO<sub>2</sub> emissions in the UK, or 60.5 million tonnes of carbon. The business sector contributes the most overall to UK carbon emissions. Total emission levels have fallen by 12% between 1990 and 2004 and realistic estimates



Solar panels on the roof of Leeds County Courts

suggest that they could fall by 18% by 2010. Greenhouse gas emissions have fallen by 28% between 1990 and 2004, and could realistically fall by 33% by 2010 (Department for Energy Food and Rural Affairs 2006).

- 9.13 A key balance needs to be attained between a reduction in carbon emissions and keeping a competitive business base. Whilst businesses have already reduced their emission rates significantly, further

reductions could be achieved cost effectively. A report (NHBC Foundation 2009) reviews the cost implications and effectiveness of achieving a 10% reduction in energy use over three scenarios: improving the building fabric; installing renewable energy; a combination of the two. The review concludes that, whilst greater lifetime carbon savings are achieved by installing renewables, the improvement of the building fabric and achieving greater efficiencies of service is the most cost-effective option.

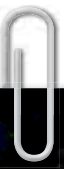
#### CASE STUDY: Park Lane College

The building was the first stage of a site strategy devised in 2002 to optimise the use of the Park Lane site. This was a south facing site and the existing buildings suffered from solar gain. The design approach orientated the new building so that the main elevations faced east and west leaving the south elevation available to collect energy. Grant assistance for the photovoltaic

facade meant that there was no additional cost to the college. The new facade supplies 10% of the buildings electrical demand, while the design further supports the sustainable objectives of the project with additional wall and roof insulation, a sedum green roof, natural ventilation and timber rain-screen cladding.

*Designed by Ian Tod, Ian Tod and Company for Park Lane College (and front cover image).*





9.14 Part L of the Building Regulations: 'Energy conservation in buildings' (Office of the Deputy Prime Minister 2006), will significantly impact on sustainable design by enforcing such improvements as thicker and better quality insulation in homes. It also requires much more forward thinking on behalf of the developer; design decisions previously left until the detailed planning application stage are now required at the pre-planning stage.

CASE STUDY: Leeds Arena

This state of the art 13,500 capacity "super-theatre" will attract some of the biggest names and events in world entertainment. Opportunities have been taken to make the building energy efficient and environmentally friendly, including heating from air source heat pumps, the roof collects rainwater to be reused in the running of the building and an area will have a green sedum roof to help enhance the environment. Improvements to access on Claypit Lane will see the site connected

to the cycling network whilst the construction contractor will monitor waste and the amount sent to landfill as part of commitment to the WRAP initiative. Meanwhile, the arena operator has committed to a green travel plan which aims to reduce single occupancy car journeys and encourage sustainable travel choices among arena employees and visitors. The Leeds Arena is currently aiming to gain a BREEAM 'Very Good' score, with an ambition is to gain the highest BREEAM score of any Arena in the United Kingdom.



<sup>10</sup> *The Observer*, 'Beat price rises by shopping around or getting in a fix'. March 12, 2006.

## CASE STUDY: Pudsey Grangefield School

An educational establishment achieving a BREEAM 'Very Good' rating. Integration of the educational and community function of the building has been thorough, with some degree of pupil involvement. Designed to be flexible over a proposed 60 year lifespan, the building incorporates good use of daylight, night time cooling and roof mounted solar panels, while utilising online building system management.

*Designed by Mentor Architects for Leeds Education Partnership*



9.15 Design-led schemes which reduce energy reliance to a fraction of those required to meet the new code levels are well established on the continent. The PassivHaus standard, a voluntary building standard developed in Germany, achieves up to a 45% reduction in CO<sub>2</sub> emissions compared to a conventional UK house. The objective is to create a building requiring little supplementary heat, achieved through high levels of insulation, triple-pane windows, mechanical ventilation with heat recovery and a level of air-tightness ten times better than current building regulation requirements. There is some evidence suggesting that PassivHaus is most suited to achieving higher levels of CSH (5 and 6) and zero carbon housing (Gentoo Homes 2009).

9.16 Light pollution or 'obtrusive light' has emerged as a significant issue in populated areas. Light pollution obscures the night sky, is wasteful of energy and can also be disruptive to those living in and beside any new development. Public safety and the needs of blind and partially sighted people, requires that highways and other public space are illuminated. However, light pollution can be reduced by the use of directional lighting, as can energy costs, without any loss of illumination.

9.17 The State of the Environment Report (Leeds Environment Partnership 2003), notes that light pollution may be a growing environmental nuisance across Leeds. Further research is required to fully understand the extent of the problem, but this guidance advises against development that loses significant light to the night sky.

9.18 Private car traffic is currently around 15 times more than the 1950 figure for UK. In Leeds the private car is the most favoured form of traffic, a mode of transport that brings about great benefits and disadvantages to the city of Leeds, the negative of these being congestion, CO<sub>2</sub> emissions, noise, and accidents. Since 25% of all car trips are less than two miles long and more than 50% are less than five miles long, the viability of increased public transport, cycling and walking are strong, given the right conditions (Commission for Integrated Transport 2010, Leeds Initiative 2003).

9.19 To counter increasing car ownership and car use, public transport, walking, cycling and car sharing are all viable options. Cycling and walking offer important alternatives to car based travel for shorter journeys, especially as around 34% of households in the Leeds District lack access to a car (National

Statistics 2001). For longer journeys cycling and walking provide the potential for transfer to public transport, with cycling, in particular, widening the catchment area of railway stations.

9.20 Leeds runs various schemes to promote walking, cycling and public transport use. The Core Strategy will include policies on accessibility requirements and new development. An existing SPD provides guidance on 'Public Transport Improvements and Developer Contributions' (Leeds City Council 2008e) and a forthcoming SPD will provide guidance on Travel Plans. Therefore the measures in this document simply refer to physical infrastructure which reduce the need to travel and can support cycling and car sharing. Further encouragements to cycle will not only benefit congestion and pollution levels, but also impact on health.



9.21 Nationwide, memberships of car clubs is currently increasing at a rate of 20% per month. The average car owner spends £90/week on their car, whereas the average car club owner spends £30/month. This emerging market would be greatly supported by infrastructure as part of new developments. An eco-car club will be provided at the Greenhouse development (see Case Study in Chapter 4).



Forward-thinking developments include some flexible space for local food production. The trend towards more sustainable food production will only increase as the price of food increases

due to factors such as the rising cost of transport.

Local produce can contribute to reductions in CO<sub>2</sub> emissions through less food transportation as well as reduced shopping trips. Apart from the obvious health benefits local food reduces the need for food packaging and refrigeration both of which have their own carbon footprints.

9.22 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) draws the following conclusions:

- Leeds produces approximately 0.6% of the regional renewable energy target, which is a very low figure. Potential for increasing the renewable production of energy does exist although the landscape morphology precludes many of the conventional wind and hydroelectric generation techniques;
- However, Leeds produces sufficient waste materials for the implementation of biomass incineration and combined heat and power energy production, and investigation of this potential is recommended;
- The two main sources of CO<sub>2</sub>, and other greenhouse gases relating to climate change in the Leeds area, are the transport and housing sectors;
- The transport sector is the single largest producer of greenhouse gases and is responsible for the majority of any air quality issues. The development of a transport management strategy would therefore have a positive impact on both climate change and air quality issues;
- In relation to household CO<sub>2</sub> production, initiatives to increase the efficiency of energy use in the home through steps such as energy efficient appliances, loft insulation and double glazing are encouraged.

**Table 9.1: Scale of implementation and effectiveness of essential and optional measures**

| Essential measures                        | CO <sub>2</sub> saving (million tonnes) | % of 38 million tonnes required | Scale of implementation over period 2010 to 2026                             |
|---|---|---------------------------------|--|
| Major refit                               | 20.2                                    | 53.2%                           | 50,000 per year (90-95% take-up by 2026)                                     |
| Behavioural change                        | 8.3                                     | 22%                             | 0.6% energy consumption reduction per year                                   |
| Low and zero carbon (LZC) technologies    | 4.7                                     | 12.4%                           | 30,000 per year (35% of all homes by 2026)                                   |
| Building better new homes                 | 3.5                                     | 9%                              | All new homes (14,000 per year) to Code for Sustainable Homes timetable      |
| <b>TOTAL</b>                              | <b>36.7</b>                             | <b>96.6%</b>                    |  |
| <b>Optional measures</b>                  |   |                                 |  |
| Further retrofit to non-cavity wall homes | 1.3                                     | 3.4%                            | 5,000 per year (22% of all non-cavity wall homes by 2026)                    |
| OR Further LZC technologies               | 1.3                                     | 3.4%                            | Additional 10,000 per year (increasing coverage to 47% of all homes by 2026) |
| OR Rebuild of demolished properties       | 1.3                                     | 3.4%                            | 3,000 homes per year or 51,000 by 2026                                       |
| <b>TOTAL</b>                              | <b>38</b>                               | <b>100%</b>                     |  |

9.23 The study of Carbon footprint of housing in the Leeds City Region – A best practice scenario analysis (Stockholm Environment Institute 2008) estimates that with “a growing population and an additional 263,000 housing units to be built within Leeds City Region by 2026, the housing sector would need to reduce its expected total carbon dioxide emissions by 38 million tonnes between 2010 and 2026 to be on track for 80 percent savings in 2050”. Measures to achieve this are set out in Table 9.1.

9.24 The guidance in this SPD will help with achieving the 9% reduction in CO<sub>2</sub> deliverable through new build, although many of the measures suggested are also applicable to major refurbishment and refit (53.2%) and take up of LZC technologies (12.4%).

#### CASE STUDY: Cockburn High School, South Leeds

Cockburn High, a specialist school in the Performing Arts, successfully secured a grant of £10,000 from The Big Lottery ‘Awards for All’ programme to design and construct a school eco-building. The project will comprise a field kitchen and education centre built from a range of natural and reclaimed materials, including straw bales, reclaimed tyres and clay.

The school have already established a food growing area as well as a chicken shed and beehives. The eco-building is the latest collaboration with Groundwork Leeds and will be used for storing and preparing food grown on the allotment, hosting community events, selling the school’s eggs and honey and also as a base for outdoor education.

9.25 The CSH includes nine issues in this category whose aims are:



Work on the building has now commenced with some of the pupils involved in its construction.

Images courtesy of Groundwork Leeds



|                             |  |
|-----------------------------|--|
| Dwelling emission rate      | To limit emissions of CO <sub>2</sub> into the atmosphere that arise from the operation of a dwelling and its services   |
| Fabric energy efficiency    | To future proof the energy efficiency of dwellings over their whole life by limited heat losses across the building envelope   |
| Renewable technologies      | To reduce carbon emissions and atmospheric pollution by encouraging local energy generation from renewable sources to supply a significant proportion of energy demand |
| Energy labelled white goods | To encourage the provision or purchase of energy efficient white goods, and so reduce the CO <sub>2</sub> emissions from appliances in the dwelling                    |
| Drying space                | To provide a reduced energy means of drying clothes  |
| Lighting                    | To encourage the provision of energy efficient external lighting, and reduce associated CO <sub>2</sub> emissions  |
| Cycle storage               | To encourage the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys           |
| Home office                 | To reduce the need to commute to work by providing residents with the necessary space and services to be able to work from home  |
| Energy display devices      | To help influence residents’ behaviour by providing them with a clear indication of their energy use.  |

#### 9.26 Building emission rate

9.27 Measures that can be taken to limit emissions of CO<sub>2</sub> into the atmosphere that arise from the operation of a building and its services include:

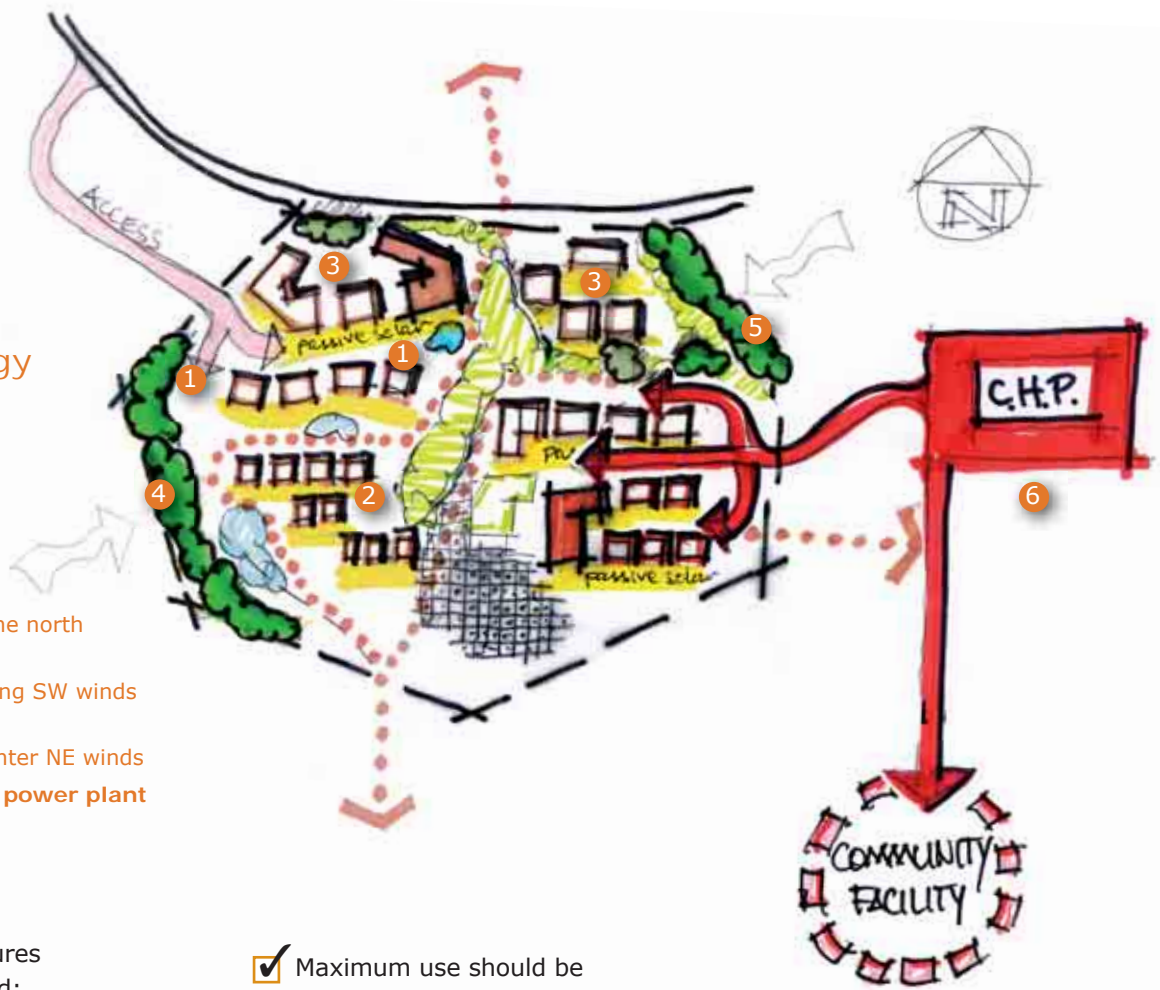
#### 9.28 Increasing solar gain

9.29 The layout of a site will have a direct impact on the potential for maximising both passive and active solar gain in any development. Passive solar gain alone can save up to 10% of heating demand (Energy Saving Trust 2006) and does not impose significant additional costs or design constraints on a development, see figure 9.1. House types can easily be modified to achieve passive solar gain objectives.



**Figure 9.1:**  
**layout & energy**

- 1 **East west roads**  
 - passive solar gain
- 2 **Orientation**  
 - passive solar gain and solar panels.
- 3 **Avoid overshadowing**  
 - larger buildings to the north
- 4 **Shelterbelt**  
 - shelter from prevailing SW winds
- 5 **Shelterbelt**  
 - shelter from cold winter NE winds
- 6 **Combined heat and power plant**



The following measures should be considered:

- ✓ As well as providing shelter, deciduous trees provide shading from the sun in the summer and let light in during winter when the leaves drop;

- ✓ Maximum use should be made of south facing slopes which will allow closer spacing of buildings and trees whilst still avoiding overshadowing;
- ✓ Taller buildings should be located to avoid overshadowing neighbouring buildings;

- ✓ Generally all buildings should be spaced to avoid overshadowing; ideally obstructions should be no higher than 25' above the horizontal to allow adequate daylight into neighbouring windows. See figure 9.3;
- ✓ Car parking areas and garages should be located to the north of buildings as these areas will not derive any benefits from solar gain.



□ The layout of new development should balance the benefits of minimising heat loss in winter with the risk of excessive solar gain during the summer. Orientation of buildings so that the main elevation faces within an angle 30° of due south. Main residential roads should run east-west where possible to assist with this. Buildings oriented east of south will benefit more from morning sun, while those oriented west of south will catch late afternoon sun. See figure 9.2;

□ Consider the impact of trees, other buildings, walls and fences on over-shadowing. This will reduce the scope for passive solar heating, particularly on north facing slopes, but can assist with avoiding overheating in summer; openings facing the sun could be shaded from summer sun, for example by trees, recessed or given overhangs, blinds or shutters and reflective glass.



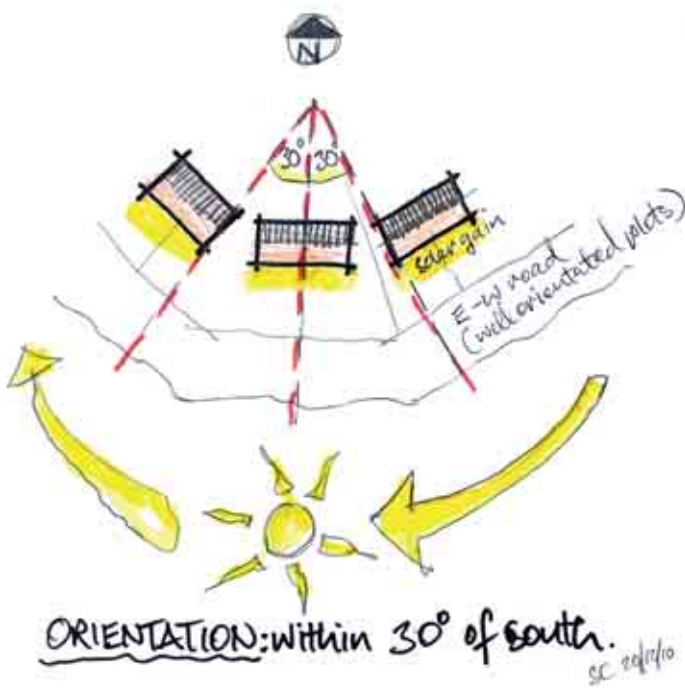


Figure 9.2:

9.30 Reducing heat loss

9.31 The shelter afforded to a building, particularly from prevailing winds, will affect the degree of heat loss. To achieve a sheltered microclimate, the following measures should be considered:

- ✓ Grouping buildings to avoid long uninterrupted passages and short gaps between buildings;
- ✓ Joining buildings, particularly housing, to create shelter and reduce the external wall-volume ratio;
- ✓ Building to a uniform height;
- ✓ The use of densely planted shelterbelts, but taking care to avoid overshadowing;
- ✓ The potential to link buildings should be explored for non-residential developments;
- ✓ Thermal buffering can be provided by attaching conservatories, lobbies, garages and greenhouses to the outside of heated rooms;
- ✓ All windows and external doors should be draught sealed. For commercial buildings with large doorways, air lobbies can be used to reduce heat loss;
- ✓ On sloping sites, buildings can be cut into the slope;
- ✓ Earth sheltered buildings should be considered. These provide good sound and heat insulation and can reduce impacts in sensitive locations.

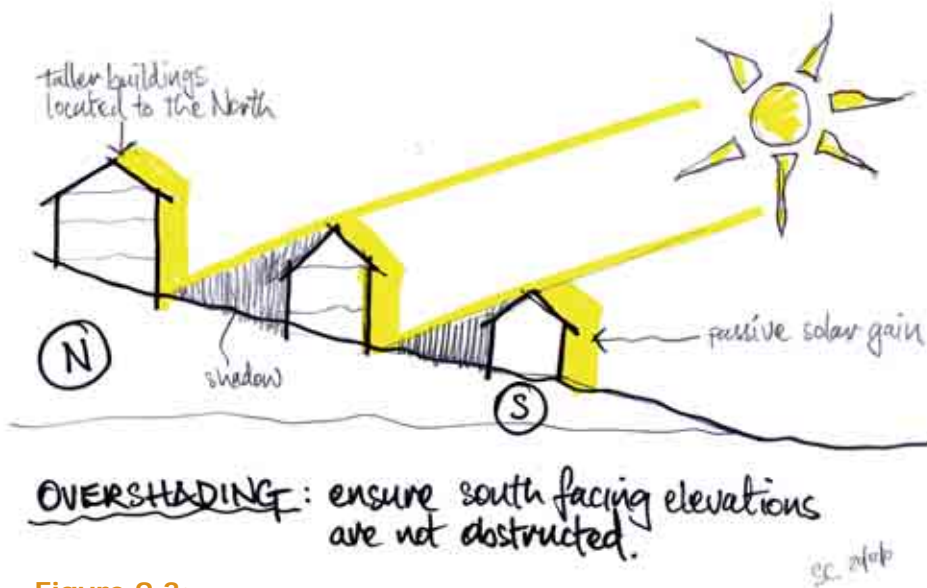


Figure 9.3:



- Avoid development in frost pockets or on exposed hillcrests;
- Design large buildings to avoid increasing air speed and turbulence;
- Compact buildings, such as flats and terraces, reduce the surface area for heat loss. Such buildings also provide flexibility for changing patterns of household formation.



insulating jacket



roof insulation



compost bin



solar panels and photovoltaic cells



condensing boiler



insulating the walls



dual-flush toilet



water efficient shower

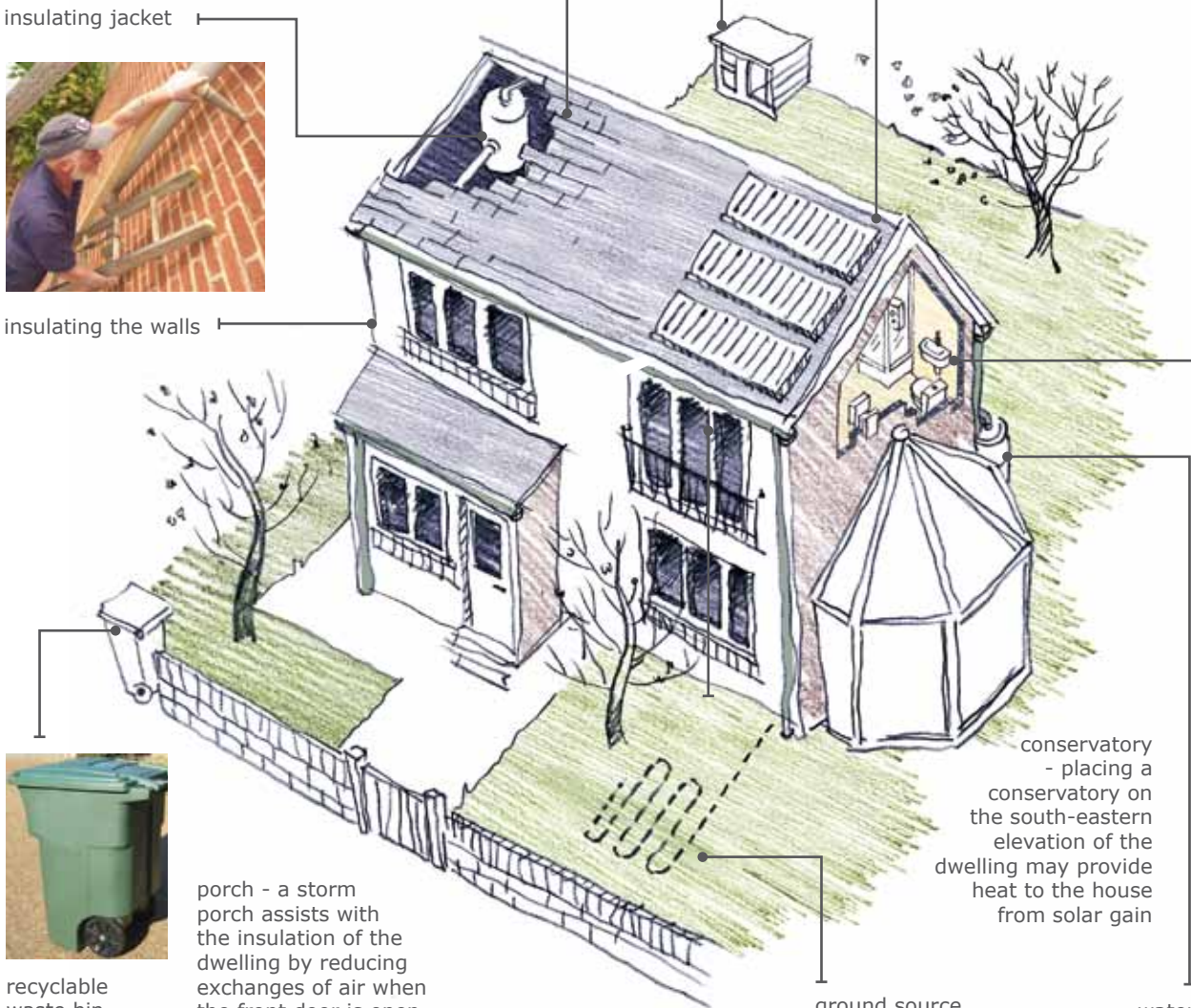


recyclable waste bin

porch - a storm porch assists with the insulation of the dwelling by reducing exchanges of air when the front door is open.



aerated taps



conservatory - placing a conservatory on the south-eastern elevation of the dwelling may provide heat to the house from solar gain

ground source heat pump

water butt



Thermal imaging shows heat loss from a well insulated house (right) and its poorly insulated neighbour



### CASE STUDY: Carnegie Pavilion

The Carnegie Pavilion is a joint venture between Leeds Metropolitan University and Yorkshire County Cricket Club and has been awarded BREEAM 'Excellent' status for its environmental features. The co-occupation of the building (over 70% of the rooms have been designed for 'dual-use') dramatically reduces running costs as well as the carbon footprint. Air source heat pumps are utilised to provide heating, cooling and (part of) the domestic hot water load for the building, while the use of low-energy fluorescent lights, which are controlled via manual switching, presence/absence detection and are also daylight-linked, minimise energy consumption and automatic water shut-off and major leak detection systems help to ensure that wastage of water is minimised. A minimum of 10% (by spend) of materials used within the build are recycled materials.

*Designed by Alsop Sparch for Leeds Metropolitan University*

*"Leeds Metropolitan University is delighted that its latest building has achieved a BREEAM excellent rating. This was especially challenging in a mixed use building with our partnership with YCCC and with a south-facing aspect. It's a testament to the high quality team work and critical and clear challenge of our belief in sustainability that the building was recognised as such"*

*Sue Holmes, Leeds Metropolitan University Director of Estates*

#### 9.32 Floor plans

9.33 The following measures should be considered:

- ☑ Living rooms and spaces should be orientated to the south and have larger windows to maximise solar gain;
- ☑ Kitchens, utility rooms, stores, stairs, halls, cloakrooms and bathrooms should generally be orientated to the north and fitted with smaller windows to reduce heat loss;
- ☑ In commercial buildings locate toilets, kitchen areas and storage space to the north of the building;

- ☑ Car parking and garage facilities should be located to the north side of buildings.



**CASE STUDY: Hockerton Housing Project, Nottinghamshire.**

The solar space heating system is completely passive. Heat transfer from the conservatory to the house can be facilitated by opening the windows, if required.

**9.34 Conservatories and porches**

9.35 The following measures should be considered:

- ✓ Locate conservatories on south, west or east facing walls. The conservatory should not be heated and there must be a properly insulated wall between the conservatory and the rest of the building;
- ✓ The conservatory should be properly insulated and double-glazed;
- ✓ Windows should be able to be opened securely to allow adequate ventilation during summer months;
- ✓ Avoid over-shading by trees and other structures;
- ✓ On commercial buildings, draught lobbies/entrance porches should be used to reduce heat loss through external doors.

**9.36 Heating and ventilation**

9.37 The following measures should be considered:

- ✓ Solar hot water systems can be integrated with conventional boilers, providing a substantial proportion of hot water requirements, reducing the size required for a conventional heating system;
- ✓ Use the smallest appropriate system to enable use at optimum efficiency;

- ✓ High efficiency condensing boilers with good heating controls should be used; some domestic boilers are micro CHP boilers, using the steam produced in the heating process to generate electricity;
- ✓ Gas is cleaner and generally more efficient than electricity. However, this may change as the proportion of electricity generated from renewable resources increases;

- ✓ Use a system that is adaptable to different fuels in the future - this will be particularly important as technologies that exploit renewable sources of energy are developed;
- ✓ Biomass (wood) boilers can be combined with oil, gas or solar technology and will require a dry storage space for fuel. Ash residue can be used as fertiliser in gardens;



- Developers should avoid traditional air conditioning and use alternative ventilation and cooling methods so that comfortable temperatures can be maintained for the expected climate throughout the design life of the development, while minimising greenhouse gas emissions;
- Where cooling and ventilation systems are necessary, they should be as energy efficient as possible, making use of low or zero carbon energy where possible. Excess heat from cooling systems should not be dumped in the environment where it will cause problems for other developments, the public or the environment in general. Such waste heat may be used as an energy source in its own right;
- Larger floor-to-ceiling heights will generally help in allowing later addition of any cooling mechanisms. In addition, higher ceilings will also trap hot air above the heads of occupants, making the room feel cooler;
- Heat exchange or groundwater cooling or use of chilled beams could be considered as part of the structure of the building from the outset;
- Ensure that ventilation brings clean, pollution-free air into the building and does not compromise noise levels or security;
- Mediterranean style shutters and verandas can be incorporated to help keep buildings cool while light coloured surface treatments such as paint will help to reflect heat in the summer.



Underfloor heating Photo by Wavin Hepworth



Different forms of roof insulation



Energy management systems help reduce energy use

- ✓ The heating system should be capable of being upgraded to include heat recovery from waste air/ water and ambient sources of energy. This is particularly relevant in commercial and industrial buildings;
- ✓ Timers and individual radiator thermostats should be provided;
- ✓ Provide flues with heat exchangers;
- ✓ Energy Management Systems with adequate metering and control systems should be used in commercial buildings.



#### CASE STUDY: Oxford Eco-House

The Eco-House Oxford is the first low energy house in the UK to have a fully integrated photovoltaic roof. It was built to assess how cost effective solar power is in a domestic setting and to show how solar energy can replace the need for less environmentally friendly fuels. The Eco-House was designed to function as a standard family home, requiring only a minimum amount of energy to run and reduces CO<sub>2</sub> from 6,500kg a year, which would be expected for a standard house this size, to a mere 148kg a year.

The house is positioned in a location that receives four hours of sunlight a day in the summer months but only 0.6 hours during winter. The surplus energy created during the summer months is stored at the house or sold to the energy company and then used or bought back in the winter. As well as the photovoltaic roof, the Eco-House has also taken steps to install energy saving appliances and high levels of insulation in order to best use the energy that is produced.



#### CASE STUDY: Dalby Forest Visitor Centre

Dalby Forest Visitor Centre in North Yorkshire has been constructed to be as environmentally sustainable as possible and, due to the materials used, it can be totally recycled at the end of its life. This has been achieved by using locally sourced and recycled materials; the cladding for the building was sourced from the surrounding forest, the water supply comes from a local spring and recycled rainwater and the roof is constructed from recycled tyres and inner tubes. The Visitor Centre's energy comes almost exclusively from renewable energy sources such as wind turbines, solar panels and a biomass boiler that is powered by woodchip from the forest. In 2007, Dalby Forest Visitor Centre won the Prime Minister's 'Better Public Building' Award and it is hoped that the building will be an inspiration for other new public buildings, in order to meet the targets for cutting carbon emissions.

*Commissioned from White Design by the Forestry Commission*

#### 9.38 Substructures and basements

9.39 The following measures should be considered:

- ✓ Large areas of cut or fill should be avoided where surplus material must be transported to and from the site;
- ✓ Consider the impact on surface water drainage and the existing water table;
- ✓ Seek to minimise adverse impacts on soil resources;
- ✓ Avoid damage to tree roots. Building foundations should be designed to reflect distances from trees;
- ✓ 'Partial depth' basements provide for better natural lighting, ventilation and damp-proofing than conventional basements;
- ✓ Providing a basement can enable more efficient use of individual plots, but should be carefully designed to avoid the creation of substandard living accommodation;
- ✓ Basements can provide a substructure that is less susceptible to frost heave, settlement and moisture changes in the subsoil.

#### 9.40 Fabric energy efficiency

9.41 For guidance on improving the fabric energy efficiency of existing buildings see 8.14. Measures that can be taken to future proof the energy efficiency of buildings over their whole life by limiting heat losses across the building envelope include:

#### 9.42 Walls

9.43 The following measures should be considered:

- ✓ Providing thermal insulation above current Building Regulation requirements;
- ✓ Ensure high standards of construction and finishing to avoid thermal bridging and achieve good air permeability standards, minimising air leakage;
- ✓ Rendering a building is sustainable through the ability to minimise the use of high embodied energy products such as bricks or stone and cover a building with an attractive façade with the advantage of adding to a building's insulation. Moreover, when lime render is used this enables the building to breathe naturally and by its very nature is a carbon neutral, natural material that can easily be removed from the underlying structure to enable reuse;



- Thicker internal walls will help to store heat from solar gain.



- ✓ External cladding panels use environmentally friendly, mass produced products that can often be recyclable or recycled. The cladding system often has its own insulation within the wider cladding system. The construction is quick, simple and can be removed and reused if required.

- In domestic buildings a balance must be reached between the size of windows and the need for privacy and security. The number and size of north facing windows should be kept to a minimum. Nevertheless, windows should be sufficient to provide natural lighting and

ventilation and window design needs to be able to incorporate measures to prevent over-heating. External blinds (louvers) can be more effective than internal blinds as they prevent heat from entering the room in the first place.

#### 9.44 Windows

9.45 The following measures should be considered:

- ✓ A room will have a day-lit appearance if the area of glazing is at least 1/25th of the total room area;
- ✓ Areas of rooms without a direct view of the sky are likely to have a low level of daylight;
- ✓ South facing windows should be large to maximise passive solar gain;
- ✓ Where windows are not possible, consider roof lights or light tubes (also known as light pipes, sun pipes, solar pipes, solar light pipes, or daylight pipes) to let in natural daylight;
- ✓ Double glazing is now standard - consider more advanced systems such as argon or krypton-filled low emission double glazing or triple glazing;
- ✓ Low emissivity (low E) coated glass can also be used to reduce heat loss by reflecting heat back into the room;
- ✓ Window frame materials affect thermal efficiency. This is particularly important for small windows. Timber frames have better thermal resistance than steel and aluminium.



#### 9.46 Roofs

9.47 The following measures should be considered:

- ✓ Pitched roofs have the following advantages over flat roofs: they generally require less maintenance;
- ✓ pitched roofs facing between 15° and 40° of due south provide an ideal location for solar panels;
- ✓ additional rooms can be created in the space provided by pitched roofs. To achieve this, however, trussed rafters should be avoided;
- ✓ steeper pitched roofs facing prevailing winds can help to break up wind flow.

#### CASE STUDY: Tao Housing, Mabgate, Leeds

The Tao housing development in Mabgate, Leeds, uses innovative Chinese methods to provide six apartments on a narrow 'slice' of land between three existing buildings. The small site limited the potential for renewable energy systems, resulting in the use of an insulating concrete formwork (ICF) system to increase the thermal efficiency of the building. The efficiency gains allowed a large glazed area to be used to increase the natural light within the building and reduce the need for electric lights, while light is also filtered into the stairwell to further reduce electricity consumption.

*Designed by Architecture 2b for Citu Ltd*



**CASE STUDY: Moorgate Crofts Business Incubation Centre, Rotherham**

The Moorgate Crofts Business Incubation Centre's green roof is self-maintaining and does not need to be mown. Far from leaving a roof more prone to leaks with all the soil and vegetation, they actually act as a barrier to weather extremes – increasing the life of the roof two to three times. Therefore they make economic sense for the consumer in the long term, as well as providing a very attractive feature to a new development.

*Designed by Rotherham Construction Partnership for Rotherham MBC*



**9.48** Green roofs are encouraged. A green roof is a roof of a building that is partially or completely covered with vegetation and soil, or a growing medium, planted over a waterproofing membrane. See 17.9 for further information. Green roofs are used to:

- Reduce heating (by adding mass and thermal resistance value) and cooling (by evaporative cooling) loads on a building;
- Reduce the heat island effect of dense urban development;
- Increase roof life span;
- Reduce storm water run off;
- Filter pollutants and CO<sub>2</sub> out of the air;
- The soil and plants on green roofs help to insulate a building for sound;
- Filter pollutants and heavy metals out of rainwater;
- Increase wildlife habitat in built-up areas and extend existing green corridors when linked to other green and open spaces nearby;
- Soften the visual intrusion of a development in a sensitive location;
- Grow fruits, vegetables, and flowers.

**9.49 Floors**

**9.50** The following measures should be considered:

- Good insulation levels will reduce heat loss and assist with sound insulation;
- Some modern heating systems work particularly effectively with underfloor heating.

**9.51 Renewable technologies**

**9.52** Low carbon technologies are those that can help to reduce carbon emissions. Renewable energy comes from energy flows that occur naturally and repeatedly in the environment (from the wind, the fall of water, the movement of the oceans, from the sun and also from biomass). Other than initial plant, installation and maintenance costs, renewable energy will therefore be close to zero carbon.



Green roof, Performing Arts Building, Leeds. Designed by Ian Tod and Company



### CASE STUDY: Council Housing

A pilot council house scheme is being delivered on three sites in West Leeds, which will meet the key requirements for the Code for Sustainable Homes Level 3.

The key sustainability features of the units are:

- The homes are designed to use no more than about 105 litres of water per person per day;
- The properties will be fitted with solar panels in order to collect heat from the sun's radiation.

All dwellings will incorporate solar hot water heating utilising the Alpha Solar Smart system. With Solar Smart, the stored volume of hot water is heated only by the collected solar energy, so no gas is used in maintaining the cylinder temperature. Should the solar heated water be exhausted, the combination boiler

fires-up long enough to help satisfy any immediate demand for hot water. In addition, a GasSaver sited above the boiler, will capture and store heat from flue gases that are normally expelled into the atmosphere, using it to pre-heat mains cold water before it enters the boiler. As a result, even when the boiler is required for heating water, the amount of gas used will be reduced by up to 37%.

All the lights use dedicated low energy fittings, Compact Fluorescent Lamps (CFLs) that last up to 10 times longer than ordinary bulbs and use less than a quarter of the amount of electricity.

Reuse of rainwater within the development will be achieved by providing a water butt for each dwelling, with a minimum storage capacity of 200 litres.

*Keepmoat Homes in partnership with Leeds City Council*

through the panel. The fluid is fed to a heat store (eg a hot water tank) to provide part of the domestic hot water demand for the building. Usually another heat source will be needed to supplement collectors in winter months. Solar thermal installations' main benefits are their relatively low capital costs and ease of maintenance. The drawback is that they are not suitable for integration to all existing heating systems, heat production does not always match demand profiles (unless excess heat can be 'dumped' to a suitable use) and the value of energy generated is currently relatively low. Solar hot water panels will work most successfully on a roof inclined at an angle of 20°-40° depending on the latitude of the building, and orientated to face due south. Many sites in Leeds are suitable for this technology;

- ✓ **Solar photovoltaic (PV)** systems use energy from the sun to convert solar radiation into electricity, which can be used directly to run appliances and lighting or sold to the national grid. PV systems perform best in direct sunlight, but continue to perform well in reduced light conditions. Systems come in various forms including solar tiles, roof-integrated panels and on-roof panels. PV systems are also available for cladding buildings, forming brise-soleils, and covering walkways. PV systems' main benefits are their flexibility, suitability to many situations, ease of installation, low maintenance and production of electricity in the day when it is most needed. Their main drawback is that they are expensive with long-payback periods, although, in the right circumstances, feed-in tariffs significantly reduce these drawbacks. Many sites in Leeds are suitable for this technology;

- 9.53 Low and zero carbon energy supplies include those from biomass (ie wood) and energy crops; combined heat and power / combined cooling Heat and Power making use of natural gas, biomass or biogases; community heating making use of waste heat; energy from waste; geothermal, ground, air and water source heating and cooling; hydro; solar thermal and photovoltaic generation; and wind generation.

- 9.54 The layout of the site should take account of any possible low or zero carbon technologies. Careful siting, design and

landscaping can optimise energy efficiency while minimising potential visual impact. Some technologies can be successfully integrated into the design of the building.

- 9.55 Measures that can be taken to reduce carbon emissions and atmospheric pollution and supply a significant proportion of energy demand by providing local energy generation from renewable sources include:

- ✓ **Solar panels** can be fitted onto or integrated into a building's roof and use the sun's energy to heat a heat-transfer fluid which passes



**CASE STUDY: Potternewton Housing, Leeds**

Built in 2003, this development of affordable housing in the Potternewton area of Leeds was one of the first residential developments to integrate solar roof technology. The PV roof tiles are incorporated into the roof covering and are expected to generate 25-50% of the houses' electricity demand and, collectively, the 20 houses will save 10 tonnes of CO<sub>2</sub> emissions per year.

*Connect Housing*



**CASE STUDY: Crossway Passivhaus**

Crossway in Kent is the first building to combine two innovative technologies to help move it to passivhaus specification; PV-T (Photovoltaic Thermal) and a PCM (Phase Change Material) heat store.

PV-T is a unique renewable technology that combines electricity generating PV cells with a solar thermal system. This technology cools the PV cells using a solar thermal

system running behind the PV, making them work more efficiently and generate more electricity (25% extra in the UK environment). The bi-product of this cooling is heat, which can be harnessed and stored in a pioneering PCM heat store that holds three times more heat than the same volume of water and stores the heat as latent heat. Two technologies helping to make each other more efficient yet share a single panel, reducing the space taken up on the roof.

*Designed by Hawkes Architecture*



✓ A **wind turbine** harnesses energy from the wind to produce electricity. The most common design is of three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower

or mast. The blades drive a generator either directly or via a gearbox (generally for larger machines) to produce electricity for consumption on site or sale to the grid. Modern designs can be very quiet in operation. Wind turbines can be mounted on masts that are free-standing or tethered with wire guys. Wind turbines should ideally be mounted nine metres above any obstruction within 100 metres. The greatest amount of power will be generated if turbines have a constant supply of steady wind, which is dependent on the site having a good wind profile (average wind

speed of 5-6 m/s or higher) and being free of obstructions such as trees or buildings. Wind turbines are amongst the most cost-effective renewables, on the right site. In Leeds, there are only a few sites that are suitable for the largest (125m tall) turbines due to the large resident population, the number of high-quality environments, generally low wind-speeds and conflicts with radar. Smaller turbines have some potential even in these areas but give poorer returns on investment. However, many built-up, urban areas of Leeds will be unsuitable for micro wind turbines;

✓ A **heat pump** is a machine that moves heat from one location (the 'source') to another location (the 'sink' or 'heat sink') using mechanical work. The most commonly understood heat pumps are fridges and freezers, which exploit the physical properties of evaporating and condensing fluids, known as refrigerants. Recently, reversible-cycle heat pumps have started to be commonly used to provide thermal comfort in homes and offices. These heat pumps use a vapour-compression refrigeration device that includes a reversing valve and optimized heat exchangers so that the direction of heat flow may be reversed. Most commonly, heat pumps draw heat from the air or from the ground, but liquid source heat pumps are not unknown at riverside and lakeside sites. Canal water may be used for heating and cooling buildings (but not if in a SSI or SEGI part of the canal). Ground-sourced heat pumps (GSHP) require heat capturing coils filled with a heat transfer fluid to be laid in trenches or in deep bore holes, depending on the ground available. As the ground temperature stays relatively constant these provide good consistent heat sources.



#### CASE STUDY: Denby Dale Passivhaus

The Passivhaus is a recently completed private three-bed detached house in Denby Dale, West Yorkshire. Built to the stringent Passivhaus standard, the project has sought to provide a solution to the urgent need to drastically cut the CO<sub>2</sub> emissions from buildings in the UK and has tried to create a low-cost and easily replicable template for low energy Passivhaus construction, using techniques and materials familiar to British builders. The house is the UK's first cavity wall Passivhaus, the original design details developed for the project

usable as a template for the construction industry for how to minimize thermal bridging, improve energy efficiency and maximise the airtightness of projects built using cavity wall construction, whether the project is aiming for the Passivhaus standard or not. The Denby Dale Passivhaus achieves radical levels of energy efficiency, with a space heating need of 15 kWh/m<sup>2</sup>/year (using approximately 90% less energy for space heating than a typical UK house) and has high levels of airtightness.

#### CASE STUDY: Richmond Hill Primary

Richmond Hill is one of six schools involved in the first phase of Education Leeds' Primary Capital Programme (PCP).

The ageing existing school buildings will be replaced with an innovative new facility designed to meet the revolutionary Passivhaus design standards. Passivhaus buildings have very well insulated shells and require much less heating, therefore reducing their environmental impact and running costs. This means that Richmond Hill will be one of the most energy efficient school buildings in the UK.

As well as many educational features such as wide 'learning streets' in place of narrow corridors and small group rooms for personalised learning; the school will provide dedicated community space open throughout the day and large multi-purpose areas that can be accessed by the community after school hours. The school grounds will also provide opportunities for local people to benefit from the new facilities.

*Designed by \_space group and (the former) Education Leeds, with Interserve Project Services*





Ground loops for ground source heat pump.

### CASE STUDY: Garforth Library and One Stop Centre

The new library and One Stop Centre in Garforth has recently opened after being awarded £1.4 million by the Big Lottery Fund to extend and improve the original building using green technologies. The main feature of the new building is the living sedum roof which assists temperature regulation as well as attracting wildlife. The library is fitted with sun pipes, reducing the need for unnatural lighting, and solar panels that provide the building's hot water. Even the desks are eco friendly having been constructed from recycled items such as fridges and washing up liquid bottles.

Air source heat pumps resemble air-conditioning units and upgrade heat from external air to a useful temperature for internal heating. Typically, be low about -5°C air source heat pumps struggle. Ground and air source heat pumps have good potential in Leeds and combining the installation of GSHP with other building works (either before or whilst footings and other ground works are being dug) can reduce costs. GSHPs also work best with underfloor heating systems;

✓ **Biomass**, a renewable energy source, is biological material derived from living, or recently living organisms, such as wood, waste, vegetable oils and alcohol fuels. Forest residues, wood chips, waste organic material from fibre or food production and specifically grown energy crops (such as miscanthus, switchgrass, hemp, corn, poplar, willow, sorghum, sugarcane and a range of tree species) are all classified as biomass. There are a number of technological options available to make use of the wide variety of biomass types as a renewable energy source.

Conversion technologies may release the energy directly, in the form of heat or electricity, or may convert it to another form, such as liquid biofuel or combustible biogas. **Examples include:**

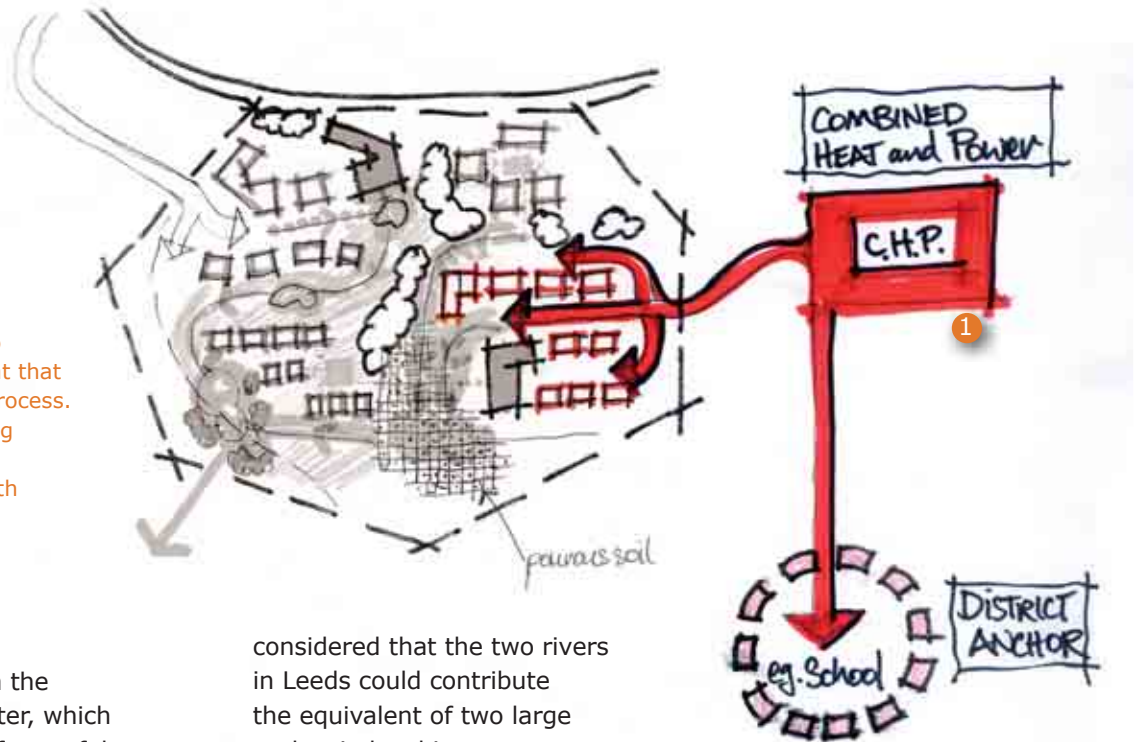
- Thermal conversion - these are processes in which heat is the dominant mechanism to convert the biomass into another chemical form. The most common technology is combustion based (biomass boilers or CHP) but pyrolysis and gasification are growing in popularity. Biomass can be used to replace more polluting coal and oil fired systems or installed in locations where mains gas is not available (eg in some rural locations) and preferably as large scale installations where particle filters are more likely to operate efficiently. To reduce the health risks associated with PM<sub>10</sub> particles, it is important that high quality boilers and emission control abatement equipment is used in all installations.
- Chemical conversion - a range of chemical processes may be used to convert biomass into other forms, such as to produce a fuel that is more conveniently used, transported or stored, or to exploit some property of the process itself.
- Biochemical conversion - makes use of the enzymes of bacteria and other micro-organisms to break down biomass. In most cases micro-organisms are used to perform the conversion process: anaerobic digestion, fermentation and composting.

In Leeds there are many woods that are currently under-managed. Bringing these woodlands into a management regime would enable biomass to be extracted in a controlled manner, without a significant impact on biodiversity, amenity, or leisure usage;

**Figure 9.4:**

## Energy

- 1 Combined heat and power (CHP)**  
- CHP generates electricity whilst also capturing usable heat that is produced in this process. This is an energy saving technology that can also be combined with sustainable fuels.



✓ **Hydropower**, or water power, is power derived from the force of moving water, which may be harnessed for useful purposes. Most types of modern hydropower are used to generate electricity. Small scale hydro or micro-hydro power has been increasingly used as an alternative energy source, especially in remote areas where other power sources are not viable. Small scale hydro power systems can be installed in rivers, canals or streams with little or no discernible environmental effect on things such as fish migration. The main considerations in a micro-hydro system installation are: a sufficient and consistent flow of water, the height difference between the intake and the exit and compliance with legal and regulatory issues. In Leeds, there is potential to install modern small scale hydro on both the river Aire and Wharfe, using some of the old civil engineering works associated with old mills. Modern Archimedian screws (slow moving encased corkscrews) can generate around 250kW of electricity on a good site and are considered to be 'fish-safe' and relatively quiet and unobtrusive. It is

considered that the two rivers in Leeds could contribute the equivalent of two large scale wind turbines.



□ If renewable technology is not economically viable at the initial construction stage, buildings can be designed to allow adoption of technologies in the future. For instance, south facing roofs can be designed to be easily retrofitted with solar panels.

- 9.56 In larger developments, the efficiency of energy use can be greatly improved through
- ✓ **Combined Heat and Power (CHP)** and/or **District Heating** (or cooling) systems. CHP uses a heat engine or a power station (which can be biomass fuelled) to simultaneously generate both electricity and useful heat which can be distributed across a development site as heating or cooling. CHP uses heat that would be wasted in a conventional power plant, potentially reaching an efficiency of up to 89%, compared with 55% for the best conventional

plants. This means that less fuel needs to be consumed to produce the same amount of useful energy. CHP is most efficient when the heat can be used on site or very close to it. However, an exact match between the heat and electricity needs rarely exists. A CHP plant can either meet the need for heat needs on site or use district heating to transfer excess heat to neighbouring developments. Overall efficiency is reduced when the heat must be transported over longer distances. This requires heavily insulated pipes, which are expensive and inefficient; whereas electricity can be transmitted along a comparatively simple wire, and over much longer distances for the same energy loss. In some parts of Leeds it may be possible to connect or co-operate with an existing network. It is important that provision is made for the necessary infrastructure within the site layout although, where the pattern of development is appropriate, this can be added at a later date. Developments which facilitate the introduction of CHP and district heating schemes are those which:

CASE STUDY: Proposed CHP plant at Eastgate Quarter, Leeds

Low Carbon Energy Centre which includes a CHP plant and a biomass boiler.

*Designed by Acme for Hammerson UK Properties Plc*



- ✓ Adopt a grouping and density which reduces installation and transmission costs;
- ✓ Are located close to the potential power/heat source;
- ✓ Comprise a mix of uses (eg housing, offices and leisure) to balance demand for power/heat over the day and night and throughout the year.

9.57 **Energy performance and the historic environment**

9.58 As central government's Planning Policy Statement 5 acknowledges: *"The historic environment has an important role to play in addressing climate change."* The retention and reuse of heritage assets avoids the material and energy costs of new development. The council's Climate Change Strategy and Action Plan encourages home owners and developers to find solutions to improve energy efficiency. This can be achieved by simple maintenance and repair of properties, ensuring that they are draft free and in good condition, as well as the use of technologies such as solar panels and heat-pumps. Conservation areas and listed buildings can be sensitive to this form of development and every care should be made to ensure that such items sit comfortably in the context in which they are placed.

9.59 **Energy Labelled White Goods**

9.60 The European Union energy label classifies the energy rating of goods from A (most efficient) to G (most inefficient). Measures that can be taken to provide or purchase energy efficient white goods, and so reduce the CO<sub>2</sub> emissions from appliances in the building include:

- ✓ Installing 'A' rated domestic appliances such as fridges, freezers and washing machines.

9.61 **Drying Space**

9.62 Measures that can be taken to provide a reduced energy means of drying clothes include:

- ✓ Providing outdoor washing lines (retractable or umbrella style will help to save space) in a secure space;
- ✓ Locate indoor drying rails in an area with adequate drainage and ventilation.

9.63 **Lighting**

9.64 Measures that can be taken to provide energy efficient lighting, thus reducing the CO<sub>2</sub> emissions from the building include:

- ✓ Making maximum use of natural lighting;
- ✓ Building Energy Management Systems should be installed to ensure that passive and active environmental systems for lighting are operating as efficiently as possible;
- ✓ Use energy efficient, compact fluorescent lighting with systems to maximise the use of timing, detection, zoning and intensity controls for lighting.





9.65 External lighting is an important aspect to consider in design. It can be difficult to get right and therefore it needs to be designed carefully and precisely. A well designed lighting scheme has a number of benefits including increased safety and security and the enhancement of architectural and landscape features after dark. However, lighting can be detrimental to the environment through light pollution, and its impact on amenity, the night skies and wildlife, and through the energy required for the lighting itself. Careful consideration should be given to the environmental impact of external lighting schemes. Measures that can be taken to provide energy efficient external lighting, and reduce associated CO<sub>2</sub> emissions include:

- ☑ Providing lighting levels at the minimum necessary to achieve safety and enhancement objectives;
- ☑ Domestic security lighting need be no more than 150W and should include movement detection and daylight cut-off sensors or timers;
- ☑ Energy efficient lamps should be used wherever possible;
- ☑ Uncontrolled floodlighting should be avoided and all light fittings should be shielded to minimise any light pollution;

- ☑ Particular care should be taken with floodlighting schemes for sports pitches which can have a detrimental impact on local amenity;
- ☑ All lighting should have a clear purpose - avoid use of lights simply to create a 'presence' at night;
- ☑ Any lighting should ensure that the need of those who may be visually impaired are considered;
- ☑ Concentrate lights where they are needed and establish a clear hierarchy, with minimum lighting around the outer, more rural, perimeter of the development;
- ☑ Direct light downwards and ensure no light shines above the horizontal plane;
- ☑ Check to see if security could be achieved in another way;
- ☑ Check the light does not affect others.

#### 9.66 Cycle storage

9.67 Measures that can be taken to encourage the wider use of bicycles as transport by providing adequate and secure cycle storage facilities, thus reducing the need for short car journeys include:

- ☑ Provide prominent, overlooked (or covered by CCTV), secure cycle parking which should be close to building entrances or inside

buildings and should avoid the need to carry cycles on steps or through buildings;

- ☑ Employers should provide a high standard of secure, weather proof, long stay cycle parking together with appropriate changing and shower facilities;
- ☑ Provide sufficient secure spaces for bikes;
- ☑ Provide showers and lockers in non-residential developments;
- ☑ Prepare a travel plan.

#### 9.68 Home office

9.69 Measures that can be taken to reduce the need to commute to work by providing residents with the necessary space and services to be able to work from home include:

- ☑ Reduce the need to travel with facilities for tele or homeworking;
- ☑ Design in appropriate and sufficient space for homeworking with adequate cabling, sockets and telephone provision;
- ☑ Provide car sharing facilities such as parking spaces for car clubs;
- ☑ Investigate potential introductory funding and management support to car clubs.



Energy monitors, available in 27 Leeds libraries, are helping residents save money and energy. The monitors, which clip around the household electricity supply, pinpoint energy-guzzling gadgets by highlighting how much electricity they use with a visual display.

Since they were made available to borrow from libraries early in 2010, householders who acted on their information and switched off appliances and gadgets not in use should have saved a cumulative total of £8,775 on their electricity bills.



## 9.70 Energy display devices

9.71 Measures that can be taken to help influence residents' behaviour by providing them with a clear indication of their energy use include:

- ✓ Providing an accessible device to monitor electricity **or** primary heating fuel consumption;
- ✓ Providing an accessible device to monitor electricity **and** primary heating fuel consumption;
- ✓ Providing a device capable of recording data.

## 9.72 Further information

- PassivHaus: [www.passivhaus.org.uk](http://www.passivhaus.org.uk)
- London Renewables (September 2004) Integrating renewable energy into new developments: Toolkit for planners, developers and consultants. Greater London Authority. Available [http://legacy.london.gov.uk/mayor/environment/energy/.../renewables\\_toolkit.pdf](http://legacy.london.gov.uk/mayor/environment/energy/.../renewables_toolkit.pdf)
- Policy Advice Note: Inland Waterways. Unlocking the potential and securing the future of inland waterways through the planning system, TCPA (2009): <http://www.tcpa.org.uk/data/files/InlandWaterways.pdf>
- Sustainable energy by design, TCPA (2005): <http://www.tcpa.org.uk/pages/sustainable-energy-by-design.html>

- The Microgeneration Certification Scheme (MCS) is an independent scheme that certifies microgeneration products and installers in accordance with consistent standards: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)
- Lighting in the Countryside: Towards Best Practice, Countryside Commission and DCLG, 1997: <http://www.communities.gov.uk/documents/planningandbuilding/pdf/158352.pdf>
- Institution of Lighting Engineers (ILE) Guidance notes for the reduction of obtrusive light, GN01, 2005: <http://www.britastro.org/dark-skies/pdfs/ile.pdf>
- Environment Agency: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- Campaign for Dark Skies: [www.britastro.org/dark-skies/](http://www.britastro.org/dark-skies/)
- Guidance by Bat Conservation Trust and Institute of Lighting Engineers: Bats and Lighting in the UK (2008) available from [www.bats.org.uk](http://www.bats.org.uk)
- For cycle parking refer to Local Transport Note 2/08, Cycle Infrastructure Design, DfT 2008, Chapter 11 Cycle Parking: <http://www2.dft.gov.uk/pgr/roads/tpm/ltnotes/ltn208.pdf>
- For information on car clubs in the UK: <http://www.carplus.org.uk/car-clubs/>

- For training events, technical support, a range of free publications and information on the Energy Saving Trust (EST) Energy Efficiency standards for both new and existing dwellings go to <http://www.energysavingtrust.org.uk/business/Business/Housing-professionals>
- Community heating for planners and developers, EST, 2005: [www.energysavingtrust.org.uk](http://www.energysavingtrust.org.uk)
- For information on green roofs: [www.thegreenroofcentre.co.uk](http://www.thegreenroofcentre.co.uk) or <http://livingroofs.org>
- For guidance on successfully integrating trees into development see [www.leeds.gov.uk](http://www.leeds.gov.uk)
- Natural England's guidance on assessing on-shore wind energy development: [www.naturalengland.org.uk](http://www.naturalengland.org.uk)
- Renewable and Low Carbon Energy Capacity Study for Yorkshire and Humber see [www.lgyh.gov.uk](http://www.lgyh.gov.uk)
- The Compare Renewables resource on [www.idea.gov.uk](http://www.idea.gov.uk) provides an overview of eight sustainable energy technologies (biomass, CHP, district heating, energy from waste, heat pumps, hydropower, solar, wind turbines).
- For advice on travel plans see the Travelwise pages on [www.leeds.gov.uk](http://www.leeds.gov.uk)

*Other Case Studies to refer to:*  
 – Greenhouse p16  
 – Innovate p13  
 – Carnegie Village p25  
 – Broadcasting Place p25



# 10. Water

- 10.1 Background information on the current situation in Leeds**
- 10.2** Clean and available water supplies are essential for the production of food, for healthy drinking and for the maintenance of natural ecosystems, as well as crucial to commerce, industry and agriculture. The appearance of rivers and streams also contribute to the landscape and natural waterways, lakes and canals are also sources of recreation and natural habitats. The way we use water has a direct impact on the environment. It is therefore essential that society's use of water is appropriate and sustainable. In global terms the world population is expected to rise by three billion by 2026, but nearly a third of the world's population will be living in areas facing water scarcity by 2025. By comparison water consumption per person in the UK is the highest in Europe.
- 10.3** In Leeds water is taken from rivers, streams, reservoirs and aquifers. Most of this water is used for public water supply. When river flows are low, water stored in reservoirs becomes an important source. Water in underground aquifers provides water to rivers and wetlands, but is also extracted for human use.
- 10.4** There are concerns that future climate change scenarios predict increased frequency of drought which is likely to lead to problems in water supply and subsequent usage restrictions. The UK Climate Impacts Programme (UKCIP) has forecast that over this century global warming will lead to significant changes in rainfall distribution and intensity. Summer precipitation in the southwest could fall by a fifth by the 2020s and over 50% by the 2080s (Hulme et al 2002), increasing pressure on water supplies further.
- 10.5** An improving system of water supply and enhanced level of water company regulation has significantly reduced issues of drought risk and water shortage in Leeds. Improved water efficiency will help Leeds fulfil its requirements under the Water Framework Directive. Yorkshire Water is the primary water provider for Leeds and is one of the ten largest water management businesses in the world, providing clean water to 4.5 million people and 140,000 businesses in the Yorkshire region (Kelda Group 2003).
- 10.6** Yorkshire Water are responsible for the collection, treatment, distribution and supply of water to Leeds. A grid system is in operation in the Yorkshire Water supply area connecting the region's rivers and 120 reservoirs to enable water to be moved to wherever it is needed. Leeds is part of a much larger 'Grid Surface Water Zone' (SWZ) which covers most of Yorkshire (Yorkshire Water 2010).
- 10.7** More efficient appliances often cost the same as less efficient models, while rainwater harvesting and grey water recycling can produce further water savings. Introducing basic water efficiencies into metered homes could save homeowners money in water bills without changing their lifestyles.



10.8 With the demand for water in the UK reaching unprecedented levels, businesses are likely to see tighter restrictions on their use of water and further increases in metered water in the future. As businesses become more aware of the water they are using and the consequent cost, demand will rise for offices designed to use less water. Over two-thirds of water use in the average office takes place in the toilets, where significant water savings may often be made.

the emphasis upon reducing consumption and carefully planning how all future activities and developments impact drainage and flooding.



10.10 The CSH includes two issues in this category whose aims are:

|                            |   |
|----------------------------|---|
| Internal potable water use | To reduce the consumption of potable water in the home  |
| External water use         | To encourage the recycling of rainwater and reduce the amount of mains potable water used for external water uses |

10.9 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) draws the following conclusions:

- Water shortage is not an issue for Leeds. However, the gross water consumption is higher than the national average, potentially putting pressure on reserves and in turn generating significantly more waste water;
- As this could put further pressure on the already strained drainage system, increasing efficiency of use would be recommended, with



### 10.11 Internal water use

10.12 Measures that can be taken to reduce the consumption of potable water in buildings include:

- ✓ Providing water efficient appliances, low water use showers and aerated taps;
- ✓ Providing facilities for heat exchange from waste water;
- ✓ Considering the use of a reed bed system for foul water treatment;
- ✓ Composting toilets may also be appropriate for some schemes;
- ✓ Undertaking a rainwater and grey water (waste water from sinks, baths and showers) use feasibility study. Where collecting and reusing water is feasible, it should be included in the proposed development;
- ✓ Installing a system for recycling grey water for toilet flushing and for

watering plants and garden/ green space irrigation; more advanced systems will require a back-up supply of mains water, safety systems to avoid storage of grey water for more than two days, treatment systems, clear pipe identification, storage tanks and overflow systems, light elimination to limit algae growth;

- ✓ Advanced rainwater systems incorporate treatment (UV

microbiological or biological) and can be used for flushing toilets and to supply showers;

- ✓ All major non-residential developments should use building type standards if available. CIRIA has published key performance indicators for water use in hotels and offices. Proposals should demonstrate that water consumption is 'below average' against these benchmarks:



- Install water meters in existing properties when they are redeveloped (water meters are compulsory in new development);
- Install efficient appliances that enable reduced water consumption;
- Fit low volume or dual flush WCs, low water showers and aerated/spray taps;
- In non-residential buildings measures such as infra-red sensor controls, door beams or magnetic door switches can be used to help control water flows for urinals and basins or waterless urinals (where installed). Leak detection systems and water metering should also be included for major water consumers.



#### CASE STUDY: St Margaret's Church Hall

A community based development with clear aims to improve and support community activities and cohesion through the building (in keeping with the listed church) of an environmentally friendly community hall, including ground

source heat pump, insulation made from recycled glass, heat recovery ventilation and rainwater collection for WCs. Made from locally sourced materials, this is a very commendable community based low impact development.

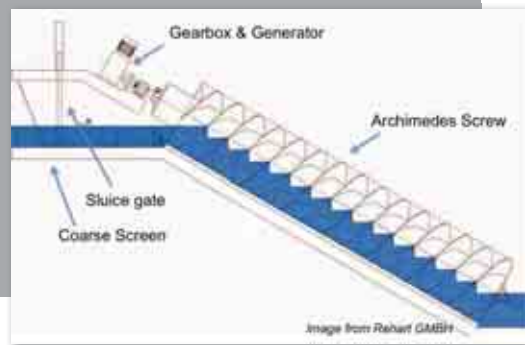
*Designed by Richard Crooks Partnership for St Margaret's Church*



Existing Water Wheel at Armley Mills



Artists impression of Archimedes Screw



### CASE STUDY: Thwaite Mills and Armley Mills

A hydropower scheme using an Archimedes Screw Turbine is proposed at the Grade II listed mill building. A multiple helix shaped set of blades mounted on a central shaft is put into

a trough and rests at an angle with the bottom in the water. As water flows down the Archimedes Screw the main shaft turns, driving the generator.

### 10.13 External water use

10.14 Measures that can be taken to recycle rainwater and reduce the amount of mains potable water used for external water uses include:

- ☑ Undertaking a rainwater and grey water use feasibility study. Where collecting and reusing water is feasible, it should be included in the proposed development;
- ☑ Water butts and other community storage facilities are a simple way of collecting rainwater which can be used for watering plants and garden/green space irrigation;
- ☑ Green roofs can reduce levels of roof water run-off. Where possible use extensive, low maintenance systems.



- ▣ Arranging gardens down a slope means that any water can be used several times over as in many Italian and Spanish garden styles.

*Other Case Studies to refer to:*  
 – Carnegie Pavillion p52  
 – Epicentre p73  
 – Northern Ballet p88

### 10.15 Further information

- CIRIA (2006) 'Water key performance indicators and benchmarks for offices and hotels'. Available: [www.ciria.org](http://www.ciria.org)
- Environment Agency(2001) 'Conserve Water in Buildings' fact sheets. Available: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- Envirowise: [www.envirowise.gov.uk](http://www.envirowise.gov.uk)
- Waterwise: [www.waterwise.org.uk](http://www.waterwise.org.uk)
- For information on green roofs: [www.thegreenroofcentre.co.uk](http://www.thegreenroofcentre.co.uk) or <http://livingroofs.org/>

# 11. Materials

## 11.1 Background information on the current situation in Leeds

11.2 The materials used in any development can have an important influence on sustainability. It is important to consider the source of the materials (whether they are from finite or renewable resources) and the energy used in both their manufacture and transportation. Buildings often consume more energy through their materials and construction than they do throughout their lifespan. This is particularly the case with commercial buildings which are generally constructed of high energy materials, such as steel, aluminium and glass, and tend to have a short lifespan before refurbishment. It is important therefore, that maximum use is made of any existing materials on site, recycled materials and of low energy materials - those that are available locally, are naturally occurring and/or a by-product of some other local activity.

11.3 Within Leeds the major mineral deposits are coal, sandstone, clay, sand and gravel. Despite its modest size there are 14 sites in Leeds where construction materials (minerals) are produced. Total aggregate production is around 750,000 tonnes per year, around one tonne per year for every resident within the district. This is much less than the estimated four tonnes per head accounted for by the consumption of aggregates in Leeds in the construction industry and through DIY.

The shortfall is made up of aggregates brought into Leeds by road and rail every day from quarries in neighbouring counties, in particular from the region's national parks.

11.4 Earth is probably the most sustainable building material as it requires no energy in its manufacture and can provide high levels of insulation. In addition, earth sheltered buildings tend to have a reduced impact on the landscape and can provide opportunities for habitat creation. Other natural



Timber sourced from sustainable forests



**CASE STUDY: Blackhill Quarry, Bramhope, Leeds**

There has been a working quarry on this site since around 1910, producing and supplying certified recycled hardcore for the construction industry and supplying reclaimed walling stone and flags and other landscaping products, to both the trade and public.

materials, such as straw, cork and hemp can be used to create low impact building and insulation materials. Timber is generally considered to be a low energy material, however care must be taken to ensure that it is sourced as locally as possible and is from well managed, independently certified sources. Timber also has the benefit of locking up atmospheric carbon. The benefits of stone are that it is durable, easy to recycle, low maintenance and has a



The sculpted roof forms and the corten finishing material is meant to reflect the weathered crags of Yorkshire rock formations.

*"This connection to the geological forms outside the city was deliberate in order to echo the associations that local sculptors such as Henry Moore and Barbara Hepworth had with the landscape."*

**Fielden Cleff Bradley**

high thermal capacity. However, consideration should be given to the need for transportation and the impacts of extraction. For the repair of historic buildings and for developments within Conservation Areas, the use of locally-sourced materials is not only a more sustainable option in terms of transport emissions, but it is often more appropriate in terms of the character of the building or area itself. Bricks have a high energy input during production, but are generally durable and can be reused or recycled. Locally produced bricks should be specified to reduce transport costs. Materials such as plastic, steel and aluminium require a high energy input in their manufacture and thus should be used sparingly.

- 11.5 Materials will be affected by climate change (South East Climate Change Partnership 2005). For example, materials like brick and concrete once warmed up, stay warm for a long time, while light materials such as wood are warmed up quickly, but also cool down quickly. Consequently, walls built with heavy materials retain heat and let it out slowly.
- 11.6 It is important that the structure should have the optimum thermal mass that helps to maintain a comfortable internal environment and avoids overheating and the unnecessary use of energy intensive cooling systems. For high occupancy uses such as houses and hospitals, this usually means high thermal mass.



11.7 The characteristics of materials may also change with changes in temperature and humidity.

**Table 11.1:**

| Material           | Climate change cause and effect                        |
|--------------------|--|
| Concrete           | Strength affected by curing at higher temperatures     |
| Lime mortar, stone | Affected by increased CO <sub>2</sub> and driving rain |
| Plastics           | Affected by increased UV                               |
| Bricks             | Strength affected by changes in moisture content       |
| MDF/chipboard      | Not to be used in areas where flooding is expected     |
| Roofing felt       | Increased UV is likely to accelerate degradation       |



Skelton Grange eco-centre

11.9 Reducing the amount of construction and demolition waste going to landfill has a direct saving in the costs associated with removing it from a site and from lower landfill taxes. Good practice levels of recycled content in construction are cost-neutral or cost saving. WRAP provides a great deal of advice and case studies in this area, which can support cost saving measures.

11.8 The construction sector uses over 420 million tonnes of material resources each year (Construction Resources and Waste Platform 2004). Annually, the sector generates 90 million tonnes of construction and demolition waste, which equates to 300% of the waste produced by all UK households combined. Only half of the waste is recycled back into the sector. Currently, around 13 million tonnes of construction

and demolition waste is material delivered to construction sites but never used.



#### CASE STUDY: Hollybush School

*'intelligent use of well controlled natural ventilation'*

Hollybush is the first of a new generation of schools, specifically planned from the very start of the design process to incorporate sustainability into its basic design. The school maximised the use of passive energy, together with improved

insulation techniques. A longevity of use was incorporated, aimed at a minimum 60 year life span together with best practice installation and construction use. Timber was selected as a reusable commodity with an acknowledgment

to the BRE green guide to construction. Consultation and feedback from staff and pupils from Hollybush School was initiated and carried through.

*Designed by ADS of Leeds City Council*





### CASE STUDY: Epicentre - Meanwood Valley Urban Farm

Opened in 1999, the Epicentre provides Meanwood Valley Urban Farm with exhibition space, classrooms and a library, as well as a central focus for the learning and inspiration of the farm's aims. The building is constructed using the Walter Segal concept of modern and adaptable sustainable design.

The building utilises recycled materials, the majority of which is locally grown timber, including the main structure of larch from the Harewood Estate. The green roof minimises the impact of the building from the north and east. Other features include a glazed 'greenspace' to optimise solar gains, compost toilets and a reed bed drainage system.

*Designed by Rob Bumby of OSA Architects (now Stack Architects) for Leeds City Council*



11.10 By locally sourcing materials such as wood or timber, the construction sector will help to reduce the need to transport materials and help maintain local character. Table 11.2 shows the maximum haulage distance it is worth moving a reclaimed material before the environmental advantage is lost.

11.11 The majority of timber used in the UK comes from unmanaged and unsustainable sources world-wide. The effect of a more sustainable construction sector would be significant as it currently uses 60% of all softwood and 44% of all hardwood timber in the UK (Forest Stewardship Council 1996). Materials that will last a long period of time and require little maintenance are also preferable.

11.12 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) draws the following conclusions:

- The imports into the area do however form a small percentage of overall consumption. In addition, the majority of Leeds' imports come from the surrounding Yorkshire and Humber region, which also has a very low import rate (6%);
- The non-renewable nature of mineral and aggregates and in light of the limited reserves within the Leeds area, reduction, reuse and recycling should always be implemented as opposed to new production;
- The utilisation of construction, demolition and excavation waste should be maximised, in order to ease demand on reserves, reduce the need for the importation of minerals and aggregates and in turn complement the waste reduction targets.

- Leeds' minerals and aggregates performance compares favourably with other areas and there is evidence of some self-sufficiency, even though Leeds is a net importer of materials;

**Table 11.2: Maximum transport distances for reclaimed materials**

| Material           | Distance (miles) |
|--------------------|------------------|
| Tiles              | 100              |
| Slate              | 300              |
| Bricks             | 250              |
| Aggregates         | 150              |
| Timber             | 1,000            |
| Steel products     | 2,500            |
| Aluminium products | 7,500            |

Source: BRE Green Guide to specification (BRE 2000)

*Other Case Studies to refer to:*  
 – Greenhouse p16  
 – Innovate p13  
 – Allerton Bywater p33  
 – Hands On p37

11.13 The CSH includes three issues in this category whose aims are:

|   |   |
|---|---|
| Environmental impact of materials                           | To encourage the use of materials with lower environmental impacts over their lifecycle                       |
| Responsible sourcing of materials – basic building elements | To recognise and encourage the specification of responsibly sourced materials for the basic building elements |
| Responsible sourcing of materials – finishing elements      | To recognise and encourage the specification of responsibly sourced materials for the finishing elements      |



CASE STUDY: York Eco-Depot

York's new Eco-Depot, finished in 2006, has won multiple awards including a Green Apple Gold Award for its sustainable design and construction and is seen as an excellent example for future developments. One of the reasons why the depot is so energy efficient is the use of locally sourced straw bales and timber as the main construction materials for the walls of the office building. Not only are straw bales highly insulating, they also have low embodied energy because straw, along with timber,

absorb carbon dioxide as they grow, unlike more common building materials that release a lot of carbon dioxide during construction. Other features of the building such as underfloor heating combined with heat absorbing concrete floors, well planned building orientation, solar panels and rainwater harvesting, have all contributed to the buildings high level of sustainability. The result of this innovative design is that the current office building is 76% more energy efficient than a traditional building and the Eco-Depot

will save approximately 176 tonnes of carbon dioxide every year.

*Designed by Carillion for City of York Council*

11.14 **Environmental impact of materials / responsible sourcing of materials – basic building and finishing elements**

11.15 Measures that can be taken to encourage the use of materials with lower environmental impacts over their lifecycle and to recognise and encourage the specification of responsibly sourced materials for the basic building (roof, external walls, internal walls, floors, windows) and finishing elements include:

- Procuring materials that have low whole life environmental impacts, for example, the use of straw bales for wall construction;
- Procuring materials that have a long life to reduce the need for future demolition;
- Avoiding over – specification;
- Reusing existing materials or procure reclaimed and recycled materials;
- Using recycled materials wherever possible rather than virgin materials. These may result from demolition on site or may be imported from elsewhere;
- Earthworks undertaken at a development should include a high percentage of recycled organic compost;
- Products such as cement and lightweight concrete blocks can be made using waste or by-product materials. These should be specified;
- Avoid specifying materials which cannot easily be separated for reuse / recycling;
- Natural non-toxic and low VOC (volatile organic compounds) flues, solvents, treatments, paints and coatings should be specified where possible, for example, lime-based renders, mortars and paints;
- Procure local materials to reduce their transportation impacts;
- Ensure all timber is legal



Leeds red brick



CASE STUDY: Town Centre House

This redevelopment of an existing 'tired' office section of a larger city centre shopping centre achieved a BREEAM rating of 'Excellent'. The building has a low energy design and predicted CO<sub>2</sub> emissions are 74% lower than a typical office development of the same scale. This has been achieved through a state of the art cooling and heating system which incorporates a heat recovery stage and natural ventilation. The building achieved a 70% recycling rate for construction waste, used locally sourced York sandstone cladding and incorporated a sedum green roof to improve biodiversity and help attenuate sudden rainfall events.

*Designed by BDF Architects and SMC Gower (now known as Archial) for Town Centre Securities plc*

11.16 Further information

- 'Green Guide to Specification': [www.bre.co.uk](http://www.bre.co.uk)
- 'Opportunities to use recycled materials in building', 'Choosing Construction Products: Recycled Content of Mainstream Products', 'Recycled Content Toolkit', are just some of the freely available documents and tools at [www.wrap.org.uk](http://www.wrap.org.uk)
- Recycled content product online construction search tool: <http://rcproducts.wrap.org.uk/>
- Evaluation tool for recycled content in construction: <http://rctoolkit.wrap.org.uk/>
- Forest Stewardship Council, UK. [www.fsc-uk.org/](http://www.fsc-uk.org/)

Re-using old roofing slates



and all timber products come from temperate sources which are independently certified, such as the FSC and PEFC;

- ☑ Innovative schemes using low impact materials will be welcomed;
- ☑ The amount of non-porous hard surfacing should be minimised. Porous surfacing materials should be used to enable surface water infiltration and manage run-off.



- Ensure the materials specified will perform adequately in the climate throughout the lifetime of the development.

# 12. Surface water run-off

## 12.1 Background information on the current situation in Leeds

12.2 Rain falling on buildings and hard surfaces cannot infiltrate into the ground so it needs to be drained artificially in order to prevent problems of localised flooding. The traditional method of dealing with surface water has been to pipe it away from developments and discharge it to the sewerage system or nearby watercourses. This has implications for water quality, the ecology and amenity of watercourses, including canals, and downstream flooding. It is predicted that climate change, as a result of human activity, will result in increased rainfall in the UK as well as an increase in the frequency of intense rainfall events. This is likely to exacerbate flooding problems. Sustainable drainage systems provide an alternative to the traditional approach. Sustainable drainage seeks to mimic more natural drainage processes by allowing rainfall to soak into the ground where possible or by delaying discharges. This reduces both the volume and rate of surface water run-off



to sewers and watercourses. While the primary function of sustainable drainage systems is to drain away water, they also have the potential to serve as amenity and/or wildlife habitats, but this should not compromise their ability to maintain them effectively to ensure their primary drainage characteristics are preserved.

12.3 The background and principles of sustainable drainage in Leeds are covered by the existing Supplementary Planning Guidance No. 22 - Sustainable Drainage in Leeds (Leeds City Council 2004).

12.4 The impact on the water environment should be a consideration at the site identification and appraisal stage. This includes impacts on water quality, protecting the flood capacity of watercourses and protecting features such as ponds and wetlands. The site layout should seek to minimise impacts on the water environment by reducing the quantity and improving the quality of surface water run-off.



A soak away to alleviate flooding, Leeds



*"With climate change, we are experiencing more unusual, extreme seasonal weather patterns and we are only too aware of more frequent downpours causing flash flooding. Trees in front gardens and streets reduce and slow surface runoff from storms, limiting soil erosion, and reduce and delay peak volumes of storm water reaching drains, helping to reduce the potential for flash flooding."*

**Tony Kirkham,**  
Head of the Arboretum,  
Royal Botanic Gardens, Kew



Drainage channel



Allerton Bywater's SUDS, Leeds

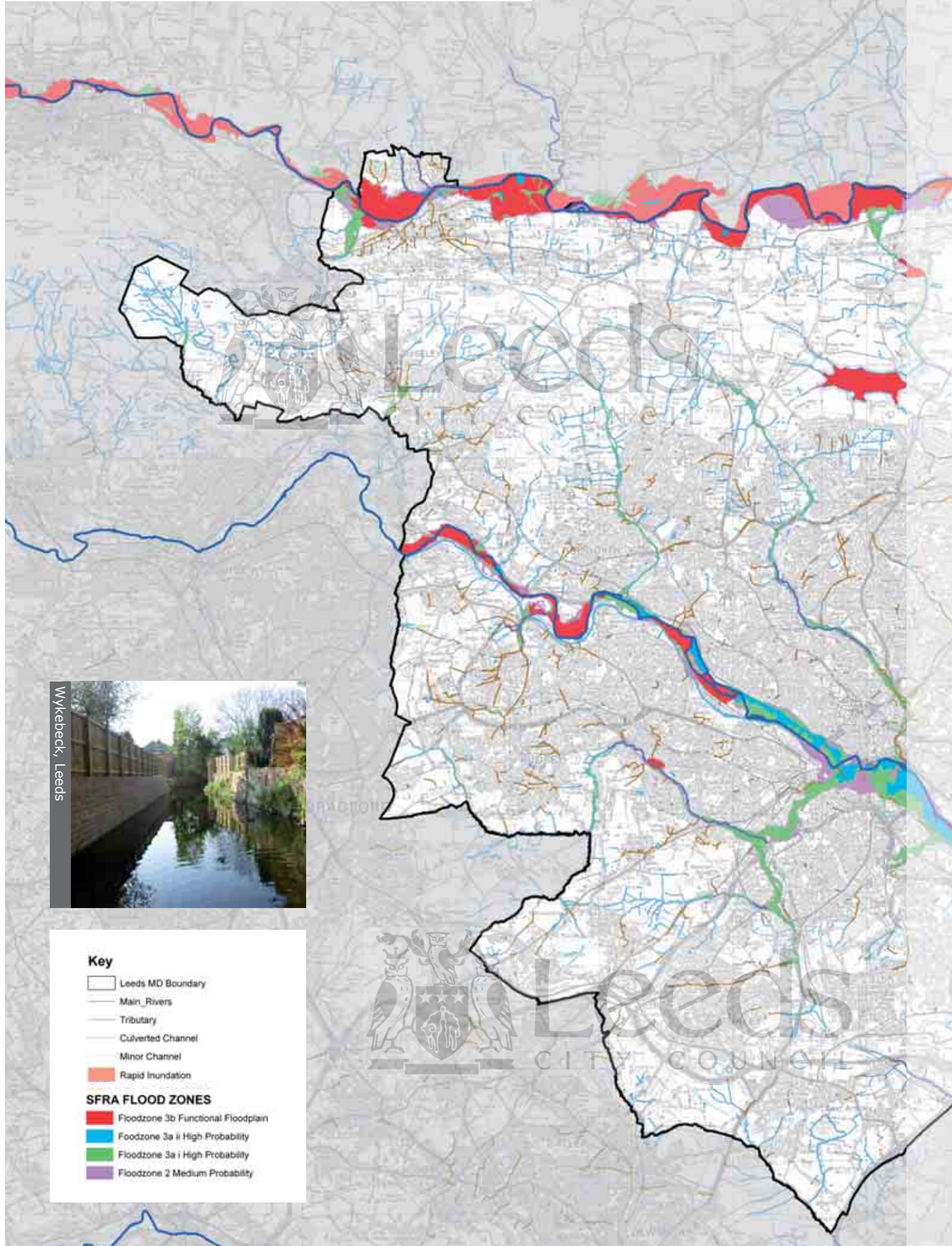
12.5 Flood plains are a vital part of our environment and their flooding is a natural event, which often occurs without risk to people. However, the effectiveness of a river and flood plain to convey and store flood water can be adversely affected by human activity. As well as their importance in providing natural storage for floodwater,

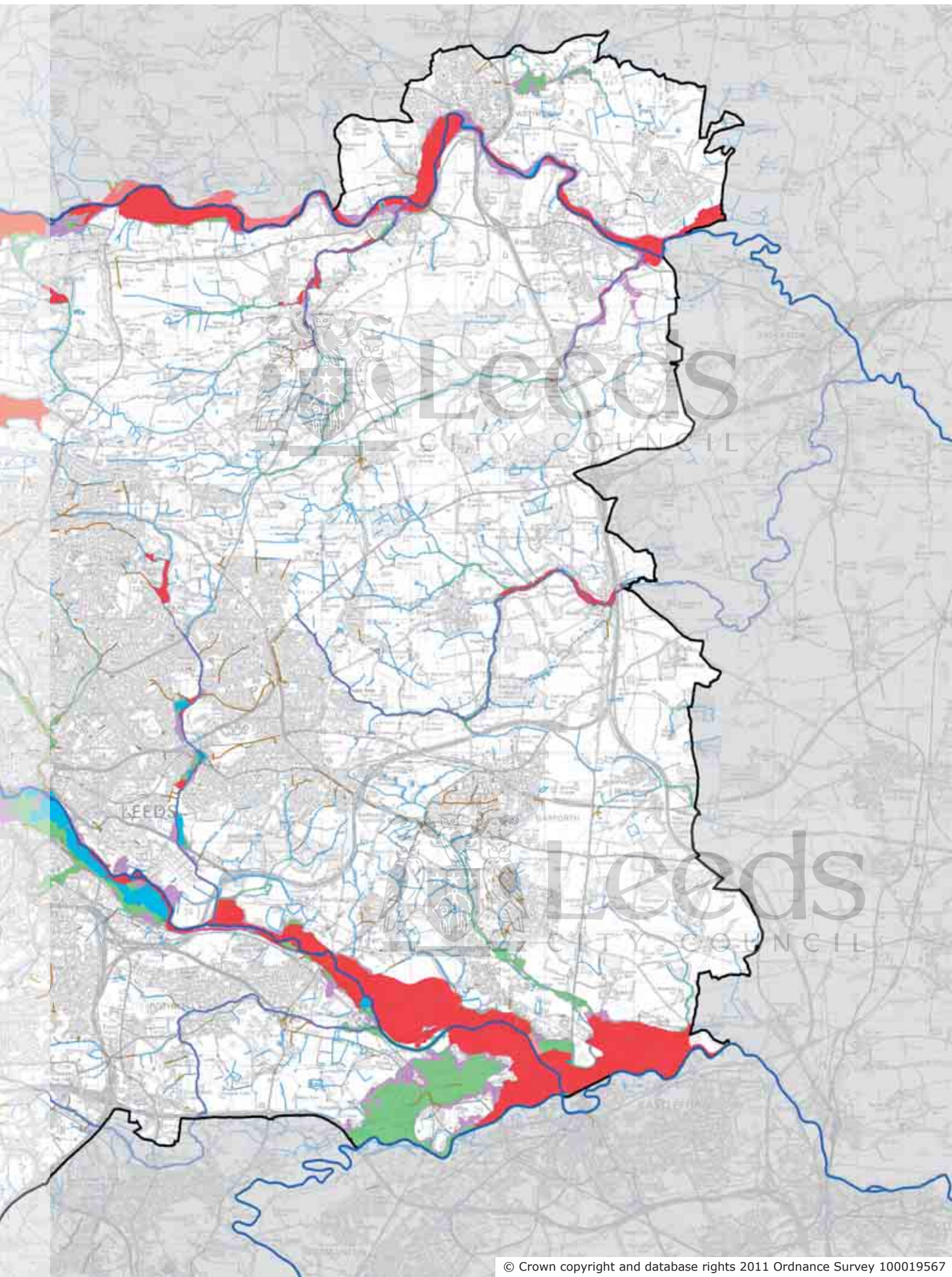
flood plains can also provide:

- Fertile agricultural land;
- Valuable habitat for wildlife and plants;
- A recreational resource;
- The periodic flooding of low-lying areas nourishes the soil, a benefit used by farmers for centuries.

12.6 Flooding can cause significant stress, disruption and economic cost for many people. Changes in our climate, such as more intense rainfall events and wetter winters, will increase the occurrence of flooding in Leeds and elsewhere.

Figure 12.1: Leeds Strategic Flood Risk Assessment Map





12.7 DEFRA (Department for Environment, Food and Rural Affairs), in conjunction with other stakeholders, is taking forward the developing strategy for flood and coastal erosion risk management via its 'Making Space for Water' programme (Department for Environment, Food and Rural Affairs 2005b). The programme is looking at:

- giving the Environment Agency a strategic overview of all forms of flooding and coastal erosion;
- identifying the most effective way to tackle the causes of urban flooding;
- ways to help people adapt to changing risk of flooding and coastal erosion;
- working with natural processes and developing approaches to flooding and erosion which achieve many objectives at once, such as improved nature conservation.

12.8 Leeds City Council is the Lead Local Flood Authority. It is responsible for identifying and mapping local flood risk and for drawing up flood risk management plans. Under the Flood and Water Management Act 2010, the council is the SUDS Approving Body (SAB) and needs to approve drainage plans for both permitted developments and those that require planning permission. This will ensure that SUDS are also included in construction that may cover large surface areas, but does not require planning permission.

12.9 As a local planning authority, the council is responsible for ensuring that flood risk is taken into account in relation to all new development. As a flood defence operating authority the council also has its own Flood



Flooding in Leeds City Centre, June 2007

Risk Management (FRM) Section (formerly Land Drainage) and has permissive powers to carry out flood alleviation work and to enforce good house-keeping by riparian owners in relation to ordinary watercourses.

12.10 The Environment Agency is the national flood defence operating authority with permissive powers to carry out flood alleviation work and to enforce good house-keeping by riparian owners in relation to main rivers. The agency has a strategic overview role in respect of flood risk management. It has responsibility for raising public awareness and providing flood forecasting/warning systems.

12.11 Through flood risk management the probability of flooding from watercourses can be reduced by land management, watercourse maintenance and flood defences. The level of damage caused by floods can also be reduced through effective land use planning, flood warning and emergency responses.

12.12 There are a number of other organisations who play an important role in the response to flooding. West Yorkshire Police coordinate the response of all public bodies, and are responsible for evacuating the public from properties and controlling traffic in flooded areas.

12.13 Leeds City Council's Peace and Emergency Planning Unit supports the work of the FRM Section, the Environment Agency and the police. In addition, the council holds a number of other responsibilities including setting up rest centres to accommodate and feed members of the public; addressing the needs of those most vulnerable in the event of a flood; organising vehicles to evacuate members of the public, ensuring road closures/diversions; cleaning debris from highways and blocked road gulleys; and arranging sandbags.

12.14 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) draws the following conclusions:

- The most pressing water issues and the stand out point that the NRWDPD should look to address is the pressure placed upon the Leeds drainage system by under capacity, pressure caused by rapid run-off from impermeable surfaces and the more extreme weather events brought on by climate change
- There must be careful planning measures put in place to ensure that all development places drainage and flooding issues as a key consideration and the construction of further impermeable surfaces should be discouraged.



12.15 The CSH includes two issues in this category whose aims are:

|   |  |
|---|--|
| Management of surface water run-off from developments | To design housing developments which avoid, reduce and delay the discharge of rainfall to public sewers and watercourses. This will protect watercourses and reduce the risk of localised flooding, pollution and other environmental damage |
| Flood risk  | To encourage housing development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding   |

Figure 12.2:

### permeable block paving

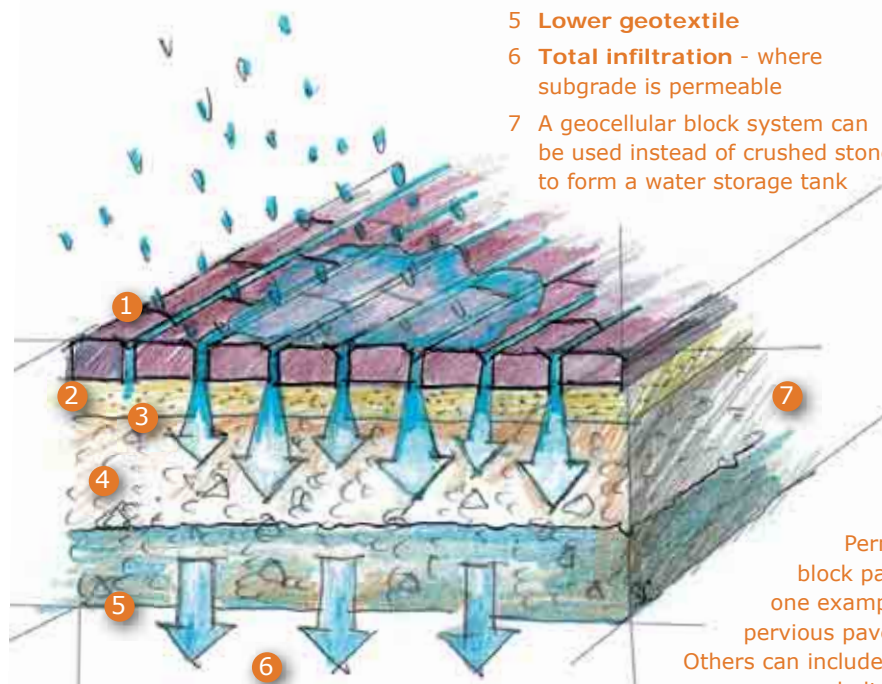
- 1 **Blocks with open joints** - no fines fill
- 2 **Free draining bedding** - no fines
- 3 **Geotextile layer**
- 4 **Open permeable base course**
- 5 **Lower geotextile**
- 6 **Total infiltration** - where subgrade is permeable
- 7 A geocellular block system can be used instead of crushed stone to form a water storage tank

### 12.16 Management of surface water run-off from developments

12.17 The preferred policy position in the council's NRWDPD is that all developments are required to ensure no increase in the rate of surface water run-off to the existing formal drainage system. Change of use developments and conversions will be expected to incorporate sustainable drainage techniques wherever possible:

- ☑ On previously developed sites peak flow rates must be reduced by at least 30%;
- ☑ On sites which have not previously been connected to the drainage infrastructure, or watercourse, surface water run-off rates will not exceed the 'greenfield' run-off rate (ie the rate at which water flows over land which has not previously been developed);
- ☑ Applications for development are expected to comply with the council's Minimum Development Control Standards for Flood Risk (Leeds City Council 2008c).

12.18 General guidance for the management of surface water run-off has been outlined in council's 'Minimum Development Control Standards for Flood Risk' (Leeds City Council 2008c). For all sites, we will require a **Flood Risk Assessment** (Drainage Impact



Permeable block paving is one example of a pervious pavement. Others can include gravel or porous asphalt. These systems help breakdown pollutants and can assist with water attenuation.

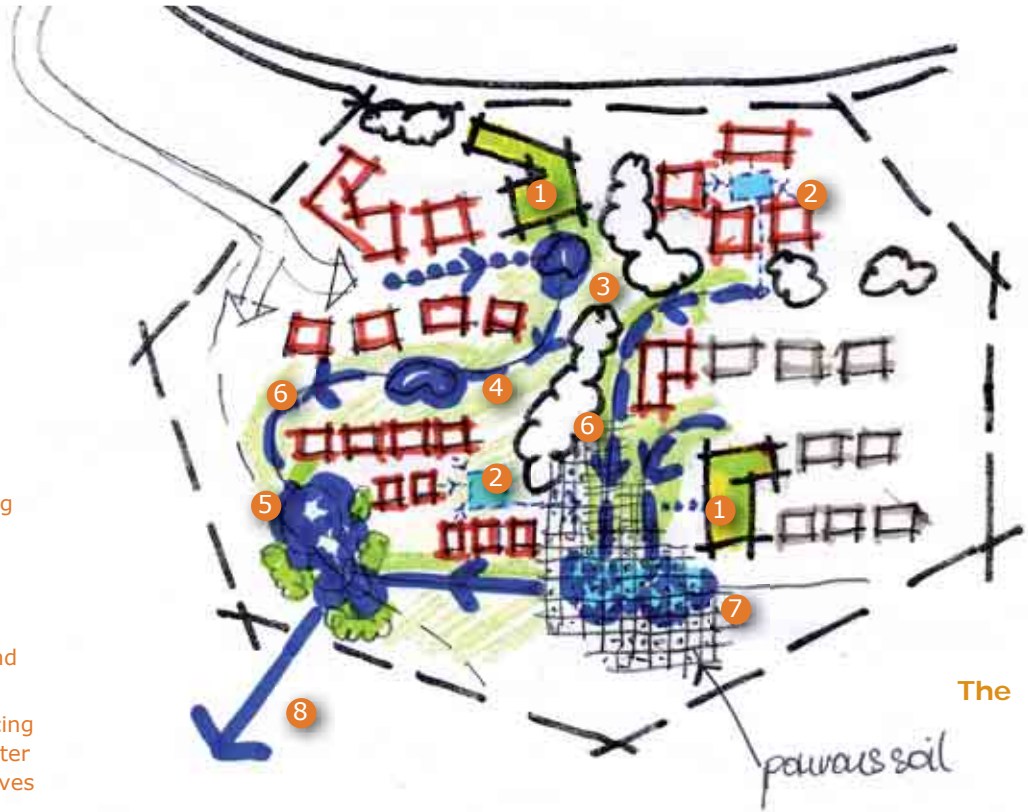


Assessment), which addresses the flood risk associated with the run-off generated by the proposed development.

**Figure 12.3:**

**SUDS**

- 1 **Green roof**  
- can also act as a water storage area
- 2 **Rainwater harvesting**  
- direct capture and use of water run-off (water used for domestic purposes) eg flushing toilets or irrigation
- 3 **Water detention basin**  
- dry basin providing temporary storage of water run-off to reduce peak flow and allows settlement of solids
- 4 **Wet detention pond (balancing pond)** - permanent pool of water that reduces peak flow, improves water quality and supports shoreline vegetation
- 5 **Constructed wetland (enhanced balancing pond)** - shallow areas with wetland vegetation - pollutant removal and wildlife habitat enhancement
- 6 **Swales and filter strips (natural conveyance systems)** - as well as filtering out silt these features can reduce peakflow. They can also infiltrate water into the ground in the right conditions
- 7 **Soakaways** - underground storage structures where the ground is porous and the water table is low. They provide storm attenuation, water treatment and ground water recharge
- 8 **Greenfield run-off rate**



12.19 Measures that can be taken to design developments which avoid, reduce and delay the discharge of rainfall to public sewers and watercourses include:

- ✓ Existing features such as wetlands, ponds and pools should be protected;
- ✓ The culverting and canalisation of watercourses should be avoided wherever possible, and opportunities to re-establish natural

watercourses, channels, margins and wetlands should be maximised;

- ✓ The amount of non-porous hard surfacing should be minimised. Porous surfacing materials should be used to enable surface water infiltration and manage run-off;
- ✓ Downstream watercourses should be protected from the adverse effects of excess surface water run-off, both in quantity and quality;





Table 12.1: The SUDS Hierarchy

| Most Sustainable<br><-----><br>Least Sustainable  | SUDS Technique  | Flood Reduction | Pollution Reduction | Landscape and Wildlife Benefit |
|---|---|-----------------|---------------------|--------------------------------|
|   | <b>Living roofs</b>   | ✓               | ✓                   | ✓                              |
|   | <b>Basins and ponds</b><br>- Constructed wetlands<br>- Balancing ponds<br>- Detention basins<br>- Retention ponds | ✓               | ✓                   | ✓                              |
|   | <b>Filter strips and swales</b>   | ✓               | ✓                   | ✓                              |
|   | <b>Infiltration devices</b><br>- soakaways<br>- infiltration trenches and basins                                  | ✓               | ✓                   | ✓                              |
|   | <b>Permeable surfaces and filter drains</b><br>- gravelled areas<br>- solid paving blocks<br>- porous paviers     | ✓               | ✓                   |                                |
| <b>Tanked systems</b><br>- over-sized pipes/tanks<br>- storms cells<br><i>NOTE: Will only be allowed in exceptional circumstances</i> | ✓   |                 |                     |                                |

- ✓ Landscape areas should incorporate such features as swales and filter strips to reduce the volume of piped surface water run-off;
- ✓ Infiltration methods, such as soakaways, should be used wherever possible and where soil conditions permit;
- ✓ Where infiltration is not practical, other forms of sustainable drainage techniques should be used, such as attenuation tanks or balancing ponds. These should be designed to maximise their wildlife value;
- ✓ Install oil interceptors and silt traps to improve the quality of any surface water discharge to watercourses and/or soakaways;



- Provide facilities for rainwater collection for reuse such as water butts and green roofs;
- Where possible, site landscaping should utilise plant species which do not require a lot of water;
- The future maintenance requirements and responsibilities of any sustainable urban drainage measures should be made clear;
- The drainage plan for the site should be sufficient for the expected climate for the lifetime of the development.

## 12.20 Flood risk

- 12.21 For all sites a **Flood Risk Assessment** is required. This should be proportionate to the risk and appropriate to the scale, nature and location of the site – taking account of flooding from any source. The Leeds Strategic Flood Risk Assessment provides lots of detailed guidance on designing in flood risk areas, including minimum development control requirements and an indication of what should be included in the detailed flood risk assessment. The Environment Agency is currently working in partnership with Leeds City Council in developing a strategic approach to flood risk management.



#### CASE STUDY Fearn's Wharf, Leeds

The development consists of 3000m<sup>2</sup> (32,000sqft) of high quality office accommodation and achieved a BREEAM 'Excellent' energy efficiency rating. Sustainable features of the building include the overall design and construction as a heat sink with natural ventilation, while further sustainable elements have since been included with the introduction of geothermal heat pumps which provide an energy and capital efficient heating system.

*Designed by Brewster Bye Architects for Bracken Developments (Yorkshire) Ltd*

#### 12.22 Leeds Flood Alleviation Scheme and Vision Document

12.23 The document aims to guide and influence the appearance, design and location of new flood defences and ensure past and future aspirations for the city are fully integrated. The 'Leeds Waterfront Strategy' (adopted by the council as Supplementary Planning Guidance) has helped define the key objectives. Recommendations will be made on general design principles, methods of reducing the visual and physical impact of defence structures and opportunities for environmental enhancements.



#### 12.24 Flood Alleviation Scheme's Design Vision Objectives:

- Identify key sites directly affected by the flood defences;
- Establish design principles to reflect local issues and enhance local character;
- Recommend design alternatives which meet the objectives of flood defences;
- Promote improvements to connectivity and linkages to wider route networks;
- Safeguard and enhance the ecological value and nature conservation of riparian habitats and encourage sustainable methods;
- Identify key opportunities for environmental improvements;
- Pinpoint development sites and future growth areas within the river corridor.

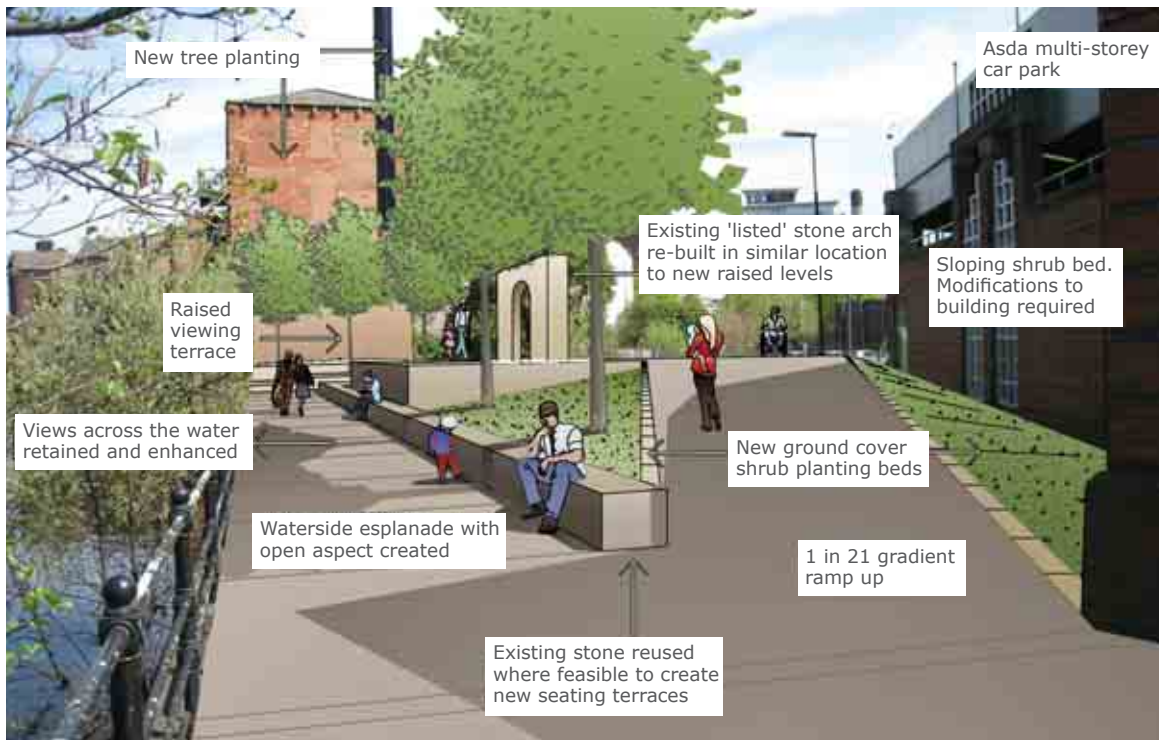
*Other Case Studies to refer to:*  
 – Moorgate Croft p57  
 – Epicentre p73



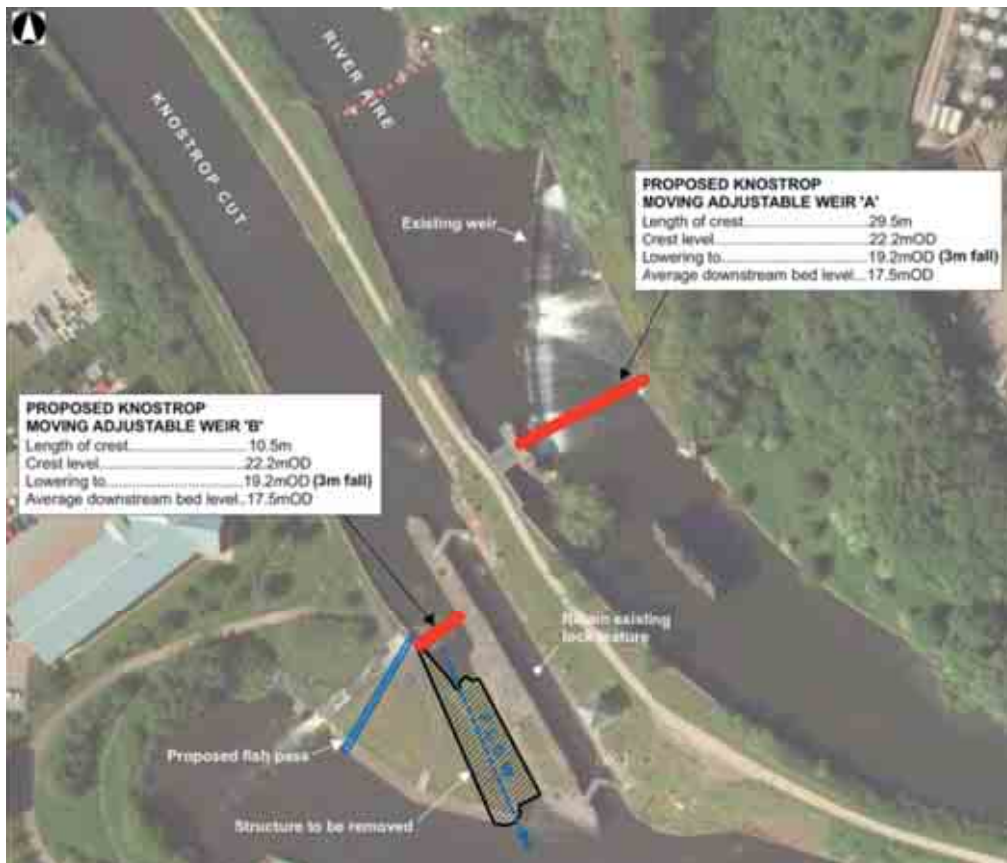
#### 12.25

Measures that can be taken to enable development in low flood risk areas, or to take measures to reduce the impact of flooding on development built in areas with a medium or high risk of flooding include:

- A major recommendation of the Leeds Strategic Flood Risk Assessment is that in flood risk areas the whole of the site should not be regarded as the developable area and space should be made for storage and/or conveyance of flood water;
- Use flood prevention/mitigation techniques including building bunds, designing higher defensive road systems and landscape features such as wells and ponds;
- Use the ground floor space for flood-compatible uses (eg car parking) or raise the ground floor above the likely flood level.



Previous proposal for Leeds Flood Alleviation Scheme: Water Lane



Leeds Flood Alleviation Scheme: Proposal for Movable Weir – concepts courtesy of Arup

## 12.26 Further information

- Floodzone data: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- CIRIA (2000) Sustainable Urban Drainage Systems: Design Manual for England and Wales. Report C522: [www.ciria.org](http://www.ciria.org)
- CIRIA (2001) Sustainable Urban Drainage Systems: Best Practice Manual. Report 523: [www.ciria.org](http://www.ciria.org)
- National SUDS Working Group (2003) Framework for Sustainable Drainage Systems (SUDS) in England and Wales: [www.ciria.org](http://www.ciria.org)
- Scottish Environmental Protection Agency, Environment Agency & Environment and Heritage Service Sustainable Urban Drainage Systems: An Introduction: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)
- Improving the flood performance of new buildings: Flood resilient construction, Communities and Local Government, Defra and the Environment Agency May 2007: [www.communities.gov.uk/publications/planningandbuilding/improvingflood](http://www.communities.gov.uk/publications/planningandbuilding/improvingflood)
- Leeds City Council (2007), Strategic Flood Risk Assessment: [www.leeds.gov.uk](http://www.leeds.gov.uk)
- Leeds City Council (2008), Minimum Development Control Standards For Flood Risk: [www.leeds.gov.uk](http://www.leeds.gov.uk)

# 13. Waste

## 13.1 Background information on the current situation in Leeds

13.2 Sustainable waste management is concerned with producing less waste, and dealing with waste that is produced in a more sustainable manner. The waste hierarchy provides a framework for sustainable waste management.

1. **Reduction:** By minimisation of waste generation and use of natural resources
2. **Reuse or repair:** Reusing discarded items
3. **Recycling:** Separating waste into materials which can then be incorporated into new products
4. **Recovery:** Of energy and materials.
5. **Disposal:** This is the least desirable option.

13.3 A total of 30.2 million tonnes of household waste is produced annually in the UK (Department for Environment, Food and Rural Affairs 2004). Currently in the UK around 75% of total household waste is still sent to landfill, even though the vast majority is reusable. In 2008/9, Leeds residents produced about 345,000 tonnes of waste and rising levels of recycling and composting means that the proportion sent to landfill was about 69%. By comparison, Germany recycles 57% of its waste and the Netherlands recycles 64%. The European Community Directive 99/31

## The Waste Hierarchy



sets a target of reducing biodegradable municipal waste sent to landfill to 75% of 1995 levels by 2010 and to 35% of 1995 levels by 2020.

13.4 Policy outlined in The National Waste Strategy 2007 (Department for Environment, Food and Rural Affairs 2007) is recognised through new targets to reduce the amount of household waste not reused, recycled or composted from over 22.2 million tonnes in 2000. The strategy aims to reduce this figure by 29% to 15.8 million tonnes in 2010, with an aspiration to reduce it to 12.2 million tonnes by 2020 – a reduction of 45%. This is equivalent to a fall of 50% per person (from 450 kg per person in 2000 to 225 kg in 2020). Nationally, energy from waste is expected to account for 25% of municipal waste treatment by 2020, compared to 10% today, which is less than the 34% by 2015 anticipated in 2000 (Department for Environment, Food and Rural Affairs 2007).

13.5 The Integrated Waste Strategy for Leeds, 2005-2035 (Leeds City Council 2005) sets a recycling target of 40% by 2020 and more importantly a desire to eliminate annual growth in municipal waste to zero by 2020. The recycling target was increased further in 2007 to plus 50% by 2020. The strategy sets out a clear aspiration for Leeds' future: *"our vision is of a zero waste city, where we reduce, reuse, recycle and recover value from all waste, and where waste becomes a resource."*

13.6 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) and Natural Resources and Waste DPD Policy Position Report (Leeds City Council 2010) draws the following conclusions:

- Waste generation in Leeds is slightly less than the national average for 2004, the most recent available national data. This reflects positively upon Leeds as the national waste arising trend has been upward in recent years; hence Leeds appears to bucking the national trend. However the amount of waste is still projected to grow in the future;
- The current recycling rate for household waste in Leeds is 30%;



## Reducing waste to landfill sites

Leeds City Council is committing to a national scheme to cut down the amount of construction waste sent to landfill sites. Between 80% to 90% of all construction waste is recyclable, for example, soil can be used for top soil in gardens or garden centres, wood is re-chipped and reused, rubble is crushed in hardcore and used for road building, plastics are washed, chipped and reused and cardboard re-pulped. Each year in the UK over 120 million tonnes of construction and excavation

waste is produced and nearly a quarter of this is sent straight to landfill. Currently Leeds is only the second local authority in England to sign up to the 2012 Construction Commitment, Halving Waste to Landfill. By signing up to this scheme, the council is committed to setting waste reduction targets for any construction contractors that the council uses and makes sure that waste is kept to a minimum when any new construction contracts are awarded.



13.7 The CSH includes three issues in this category whose aims are:

|  |   |
|--|---|
| Storage of non-recyclable waste and recyclable household waste | To recognise and reward the provision of adequate indoor and outdoor storage space for non-recyclable waste and recyclable household waste                            |
| Construction site waste management                             | To promote reduction and effective management of construction related waste by improving on performance which meets the Site Waste Management Plan (SWMP) regulations |
| Composting   | To encourage developers to provide the facilities to compost household waste, reducing the amount of household waste sent to landfill                                 |

- Construction and demolition waste is the largest proportion of the waste stream, followed by commercial and industrial and then municipal waste;
- An emphasis should be placed upon reduction, reuse and recycling of waste in an attempt to treat waste as a by-product and the landfilling of waste should only occur as a last resort;
- Energy from waste would provide a way to address many of the issues whilst reducing reliance on fossil fuels for energy generation and reducing the potential burden of increasing landfill tax;
- Waste arising in the Leeds area would be well suited for use in biomass and CHP energy production and investigation of this potential is recommended.

### 13.8 Storage of non-recyclable waste and recyclable waste

13.9 It is vital that developers make early contact with Leeds City Council's Environmental Services to understand existing collection arrangements and likely future developments of the waste and recycling collection system and the related waste storage provision requirements.

13.10 Measures need to be incorporated into all developments, ideally at an early stage of design development, to ensure the provision of adequate indoor and outdoor storage space for non-recyclable waste and recyclable materials for all residents and include:

- ✓ For houses and flats provide: **internal storage** capacity appropriate for maximum use of the available recycling

opportunities. Residents require at least 60 litres per dwelling for storage of recyclable materials prior to transfer to outdoor collection containers. Sufficient **external storage** for up to three 240 litre containers (to be consistent with Leeds City Council's current mixed dry recycling, garden waste and residual waste collections), **composting** containers (large enough to compost 25% of household waste) and a **separate container for the storage of food waste** (not all food waste can be composted). Food waste collections are currently being undertaken in some areas of Leeds and are likely to increase.

- ✓ All storage must be accessible to disabled people, particularly wheelchair users, and sited on hard level surfaces;
- ✓ The external waste storage area will need to be sited at a distance that is accessible both to the residents and waste collection crew. Either waste containers can be moved easily from the rear of the property to the front for collection or where this is not feasible, to create a suitable storage area, near to the carriageway, which can act as a direct waste collection point. Access routes should be direct, free from obstructions and raised thresholds to allow easy manoeuvring of wheeled bins. Where changes in levels are unavoidable suitable ramps should be provided;
- ✓ For developments of more than one residential unit, applicants must demonstrate that the provision of communal external storage for both residual waste and recyclable materials is large enough to cater for all dwellings. This judgement must be based on collection timetable information agreed with Leeds City Council;
- ✓ Ensure that all communal storage facilities (both internal and external) are easily accessible to waste collection vehicles with sufficient space to allow uplifting and emptying of the provided communal storage containers. This is a particular issue in basement areas of flats;
- ✓ Storage space for non-residential units will need to be determined through negotiation depending on specific development types. Residential recycling rates will be applied in the first instance: so provision must be made for storing a minimum of 50% of commercial waste for recycling or composting;

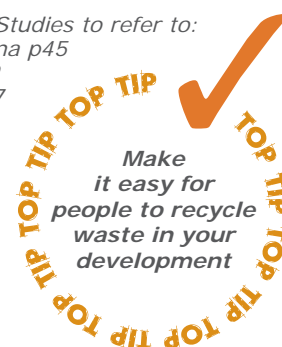


## CASE STUDY: Northern Ballet

From the outset environmental considerations were central to the design of the Northern Ballet and Phoenix Dance Theatre, with all parties fully committed to creating the most sustainable and environmentally friendly building possible. The energy efficiency of the building in use resulted in the inclusion of a number of specific features; a green sedum roof to provide insulation and reduce the run-off of water, the provision of solar panels to reduce the reliance of the building on the national grid, and heating and ventilation controlled by a computerised building management system to allow localised temperature control and reduce waste. The building is designed in two sections, the dance studios are on the southern side with solar shading built in to cover large areas of glass, the offices are located on the northern side to minimise solar gain. In terms of construction, wherever possible materials have been sourced from sustainable sources. The contractor has minimised the amount of waste going to landfill and received a very good score under the Considerate Contractors scheme. Sustainable travel is encouraged through the provision of cycle parking and public transport information. The building has been designed to achieve a BREEAM 'Excellent' rating and is currently awaiting assessment.

*Strategic Design Alliance for Leeds City Council*

Other Case Studies to refer to:  
 - Leeds Arena p45  
 - Envac p99  
 - Trinity p27



**Make it easy for people to recycle waste in your development**

- ✓ Provide facilities for the collection of materials for recycling; eg bottle, can and paper banks which must be carefully located to avoid noise nuisance for nearby residents;
- ✓ Developers are encouraged to consider the many new innovative ways of collecting and storing recyclable waste streams. The design must be agreed with Leeds City Council to ensure it is compatible with the council's collection vehicles.



- Waste storage arrangements should prevent excessive odour in warmer weather conditions.





### 13.11 Construction site waste management plans

13.12 Measures that can be taken to promote reduction and effective management of construction related waste by improving on performance which meets the Site Waste Management Plan (SWMP) regulations include:

- ✓ Maximise the reuse of existing buildings and structures on site where existing buildings cannot be reused, utilise the materials as part of the new development or other developments nearby. Materials such as stone, slates, tiles, timber, paving and bricks are generally suitable for reuse;
- ✓ Excess material arising from construction should not be disposed of on site;
- ✓ Minimise, monitor, measure and report non-hazardous waste production;
- ✓ Sorting and separating materials on site for reuse and recycling and aim for at least 50% by weight or volume diversion from landfill;
- ✓ Identify any hazardous materials (eg asbestos), monitor, measure and report hazardous materials and arrange for containment and disposal by a licensed operator;

- ✓ Design that makes use of prefabricated units or whole units of construction materials;
- ✓ Provide on site storage of materials to minimise losses to damp or rain and that facilitates reuse on site or recycling;
- ✓ If reuse of salvaged materials is not possible within your trade, consider registering with a waste exchange organisation such as WhyWaste or NISP (National Industrial Symbiosis Programme) as other businesses or community groups may be able to make use of materials that may otherwise be disposed of.

### 13.13 Composting

13.14 Measures that can be taken to encourage developers to provide the facilities to compost waste include:

- ✓ For individual houses provide a composting container (large enough to compost 25% of household waste) per dwelling together with an information leaflet explaining why composting is important, materials that can be composted and troubleshooting advice;
- ✓ For flats or developments where composting would be inappropriate, the requirement for a composting container may be removed;
- ✓ Composting toilets and reed bed systems for the treatment of foul water should be considered where appropriate.

### 13.15 Further information

- Wastewatch is an environmental charity promoting sustainable resource use [www.wastewatch.org.uk](http://www.wastewatch.org.uk)

- WRAP (Waste & Resources Action Programme) works to help businesses and individuals reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way. Envirowise offers free, independent support to organisations to help them become more resource efficient and save money: <http://envirowise.wrap.org.uk>
- Building Regulations, Approved Document H provides guidance on the arrangements for separate storage of waste for recycling: <http://www.planningportal.gov.uk/buildingregulations/approveddocuments>
- BS 5906: 2005 Waste Management in Buildings – Code of Practice: [http://shop.bsigroup.com/en/ProductDetail/?p\\_id=000000000030050097](http://shop.bsigroup.com/en/ProductDetail/?p_id=000000000030050097)
- 'Non-statutory guidance for site waste management plans': [www.defra.gov.uk/environment/waste/topics/construction/pdf/swmp-guidance.pdf](http://www.defra.gov.uk/environment/waste/topics/construction/pdf/swmp-guidance.pdf)
- WRAP, guidance on site waste management and the Demolition Protocol. Available: <http://www.wrap.org.uk/construction>
- For information on the council's approach to waste management see [www.leeds.gov.uk](http://www.leeds.gov.uk)
- The Business Waste Handbook has been produced to help businesses in Leeds to manage their waste and save money. See [www.leeds.gov.uk](http://www.leeds.gov.uk)
- For information about recycling and composting see [www.recyclenow.com](http://www.recyclenow.com)
- [www.whywaste.org.uk](http://www.whywaste.org.uk) is a free online waste exchange service for businesses in Yorkshire and Humber.

# 14. Pollution

## 14.1 Background information on the current situation in Leeds

14.2 This chapter concentrates on air pollution. Guidance on other types of pollution are provided elsewhere:

- Land contamination – this SPD does not provide guidance on land contamination and remediation. For advice on this please see the land contamination pages on [www.leeds.gov.uk](http://www.leeds.gov.uk);
- Construction site pollution – see section 16;
- Light pollution – see 9.63;
- Noise pollution – see 15.9;
- Waste – see section 13;
- Water pollution – see 12.19.

14.3 The European Air Quality Framework Directive (Directive 96/62/EC) identifies a number of pollutants for which limit or target values are set in additional Daughter Directives. In the UK the requirements of these directives have been transposed into the National Air Quality Strategy (NAQS), which sets mandatory health based standards for seven air pollutants: nitrogen dioxide



(NO<sub>2</sub>); fine particles (PM<sub>10</sub>); carbon monoxide; lead; and 1,3-butadiene. This strategy specifies mandatory limits and makes the review and assessment of local air quality a requirement for all local authorities. Of these seven pollutants Leeds only has any potential problem with levels of NO<sub>2</sub> and PM<sub>10</sub> (particulates), and road traffic is the greatest source of emissions for both of these.

14.4 Failure to meet the standards for any of the above pollutants (non-compliance) requires declaration of an Air Quality Management Area (AQMA)

together with the preparation of an Air Quality Action Plan (AQAP) to help mitigate the most significant problems ie. emission sources. Areas of Concern (AoC) are those locations identified during the review and assessment process as being at risk of exceeding the standards and therefore requiring further investigation. AQAPs are also required for sites deemed to be AoCs.

14.5 Exposure to both NO<sub>2</sub> and PM<sub>10</sub> can have adverse effects on human health, affecting the respiratory system. Short-term exposure to NO<sub>2</sub> is associated

Modern buses run on low sulphur diesel

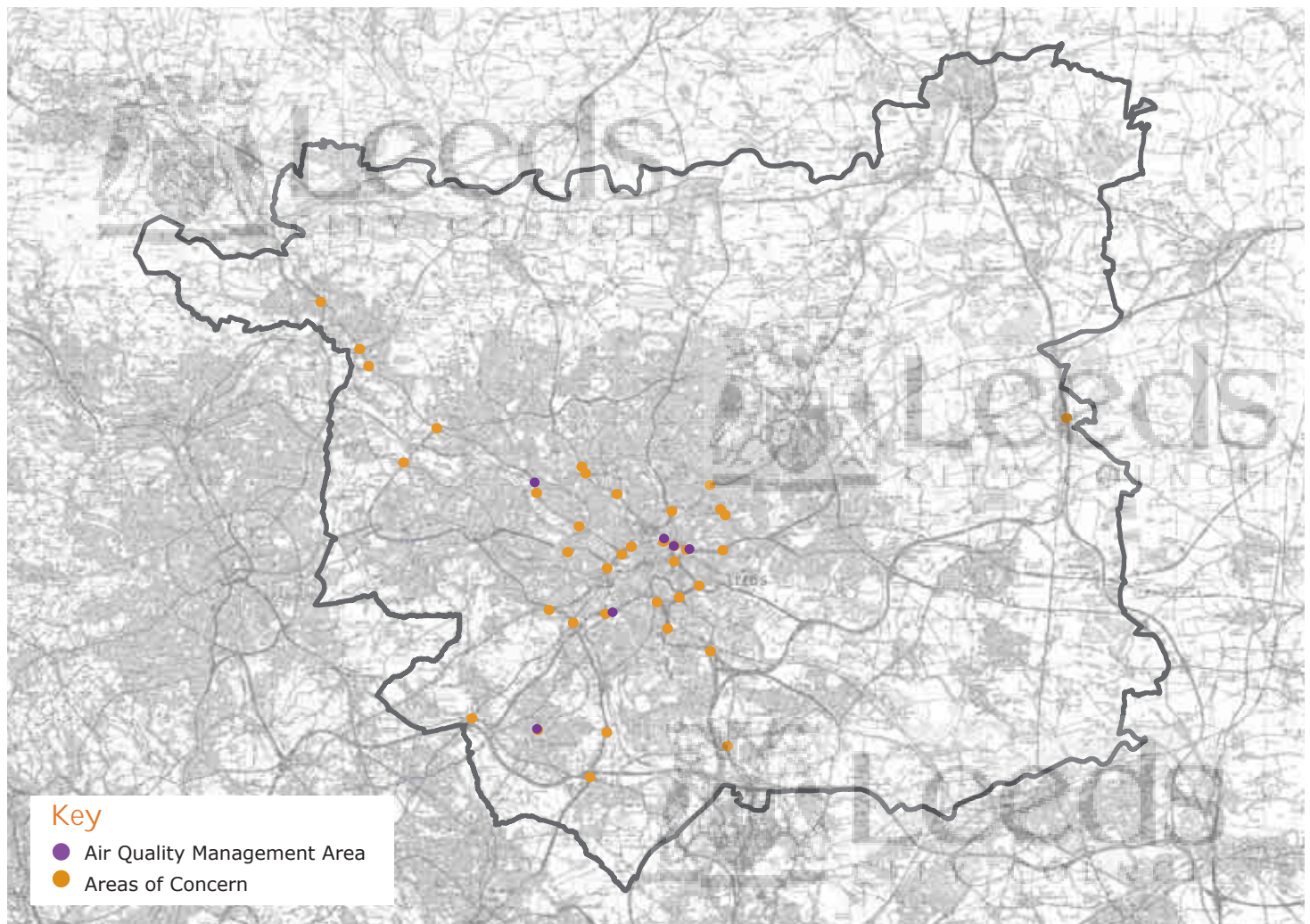


with reduced lung function and airway responsiveness and increased risk of respiratory infection in children. Inhalation of fine particles (PM<sub>10</sub>) can increase the frequency and severity of respiratory symptoms and the risk of premature death.

14.6 Both of these pollutants also contribute to a range of other environmental issues such as acidification, eutrophication, photochemical smog/ground level ozone and global climate change effects through complex positive/negative radiative, or warming effects.

14.7 The review and assessment process involves a combination of air quality monitoring and modelling against the air quality standards by local authorities. Figure 14.1 shows the location of Leeds AQMAs and AoCs. All are associated with traffic related NO<sub>x</sub> emissions.

Figure 14.1: Air Quality Management Areas



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“Sustainability cannot be achieved through bricks and mortar alone. In the UK, carbon emissions from our day-to-day lives are split roughly three ways between our homes, transport, and growing and transporting our food. Therefore, a development cannot be truly sustainable unless travel, food buying and waste are also addressed.”

**BedZED**

**CASE STUDY: BedZED**

‘Beddington Zero Energy Development’ (BedZED) is the UK’s largest eco-village and is located in Sutton, London. The development comprises 82 homes and office space, with solar panels embedded in the fabric of the building. It is constructed from second hand materials directly from demolition sites and reconditioned timber and steel wherever possible. Natural materials such as oak and chestnut hardwoods were sourced from a WWF Forest Stewardship Council approved woodland. Bulk materials such as local brick, concrete aggregate and precast floor planks were also sourced within 35 miles of the site to reduce their embodied energy. All of these major environmental savings were made without adding to the net cost of the development.



Sustainable transport reduces pollution and BedZED has seen a 64% reduction in car mileage, which equates to 2,318km/year (compared to national average).

*Architect: Bill Dunster, BedZED*

14.8 All the traffic related AQMAs are located close to junctions or interchanges between main radial routes and the Inner Ring Road. These areas suffer from a combination of high localised emissions from congested junctions on top of the high general background created by the large volume of traffic concentrated over the relatively small city centre area.

14.9 The AoCs are isolated areas of housing located very close to the strategic motorway network. There is a risk of these areas exceeding the NAQS standards due to the very high traffic flows and HGV content on these roads.

14.10 On-going monitoring throughout Leeds continues to identify road transport emissions as the most

significant source of NO<sub>x</sub> and PM<sub>10</sub> in West Yorkshire. Road transport emissions of NO<sub>2</sub> and PM<sub>10</sub> account for approximately 75% (for NO<sub>2</sub>) and 50% (for PM<sub>10</sub>) of total urban emissions. The most significant levels of exhaust emissions (approximately 55% of weekday emissions) occur during morning and evening peak periods which are exacerbated during congested traffic conditions.

14.11 Leeds City Council is promoting a range of low carbon vehicle

technology within its own fleet (biomethane refuse vehicles, hybrid vehicles and electric vehicles).



Electric scooter



This biomethane gas-powered Mercedes Eonic refuse truck is delivering a stunning 60% reduction in carbon emissions, compared to a standard vehicle. And now the council is taking a further step forward in pioneering green methods for collecting rubbish by becoming the first local authority to have its own biomethane fuel station. This could mean many more council vehicles eventually converting to the green fuel and also potentially allow other organisations in the city to share the facilities.

14.12 The analysis of the evidence in the Natural Resources and Waste DPD Resource Flow Analysis (Leeds City Council 2008d) draws the following conclusions:

- On a national level, Leeds performance on air quality issues is generally good. Transport related emissions place the most significant risk to air quality and careful controls should be made in order to maintain air quality in the Leeds area;
- The six AQMAs in the Leeds area have made excellent progress under their air quality management plans and it is predicted that when reassessment occurs, the majority will be abolished.

14.13 The CSH includes two issues in this category whose aims are:

|   |   |
|---|---|
| Global warming potential (GWP) of insulants | To reduce global warming from blowing agent emissions that arise from the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials |
| NOx emissions                               | To reduce the emission of nitrogen oxides (NOx) into the atmosphere   |

### 14.16 NOx emissions

14.17 Measures that can be taken to reduce the emission of nitrogen oxides (NOx) into the atmosphere include:

- ☑ Specify heating plant with low nitrous oxide emissions. See also advice on biomass heating plants in section 9.51 on renewable technologies;
- ☑ Provide bike spaces, showers and lockers to encourage cycling;
- ☑ Provide charging points for electric vehicles, refuelling infrastructure for gas vehicles;
- ☑ Provide preferential parking arrangements for low carbon fuelled vehicles.

### 14.18 Further information

- Leeds City Council are responsible for air quality monitoring and modelling in Leeds: [www.leeds.gov.uk/airquality](http://www.leeds.gov.uk/airquality)
- Streetcar [www.streetcar.co.uk](http://www.streetcar.co.uk)
- City Car Club [www.citycarclub.co.uk](http://www.citycarclub.co.uk)
- Car Plus [www.carplus.org.uk](http://www.carplus.org.uk)

### 14.14 Insulants

14.15 Measures that can be taken to reduce global warming from blowing agent emissions that arise from the manufacture, installation, use and disposal of foamed thermal and acoustic insulating materials include:

- ☑ Insulation requiring the use of ozone depleting gases should be avoided;
- ☑ Natural insulation material such as sheep's wool or cellulose (recycled paper) should be considered.



# 15. Health and wellbeing

## 15.1 Background information on the current situation in Leeds

15.2 Noise nuisance can have a large impact on people's quality of life and can affect people living, working or visiting in noisy areas. There are also potential health issues associated with disturbed sleep, stress, etc.



**Table 15.1: Noise complaints received in Leeds**

| Noise complaints received | 1998/99     | 1999/00     | 2000/01     | 2001/02     | 2002/03        | 2003/04     | 2004/05     | 2005/06     |
|---------------------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|-------------|
| Domestic                  | 1708        | 1725        | 1958        | 3659 *      | No data        | 4311        | 4860        | 5406        |
| Of which out of hours     |             |             |             |             |                |             | 3162        | 3324        |
| Commercial/industrial     | 976         | 822         | 820         | 1037        | No data        | 2697        | 758         | 878         |
| Of which out of hours     |             |             |             |             |                |             | 255         | 331         |
| <b>Total</b>              | <b>2684</b> | <b>2547</b> | <b>2778</b> | <b>4696</b> | <b>No data</b> | <b>7008</b> | <b>5618</b> | <b>6284</b> |

15.3 External private open space can be important. They may include allotments and gardens, which can contribute to sustaining biodiversity, sustainable drainage, and provide opportunities for composting and creating healthier, more attractive places. Landscape features and greenspace associated

with development should be considered as an integral part of the design process. As well as providing a setting for the buildings, landscaped areas and greenspace can provide useful areas for amenity and wildlife, infiltration areas for surface water and an opportunity to retain existing features such as trees and hedgerows.

\* 24 hour service was introduced April 2001, covering complaints occurring during the weekend and Thursday and Friday nights. It does not include commercial/ industrial related complaints.

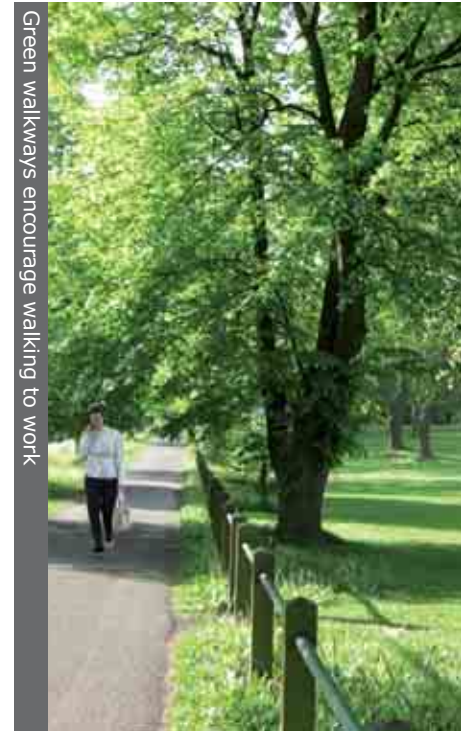


**CASE STUDY: LILAC**

LILAC is a pioneering project which aims to build a community of 20 homes and a common house to high ecological standards using co-housing design principles and aim to be permanently affordable through the formation of a Mutual Home Ownership Society (MHOS). The LILAC project, which stands for Low Impact Living Affordable Community, has designed the homes to be super-insulated, use natural and locally sourced materials, such as straw and timber, and makes use of heat from the sun to warm the houses and reduce energy bills.

One of the main benefits to this design, aside from the ecological advantages, is the increased sense of community provided by the mixture of private dwellings and shared facilities. The common house includes communal facilities such as a meeting space, kitchen, laundry, play area, guest bedroom and a workshop. These shared facilities also help reduce energy use and save money for residents. Included in the concept design is limited on-site parking, cycle storage and a car share scheme.

*Proposed scheme designed by White Design for LILAC*



*Other Case Studies to refer to:*  
 – Greenhouse p16  
 – Allerton Bywater p33  
 – New Beverley School p102

15.4 One of the current key values outlined by Leeds City Council is 'Treating People Fairly' (see 3.13). With this in mind it is imperative that all new development consider the needs of all users (including those who have become disabled by the environment) to ensure that no one is discriminated against. It should be noted that failure to consider such issues at a design stage may result in costly developer adaptations at later stage.

15.5 Adhering to the latest best guidance on accessibility and inclusion, as stated document such as in British Standard BS8300, Part M of the Building Regulations, Sport England Guidance etc, is expected for planning approval. Furthermore, it is important

to recognise that standards are gradually increasing and therefore exceeding the current expectations will reduce the risk of future adaptations and is a key part of designing and constructing the most sustainable buildings.

15.6 The CSH includes four issues in this category whose aims are:

|                |   |
|----------------|---|
| Day-lighting   | To improve the quality of life in homes through good daylighting and to reduce the need for energy to light the home                                      |
| Sound          | To ensure the provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours   |
| Private space  | To improve the occupiers' quality of life by providing an outdoor space for their use, which is at least partially private                                |
| Lifetime homes | To encourage the construction of homes that are accessible to everybody and where the layout can easily be adapted to meet the needs of future occupants. |



CASE STUDY: Rutland Lodge Medical Centre

Rutland Lodge has been designed as a healthy building to house a new medical centre. It features solar panels for hot water, photovoltaic panels for electricity and large south

facing windows for solar gain. Recycled and filtered rainwater is used to flush the toilets.

*Designed by OSA Architects (now Stack Architects)*

15.7 Day lighting

15.8 Measures that can be taken to improve the quality of life in buildings through good daylighting and to reduce the need for energy to light buildings include:

- ✓ A room will have a day-lit appearance if the area of glazing is at least 1/25th of the total room area;
- ✓ Areas of rooms without a direct view of the sky are likely to have a low level of daylight;
- ✓ Where windows are not possible, consider roof lights or light tubes (also known as light pipes, sun pipes, solar pipes, solar light pipes, or daylight pipes) to let in natural daylight;
- ✓ Making maximum use of natural lighting and ventilation. A plan depth of up to 13m allows for natural daylighting and ventilation from windows on both sides;

- ✓ To allow natural ventilation, windows should be able to be opened securely at high and low levels of the building;
- ✓ The use of atria and glazed courtyards in larger buildings will increase natural lighting levels and can be used to induce a stack ventilation effect, but these spaces should not be fully heated;
- ✓ Large single storey buildings can be designed with rooflights to introduce natural daylight;
- ✓ Wind towers, associated with a central atrium, can be used to provide natural ventilation for larger buildings, such as offices and shopping centres.



□ In commercial buildings excessive solar gain can add to the heat generated by lighting and equipment and lead to over heating. Avoid the need for air conditioning by incorporating shading features such as louvres, external blinds and large roof overhangs;

CASE STUDY: St Mary's Close Live/Work Studios, New Wortley, Leeds

This terrace of five family houses incorporate live/work studios and have been designed to enable flexible living and working under one roof. On completion in 2005 they achieved an Eco-Homes 'Excellent' rating and are also built to Lifetime Homes criteria.

Being highly fuel efficient, with provision made for zoned heating, they aim to cost just £3 a week to run in energy costs. They were also designed to allow for future conversion to solar energy.

*Designed by Brewster Bye Architects for Yorkshire Housing*







#### CASE STUDY: Wellington Place, Leeds

'Green in the City' is a temporary works project undertaken by MEPC to allow a vacant building site to be utilised by the community. The football pitches are used every night and the allotments have proven very successful. The tree-lined boulevard is currently being completed ahead of any development.

*Developer: MEPC*

#### CASE STUDY: Gipton Housing, Leeds

This new affordable housing scheme in Gipton, Leeds, features PV panels and a carefully designed layout with an emphasis on solar orientation to maximise sunlight. Where space is limited, Juliette balconies offer a way of engaging with the outdoor environment.

*Designed by EDAW and Knapton & Knapton, for Bellway and Leeds City Council*



### 15.9 Sound insulation

15.10 Measures that can be taken to provide improved sound insulation to reduce the likelihood of noise complaints from neighbours include:

- ✓ Ensure adequate levels of sound insulation in floors and walls;
- ✓ Design noisy areas (eg stairs, lifts, circulation areas) away from sensitive areas (eg bedrooms);
- ✓ Insulate noisy plant rooms;
- ✓ Use at least double glazing to help reduce noise and reduce heat loss;
- ✓ Consider how ventilation systems will operate in noisy areas. Alternatives to opening windows may have to be considered;
- ✓ Make use of noise bunds and landscaped earthmounds to protect development from noise sources;
- ✓ Incorporate low noise road surfacing.

### 15.11 Private space

15.12 Measures that can be taken to improve the occupiers' quality of life by providing an outdoor space for their use, which is at least partially private include:

- ✓ Private space should be easily accessible for disabled people and wheelchair users in particular;
- ✓ The site layout should seek to provide a hierarchy of spaces from public to private;
- ✓ Structural landscape works or features should be used to modify microclimate and to reduce noise from roads;
- ✓ Rear gardens should be designed to have maximum privacy and, where possible, to provide space for food growing and kitchen waste recycling;

- ✓ Landscape design should seek to minimise opportunities for crime;
- ✓ Consideration should be given to the contribution of site landscaping to nature conservation;
- ✓ Significant areas of tree planting can act as air filters and also absorb CO<sub>2</sub>. Planting is therefore particularly important adjacent to main roads;
- ✓ Species appropriate to the location should be selected for planting. Considerations include value for wildlife, the mature height and spread of trees and the distance to existing and proposed buildings, structures and services;
- ✓ Developers will be expected to make provision for the long term maintenance of site landscaping;



- Landscape areas should be designed, where possible, to enable infiltration of surface water from the development and to detain floodwaters;
- Avoid plant species that require large amounts of water;
- Hard-wearing surface treatments will be needed where outdoor spaces are likely to be used more in warmer temperatures. However surfaces should be permeable (eg gravel or paved) to avoid increased water runoff and should also be chosen to avoid creating dust and soil erosion;
- Help to reduce the urban heat island effect e.g. by planning green space and using appropriate shade when locating your development. Provision of shady areas will be particularly important as people spend more time outside thereby increasing their risk of exposure to solar radiation which can cause skin cancer;
- As people spend more time outside, it will be important to design outdoor space so that the risk of noise nuisance is minimised;
- In higher density developments where gardens cannot be provided, balconies, roof gardens and green links to nearby green spaces should be included;
- Root barriers can help to deal with risks of subsidence from existing mature trees.



Allotments provide exercise as well as fresh food

*“Where do we sit outdoors in the garden on a hot day? Usually, under the shade of a tree. Why? Because the air is cooler – estimates suggest a mature tree can reduce the local air temperature on a hot summer day by 10°C (18°F). Asthma rates for children fall by a quarter where tree populations are high. Trees are 24/7, living, air-conditioning systems, absorbing carbon dioxide, dust, pollen and other particulates and releasing oxygen from photosynthesis.*

*In much of the USA, large deciduous trees are commonly planted around houses. Their shade is valued for reducing air-conditioning costs in summer, while by dropping their leaves in winter they allow sunlight in, enabling the opposite, a warming effect”*

**Tony Kirkham,**  
Head of the Arboretum,  
Royal Botanic Gardens, Kew

### 15.13 Lifetime homes

15.14 All homes can include measures that may be used to ensure they are accessible to everybody and where the layout can easily be adapted to meet the needs of future occupants and allow people to stay in their homes should individual circumstances change. Lifetime home considerations cover:

- Car parking;
- Distance between car parking and home;
- Approach to entrances;
- Entrance design;
- Stairs;
- Doorways and hallways;
- Circulation space;
- Living room location;
- Provision for entrance level bed-space;
- Entrance level WC and provision for drainage;
- Ability to incorporate hand-rails;
- Provision for stair lift or lift;
- Provision for hoist between bedroom and bathroom;
- Bathroom design;
- Living room window design;
- Switches and controls.



Collingham



**CASE STUDY: 'ENVAC' Mobile Vacuum System at Hammarby Sjostad, Stockholm**

Movac is a particularly cost-effective, user-friendly and environmentally-friendly waste handling system for urban environments and suburban areas compared with other mobile collection systems. This system is ideal for recycling as the inlets can be placed closer to the user, making sorting at source easier and more comfortable.

The waste inlets are positioned centrally. Users throw their waste bags into readily accessible waste inlets located indoors or outdoors. The waste is then stored in closed underground screw tanks which are linked together with docking points by means of a network of underground pipes. Docking points are positioned on the periphery. These docking points are positioned in such a way as to ensure that the vacuum truck picking up the waste does not have to drive into gardens or narrow

streets. The underground tanks are emptied regularly depending on the amount of waste discarded and the storage capacity of the screw tanks. The vacuum truck which empties the tanks via the docking points creates a vacuum in the pipe system. Once this vacuum has reached a required level, the screws in the tanks are activated automatically. The waste is screwed and sucked seamlessly out of the screw tanks, through the pipe system and into the vacuum truck, where it is compressed.



Other measures that will assist with keeping occupants safe include:

- Ensure that there are safe access routes above likely flood levels and that routes are clearly marked;
- Negotiate with utilities and others over the climate resilience of services and infrastructure to the development.

**15.15 Further information**

- The council's noise service investigate a wide range of noise complaints from a variety of sources. Common examples include loud music, barking dogs, and burglar alarms. See [www.leeds.gov.uk](http://www.leeds.gov.uk)
- 'Wheelchair Housing Design Guide' (2nd edition) National Wheelchair Housing Association group. 2006. Available from [www.brebookshop.com](http://www.brebookshop.com)
- Design of buildings and their approaches to meet the needs of disabled people. BS 8300. British Standards Institute 2009. Available from [www.bsigroup.com](http://www.bsigroup.com)
- DD 266:2007 Design of accessible housing. Lifetime home. Code of practice. Available from [www.bsigroup.com](http://www.bsigroup.com)
- Access Audit Handbook. Alison Grant Centre for Accessible Environments. 2005. Available from [www.ribabookshops.com](http://www.ribabookshops.com)
- Building for Life Standards. CABE. 2003. [www.buildingforlife.org](http://www.buildingforlife.org)
- Lifetime Homes standards. [www.lifetimehomes.org.uk](http://www.lifetimehomes.org.uk)
- The Disability Discrimination Act 1995. [www.direct.gov.uk](http://www.direct.gov.uk)
- The Building Regulations 2000 – Approved Document M – Access to and use of Buildings 2004 Edition [www.planningportal.gov.uk](http://www.planningportal.gov.uk)
- Access for Disabled People – Design Guidance Note – Sport England [www.sportengland.org](http://www.sportengland.org)
- Sign Design Guide – JMU and the Sign Design Society [www.signdesignsociety.co.uk](http://www.signdesignsociety.co.uk)
- For guidance on successfully integrating trees into development see [www.leeds.gov.uk](http://www.leeds.gov.uk)

# 16. Management

## 16.1 Background information on the current situation in Leeds

16.2 Successful communication on environmental issues is acknowledged as being a critical element of environmental improvement. This may take the form of formal initiatives operating in local schools and other educational establishments, properly evaluated interventions designed to alter behaviour in the community (eg to increase participation in recycling schemes) or simple provision of information and other publicity material.

16.3 In education, the recent development of the Leeds sustainable schools framework is an exciting initiative designed to support whole school improvement through better outcomes for pupils, increased attainment and greater financial and operational efficiencies for schools. A dedicated complimentary handbook provides the necessary tools to support schools to liaise with their stakeholders and communities, encouraging greater participation on sustainability.



Gyms provide fitness opportunities for all ages

a wide range of elements or 'doorways' of school life from developing school buildings and grounds, through waste minimisation and recycling to improved energy and water conservation. This dynamic process helps schools to make explicit the links between its curriculum, buildings and the community thereby enhancing the learning experience. It also helps schools to define an ethical stance as an extended school within the community. Of the 266 Leeds schools, 70 have so far registered to the framework in the six months since December 2010 – with

the ultimate aspiration of all the city's schools benefiting from the framework over time.

16.4 Leeds City Council maintains the Environment Leeds website, which reports on environmental activities and issues affecting organisations, businesses and individuals across Leeds.

16.5 Construction site practices can have a huge impact on the local area and local population. Dust, noise, vibrations, dirty roads, increased traffic, parking problems, water pollution and soil contamination are all often recorded. For example,



the Environment Agency registers most incidents of water pollution as coming from construction sites.

16.6 The CSH includes four issues in this category whose aims are:

16.7 **Building user guide** ✓

16.8 A building user guide should be provided in an appropriate format for users. This might include translation into other languages, Braille, large print or audio cassette/CD. The guide should be written in a form that is easy for users to understand and should include information on the following:

- Environmental design and features of the building;
- Energy instructions and efficiency advice;
- Water use instructions and water saving advice;
- Sustainable drainage instructions and advice
- Recycling and waste;
- Sustainable DIY advice;
- Emergency information;
- Public transport;

- Local amenities;
- Responsible purchasing;
- Links to further information;
- In non-residential development, more specialist guidance may be needed for facilities managers.

16.9 **Considerate constructors scheme** ✓

16.10 Measures that can be taken at construction sites managed in an environmentally and socially considerate and accountable manner include:

- Operate under the considerate constructors scheme. Good practice measures recommended in the scheme are:

**Considerate**

- Communication – *Sites should proactively inform those affected by the work;*
- Parking – *Site parking should cause minimal impact on an area;*
- Diversions – *Diversions should be avoided. However, where necessary, should be clear and simple to follow;*
- Deliveries – *Should be planned and timed to cause least impact;*
- Perimeter – *The perimeter of the site should be a positive advert for the industry*

|                                 |   |
|---------------------------------|---|
| Building user guide             | To recognise and encourage the provision of guidance to enable home owners/occupiers to understand their home/building efficiently and to make the best use of local facilities     |
| Considerate constructors scheme | To recognise and encourage construction sites managed in an environmentally and socially considerate and accountable manner   |
| Construction site impacts       | To recognise and encourage sites managed in a manner that mitigates against environmental impacts   |
| Security                        | To encourage the design of developments where people feel safe and secure; where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion |

**CASE STUDY: Monitoring Systems**

All of the 166 apartments at Greenhouse (see case study on pages 16-17) have an integrated energy monitoring system by using the TV as an interface. This allows the residents not only to monitor their own energy usage, but also the amount of energy the building is generating and using as a whole. The system has also enabled occupants to form an energy co-operative, with Greenhouse acting as energy supplier and invoicing homeowners by net usage, taking into account energy produced on site and energy exchanged between apartments. Furthermore,

homeowners can book an electric pool car from the on-site car club, get real-time information on local transport and access a notice board to keep in touch with the wider community, all through the TV. Ensuring that all residents would actively use and participate in the communal technology system at Greenhouse was absolutely critical to the success of the project as a whole. If the monitoring system was not fully integrated into daily life for the residents, they would not embrace the core values of the scheme and wouldn't change their energy usage behaviour, impacting on the sustainability of the building.



## CASE STUDY: New Beverley School

### *'intelligent management of day-lighting'*

New Beverley School has specifically incorporated sustainable and ecological design precepts into its build design. This encompasses passive energy use, better insulation, light wells and a controlling use of ventilation all of which are variable and adaptable during the yearly cycle. The school's circular snail-shell design compliments its sustainable attributes and promotes elegant educational opportunities. The design dramatically reduces any external exposure to the school, while avoiding limited day-lighting opportunities through light-wells and 'sun pipes'. This approach also reduces heat loss during winter and heat gain in summer. It incorporates a strong management system and best practice construction process as well as a 60 year minimum use life cycle.



The school has won regional RICS awards for Regeneration and for Community Involvement. It has also won "Project of the Year" in the RICS Pro-Yorkshire Awards and the 2007 Built Environment and Architectural Heritage National Green Apple Awards.

*Designed by Leeds City Council's Strategic Design Alliance for Education Leeds*

- Communication – Sites should proactively inform those affected by the work;
- Goodwill – Sites should be a positive influence on the area in which they operate;
- Complaint handling – Any complaints are recorded, investigated and resolved;
- Avoiding nuisance – Sites should interact positively with their neighbours.



- Hazardous materials – These should be managed responsibly to avoid any pollution;
- Energy reduction – Everything possible should be done to reduce the use of non-sustainable energy;
- Pollution – Any pollution should be minimised.

#### Site cleanliness

- Perimeter – The perimeter of the site should be a positive advert for the industry;
- Facilities – Should be kept clean and tidy at all times;
- Site – Should be kept clean and tidy at all times;
- Vehicles – Should present a positive image of the industry.

#### Good Neighbour

- Site presentation – Sites should act as a positive advert for the industry;

#### Respectful

- Operatives – Operatives should appear and act professionally at all times;
- Facilities – Should be good quality and well maintained.

#### Safe

- General public and neighbours – Sites should not endanger those they affect;
- Operatives – Sites should not endanger those that work on them;
- Visitors – Sites should not endanger those that visit them.

#### Responsible

- Occupational Health and First Aid – Site Managers should positively influence those they employ;
- Security – Sites should be secure at all times;

#### Environmental awareness

- Policies and assessments – Environmental standards and targets should be documented and monitored;
- Waste – Sites should do all they can to reduce waste in addition to reusing and recycling;
- Ecology – Everything possible should be done to protect and enhance the local ecology;

- Offsite traffic management – *Vehicle movements resulting from any site's activities should cause minimal impact on an area;*
- Educational visits – *Sites should present themselves as a learning facility for the local community;*
- Training – *Companies and sites should look to constantly develop those who work for them;*
- Equal Opportunities – *Sites should proactively encourage equal opportunity employment.*

#### Accountable

- To the Considerate Constructors Scheme – *Sites should actively promote registration with the scheme and its aims;*
- To the general public – *Sites should positively promote themselves and the industry;*
- To operatives – *Sites should support operatives in surpassing the requirements of registration.*

#### 16.11 Construction site impacts

16.12 Measures that can be taken at sites managed in a manner that mitigates against environmental impacts include:

- ✓ Monitor, report and set targets for CO<sub>2</sub> production or energy use arising from site activities;
- ✓ Monitor, report and set targets for CO<sub>2</sub> production or energy use arising from commercial transport to and from the site;
- ✓ Monitor, report and set targets for water consumption from site activities;
- ✓ Adopt best practice for air (particularly dust) pollution arising from site activities;
- ✓ Adopt best practice for water (ground and surface) pollution control occurring on site;
- ✓ Main contractor has an environmental materials policy, used for sourcing of construction materials to be utilised on site;
- ✓ Main contractor operates an Environmental Management System.



#### 16.13 Security

16.14 Measures that can be taken to design developments where people feel safe and secure; where crime and disorder, or the fear of crime, does not undermine quality of life or community cohesion include:

- ✓ Dialogue at the concept stage with a specialist Architectural Liaison Officer and consideration of the Secured by Design scheme, which promotes designing out crime in the built environment;
- ✓ Following the principles of Designing for Community Safety (Leeds City Council 2007a) and Neighbourhoods for Living (Leeds City Council 2007b) and applying them to:
  - Taking an integrated approach
  - Environmental quality
  - Creating defensible space
  - Access and footpaths
  - Surveillance
  - Clear demarcation of public and private spaces
  - Open space provision.

#### 16.15 Further information

16.16 Other organisations in the city known to communicate on environmental issues include the Environment Agency ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)) and Leeds Voice Environment Forum ([www.leedsvoice.org.uk](http://www.leedsvoice.org.uk))

- Environment Leeds Newsletter ([www.leedsinitiative.org/environment/](http://www.leedsinitiative.org/environment/))
- Healthy Schools and Wellbeing Service [www.schoolwellbeing.co.uk](http://www.schoolwellbeing.co.uk).
- ICE, 'A Report on Demolition Protocol' [www.ice.org.uk](http://www.ice.org.uk)
- CIRIA, Environmental Good Practice – Site Guide [www.ciria.org.uk](http://www.ciria.org.uk)
- GLA, Draft London Best Practice Guide: The Control of Dust and Emissions from Construction and Demolition [http://www.london.gov.uk/thelondonplan/guides/bpg/bpg\\_04.jsp](http://www.london.gov.uk/thelondonplan/guides/bpg/bpg_04.jsp)
- Considerate Constructors Scheme: [www.ccscheme.org.uk](http://www.ccscheme.org.uk)
- Secured by Design is the official police flagship initiative supporting the principles of designing out crime. It focuses on crime prevention at the design, layout and construction stages and promotes the use of security standards for a wide range of applications and products: [www.securedbydesign.com/index.aspx](http://www.securedbydesign.com/index.aspx)



# 17. Ecology

## 17.1 Background information on the current situation in Leeds

17.2 The enhancement of biodiversity through the successful integration of existing and newly created wildlife habitats into development schemes is an important part of creating places where people want to live. As well as being important in its own right biodiversity also provides essential ecosystem services including the supply of food, water and timber; the regulation of flooding and climate change; and the provision of recreational and cultural benefits (see Figure 17.1).

17.3 The Leeds district has a varied landscape ranging from the uplands in the north west to the limestone ridge in the east as well as two major river valleys. This supports a rich variety of wildlife and habitats. The Leeds Biodiversity Action Plan identifies four priority habitats and six priority species with further habitats and species to be added with future reviews (Leeds City Council 2001).

17.4 The Leeds LDF includes policies which seek to maintain and enhance biodiversity and to protect designated nature conservation sites. The LDF will also identify the Leeds Habitat Network which will include areas for habitat creation, restoration and enhancement.

17.5 The Biodiversity and Waterfront Development SPD (Leeds City Council 2006a) provides detailed guidance for development adjacent to rivers, canals and watercourses.

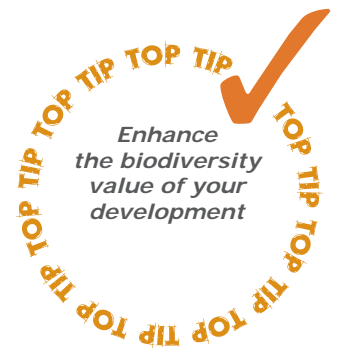
17.6 The CSH includes five issues in this category:



Wyke Beck Valley: an important green corridor

|                                    |  |
|------------------------------------|--|
| Ecological value of the site       | To encourage development on land that already has limited value to wildlife, and discourage the development of ecologically valuable sites |
| Ecological enhancement             | To enhance the ecological value of the site  |
| Protection of ecological features  | To protect existing ecological features from substantial damage during the clearing of the site and the completion of construction works   |
| Change in ecological value of site | To reward steps taken to minimise reductions and encourage an improvement in ecological value  |
| Building footprint                 | To promote the most efficient use of a building's footprint by ensuring that land and material use is optimised across the development     |





**17.7 Ecological value of the site**

**17.8 An ecological assessment** ✓ will be required which should include:

- Ecological survey data, including a desk study and field surveys carried out at an appropriate time of year;
- An assessment of the overall ecological value of the site and the impact of the proposed development taking into account the development footprint, the area required for construction and the impact of any off-site services, such as drainage;
- An assessment of any off site impacts on adjoining, nearby or connected habitats and species;

- Special attention should be given to assessing the impact on designated nature conservation sites, protected species and priority (local and national) habitats and species;
- Recommendations on protection, mitigation, enhancement and management of biodiversity on the site. Any habitats and features to be retained must be clearly identified;

Take account of the effect of unavoidable climate change anticipated in Leeds over the lifetime of the development on the ecology of the site.

**17.9 Ecological enhancement**

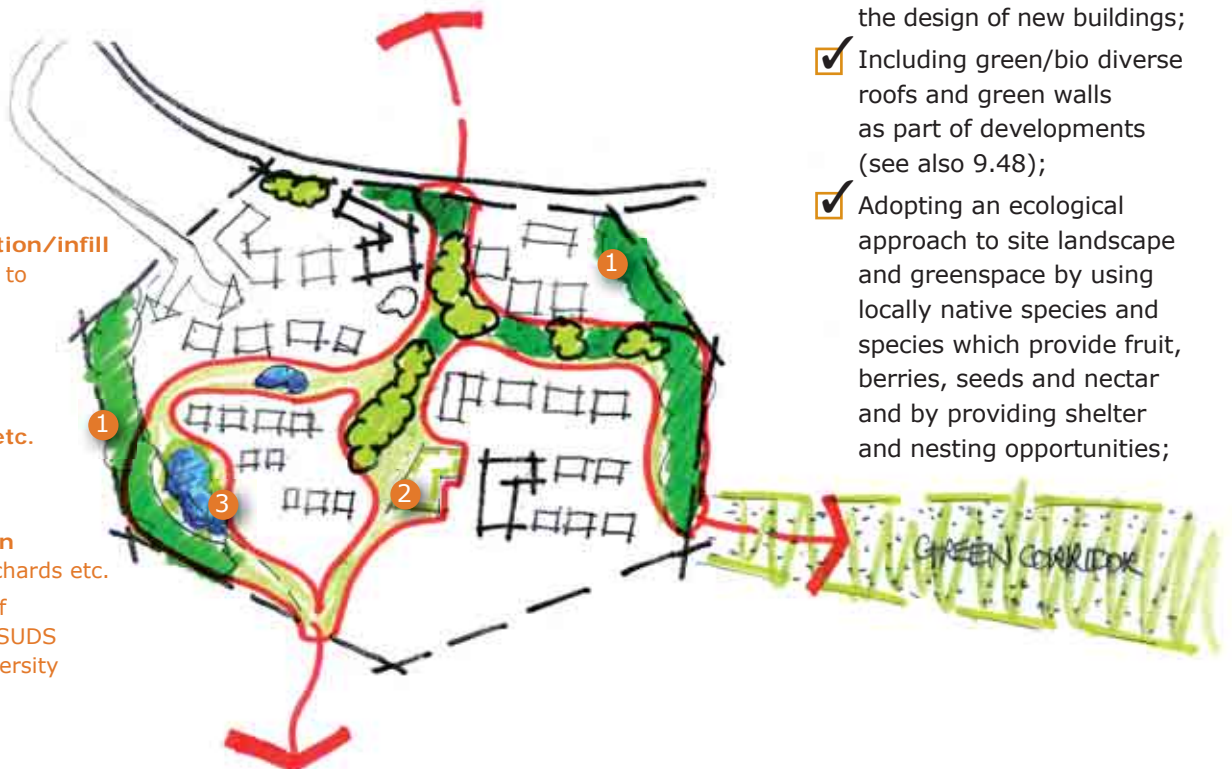
**17.10** All development will be expected to provide biodiversity enhancements. Measures required will depend on the size of development, location, features present on the site, the relationship with adjacent and nearby habitats and species and local biodiversity priorities. Proposals for biodiversity enhancements should be submitted as part of planning applications. Schemes such as Biodiversity Benchmark may be used to demonstrate improvement in biodiversity performance.

Measures that may be used to enhance the ecological value of the site include:

- ✓ Providing roosting and nesting opportunities for bats and birds; such features can easily be incorporated into the design of new buildings;
- ✓ Including green/bio diverse roofs and green walls as part of developments (see also 9.48);
- ✓ Adopting an ecological approach to site landscape and greenspace by using locally native species and species which provide fruit, berries, seeds and nectar and by providing shelter and nesting opportunities;

**Figure 17.1:**  
multi-functional  
Open space

- Linking vegetation/infill**  
- Connecting out to green corridors
- Green space /Open space**
- Existing trees etc.**
- 1 Shelterbelts**
- 2 Food production**  
- Allotments, Orchards etc.
- 3 Wetland-** Part of multi-functional SUDS increasing biodiversity



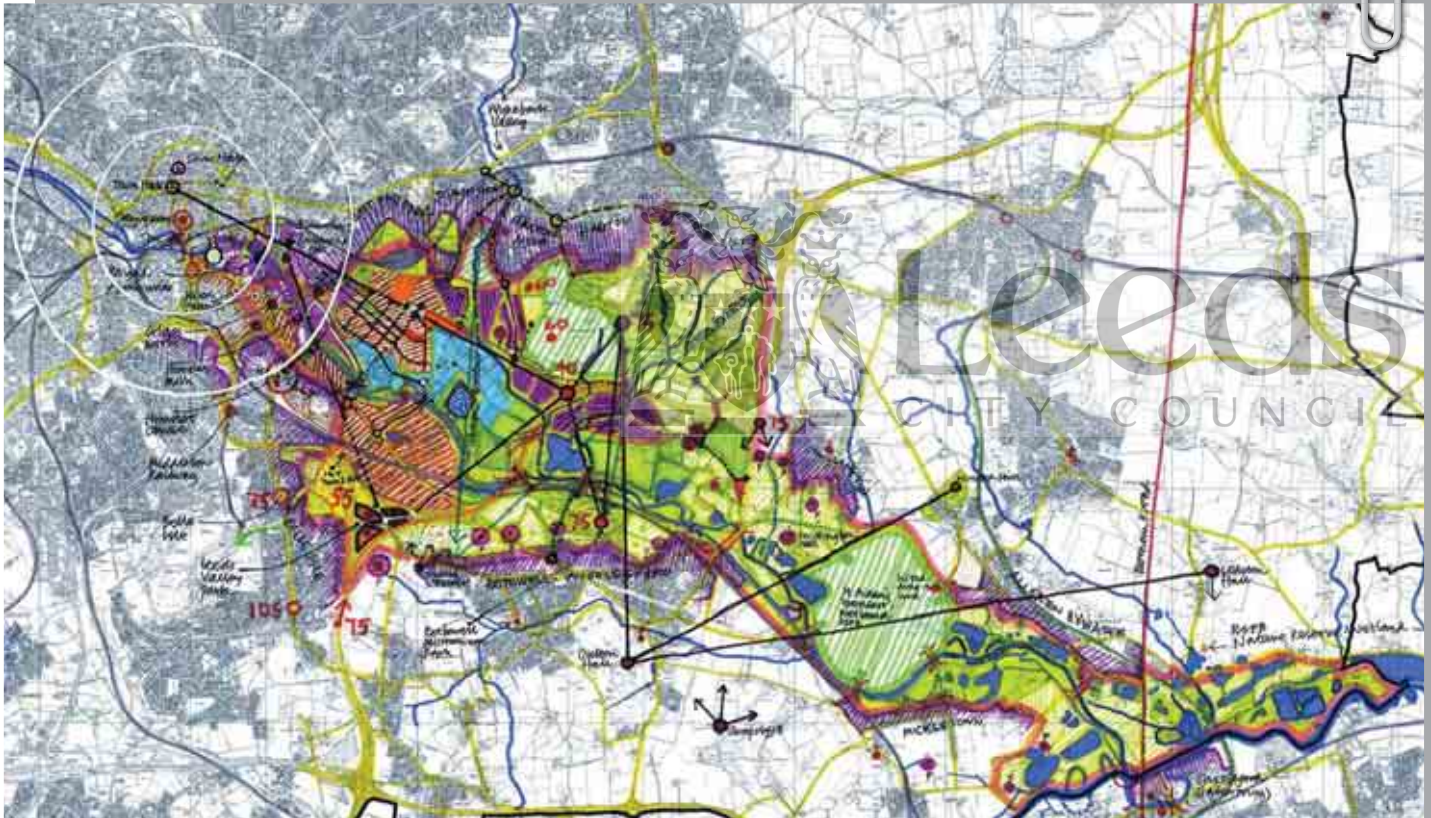


Grassland and scrub on disused railway land



Green viaduct - naturally re-vegetated viaductages

- ✓ Including trees in areas of hard landscape;
  - ✓ Habitat creation and restoration including hedgerows, meadows and wetlands;
  - ✓ The creation of habitat links and corridors, including links with off site habitats;
  - ✓ The incorporation of ponds, ditches, reedbeds and other wetland features into sustainable drainage schemes;
  - ✓ The re-opening of culverted watercourses and the restoration of canalised watercourses;
  - ✓ Incorporating vegetation, such as hedges, as part of boundary treatments where appropriate.
- 17.11 **Protection of ecological features**
- 17.12 Measures that protect ecological features include:
  - ✓ Habitats and features to be retained should be shown on site layout plans and any mitigation required for protected or important species must be agreed before work starts on site;
  - ✓ All areas of vegetation and landscape features to be retained should be protected during all site clearance and construction work by fencing to the standard specified in BS5837;
- ✓ Wetland features should be protected from run off from the site (oil, diesel spills etc) and any adverse changes in hydrology;
  - ✓ Buildings and services should avoid damaging tree roots;
  - ✓ The impact of services and site drainage should be considered;
  - ✓ All external lighting should be designed to minimise light spill and should not be directed towards any bat roost exits or any habitats or linear features used by bats or other sensitive nocturnal species.
- 17.13 **Change in ecological value**
- 17.14 All development should seek to have a net positive impact on biodiversity.
- 17.15 **A Biodiversity Management Plan** will be required which should include all protection, mitigation and enhancement measures to be implemented as part of the development. Submission and implementation of the plan will usually be required by a condition on the planning permission.
- 17.16 **Building footprint** ✓
- 17.17 Compact developments which reduce land take will be encouraged particularly where this allows space for habitat retention or creation.
- 17.18 All development should seek to minimise overall consumption, especially the consumption of non-renewable resources.
- 17.19 **Further information**
  - Green Roofs: their existing status and potential for conserving biodiversity in urban areas. English Nature: <http://livingroofs.org/>
  - ODPM / DEFRA / English Nature Planning for Biodiversity and Geological Conservation: A Guide to Good Practice. March 2006: [www.communities.gov.uk](http://www.communities.gov.uk)
  - Biodiversity by Design, TCPA: [www.tcpa.org.uk/biodiversitybydesign.htm](http://www.tcpa.org.uk/biodiversitybydesign.htm)
  - Planning for Biodiversity. Good practice guide. RTPi, 1999: [www.rtpi.org.uk/item/504/23/5/3](http://www.rtpi.org.uk/item/504/23/5/3)
  - Working with wildlife site guide, CIRIA (2005): [www.ciria.co.uk/theme\\_environmental.htm](http://www.ciria.co.uk/theme_environmental.htm)
  - Design for Biodiversity, LDA: <http://www.d4b.org.uk/policiesAndGuidance/index.asp>



### CASE STUDY: Aire Valley Leeds

The Vision for Aire Valley Leeds has been developed in partnership with a range of stakeholders and takes forward the regeneration principles that Leeds has been exploring for many years.

A new mixed use community at the edge of the city centre will re-create city living for the ecological age via the Urban Eco Settlement (UES), including the creation of a new park, green infrastructure, social infrastructure

and sustainable homes in Aire Valley and around the rim of the city. The proposals for Aire Valley Leeds Urban Eco-Settlement are about demonstrating new approaches to 'remake places', working with public and private sector partners to establish new innovative solutions, in addition to the environmental aspects of new development.

Aire Valley Futures represents the contextual and detailed consideration of how AireValley Leeds should be

implemented utilising sustainable principles, via the adaptation and supplementation of existing criteria present in such as PPS1 (Eco Towns).

This work aims to ensure that Aire Valley and its UES represents an innovative and exemplar, trailblazing approach to sustainable regeneration. It will set out a staged approach to the delivery and realisation of BREEAM excellent and code level 4, 5 and 6 of sustainable homes.

- Biodiversity and development guidance for Hampshire: recommendations for integrating biodiversity into local development Frameworks. Hampshire Biodiversity Partnership, 2005: [www.hampshirebiodiversity.org.uk](http://www.hampshirebiodiversity.org.uk)
- Biodiversity and Geological Conservation, ODPM Circular 06/2005: [www.communities.gov.uk/publications/planningandbuilding/circularbiodiversity](http://www.communities.gov.uk/publications/planningandbuilding/circularbiodiversity)
- ODPM Planning Policy Statement (PPS) 9 Biodiversity and Geological Conservation

- Association of Local Government Ecologists & British Standards. PAS2010 Planning to halt the loss of biodiversity. August 2006
- Guidance by Bat Conservation Trust and Institute of Lighting Engineers: Bats and Lighting in the UK (2008) available from [www.bats.org.uk](http://www.bats.org.uk)
- For information on green roofs: [www.thegreenroofcentre.co.uk](http://www.thegreenroofcentre.co.uk) or <http://livingroofs.org/>
- For information on Biodiversity Benchmark: [www.wildlifetrusts.org/biodiversitybenchmark](http://www.wildlifetrusts.org/biodiversitybenchmark)

*"Just as importantly, trees are valuable habitats for a wide range of creatures both in rural and urban settings, increasing biodiversity and bringing wildlife into built-up areas. And it is not necessary to plant only British natives for wildlife, for many exotic species are beneficial, too."*

**Tony Kirkham,**  
Head of the Arboretum,  
Royal Botanic Gardens, Kew

# 18. Glossary and Abbreviations

| Abbreviation /Term          | Definition  |
|-----------------------------|---|
| 1,3-butadiene               | 1,3-butadiene, like benzene, is a volatile organic compound emitted into the atmosphere principally from fuel combustion of petrol and diesel vehicles. 1,3-butadiene is also an important chemical in certain industrial processes, particularly the manufacture of synthetic rubber.  |
| AAP                         | Area Action Plan  |
| Acidification               | The increase in acidity of water bodies (particularly the ocean) caused by the increased uptake of atmospheric carbon dioxide.  |
| Adaptation                  | Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects.  |
| Air Quality Action Plan     | Where a local authority has set up an AQMA, it must produce an action plan setting out the measures it intends to take in pursuit of the air quality objectives in the designated area. The plan should be in place, wherever possible, within 12-18 months of designation and should include a timetable for implementation.   |
| Air Quality Management Area | If a local authority finds any places where the objectives are not likely to be achieved, it must declare an Air Quality Management Area there. This area could be just one or two streets, or it could be much bigger. Then the local authority will put together a plan to improve the air quality - a Local Air Quality Action Plan.   |
| Air source heat Pump        | An air source heat pump is a type of heat pump which uses the outside air as a heat source or heat sink to heat or cool an interior space. Air source heat pumps are more efficient than oil, gas, and electric resistance heating in mild climates but they are less efficient than ground source heat pumps because a ground source heat pump draws energy from the ground which is warmer than the external air in winter. However, air source heat pumps are cheaper to install than ground source heat pumps as they avoid the cost of installing a ground loop.   |
| Anaerobic digester          | Anaerobic digestion is a series of processes in which micro-organisms break down biodegradable material in the absence of oxygen. It is widely used to treat wastewater sludges and organic waste because it provides volume and mass reduction of the input material. As part of an integrated waste management system, anaerobic digestion reduces the emission of landfill gas into the atmosphere. Anaerobic digestion is a renewable energy source because the process produces a methane and carbon dioxide rich biogas suitable for energy production helping replace fossil fuels. Also, the nutrient-rich solids left after digestion can be used as fertiliser. |
| AoC                         | Area of Concern   |
| AQAP                        | Air Quality Action Plan   |
| AQMA                        | Air Quality Management Area   |
| Area Action Plan            | An Area Action Plan is an optional Development Plan Document specified in UK planning law forming part of a Local Development Framework. It is aimed at establishing a set of proposals and policies for the development of a specific area (such as a town centre or an area of new development) of a district authority. There is no limit on the number of Area Action Plans a local authority can develop.  |
| Area of Concern             | Areas of Concern are established where the air quality audit process has identified potential problems, but need further evidence to quantify whether an AQMA should be declared.   |
| BAP                         | Biodiversity Action Plan  |
| Biodiversity                | Biodiversity is the 'living' part of the environment. It is the wealth and variety of all living things, including animals, fungi, plants and micro-organisms, but also the communities and habitats they form together. It includes not only the variety that exists between different species, but also the variation and differences between individuals of the same species.  |
| Biodiversity Action Plan    | A Biodiversity Action Plan is an internationally recognised programme addressing threatened species and habitats and is designed to protect and restore biological systems.   |

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| Biomass   | Biomass, as a renewable energy source, refers to living and recently dead biological material that can be used as fuel or for industrial production. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic material which has been transformed by geological processes into substances such as coal or petroleum.   |
| BREEAM  | Building Research Establishment's Environmental Assessment Method  |
| Building Regulations  | Building regulations are statutory instruments that seek to ensure that the policies set out in the relevant legislation are carried out. Building regulations approval is required for most building work in the UK. Building regulations that apply across England and Wales are set out in the Building Act 1984.   |
| Building Research Establishment's Environmental Assessment Method | BREEAM is a leading and widely used environmental assessment method for buildings. It sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance.   |
| Car club  | Car clubs allow people to rent cars for short periods of time, often by the hour. They are attractive to customers who make only occasional use of a vehicle, as well as others who would like occasional access to a vehicle of a different type than they use day-to-day.  |
| Carbon capture and storage  | Carbon capture and storage is an approach to mitigating the contribution of fossil fuel emissions to global warming, based on capturing carbon dioxide (CO <sub>2</sub> ) from large point sources such as fossil fuel power plants. The carbon dioxide can then be permanently stored away from the atmosphere.   |
| Carbon dioxide  | Carbon dioxide is a greenhouse gas. Due to human activities such as the combustion of fossil fuels and deforestation, and the increased release of CO <sub>2</sub> from the oceans due to the increase in the Earth's temperature, the concentration of atmospheric carbon dioxide has increased by about 35% since the beginning of the age of industrialization.   |
| Carbon emissions  | Carbon dioxide emissions are associated with the combustion of fossil fuels. The largest source is energy generation, with transport, business and domestic fuel use also being important.   |
| Carbon footprint  | A carbon footprint is "the total set of greenhouse gas emissions caused directly and indirectly by an individual, organisation, event or product" (UK Carbon Trust 2008). An individual, nation or organization's carbon footprint is measured by undertaking a greenhouse gas emissions assessment. Once the size of a carbon footprint is known, a strategy can be devised to reduce it.   |
| Carbon Trust  | The Carbon Trust was set up by Government in 2001 as an independent company. Its mission is to accelerate the move to a low carbon economy by working with organisations to reduce carbon emissions and develop commercial low carbon technologies.  |
| CCS   | Considerate Constructors Scheme  |
| CHP   | Combined heat and power  |
| CIRIA   | Construction Industry Research and Information Association   |
| Climate change  | Climate change is caused by the rise in average global temperature due to increasing levels of greenhouse gases in the Earth's atmosphere. This in turn causes rises in sea levels, increased surface ocean temperatures and changes to weather patterns. If unchecked, these changes will radically alter our environment and lead to catastrophic loss of human life and massive extinction of other species. There is overwhelming scientific evidence that human activity is the primary cause of observed recent changes and that urgent action is needed to cut emissions to stabilise atmospheric greenhouse gases at levels which avoid catastrophic climate change. |
| CO <sub>2</sub>   | Carbon dioxide   |
| Code for Sustainable Homes  | The Code for Sustainable Homes is an environmental impact rating system for housing in England, setting new standards for energy efficiency (above those in current building regulations) and sustainability which are not mandatory under current building regulations but represent important developments towards limiting the environmental impact of housing.   |
| Combined heat and power   | Combined heat and power is the use of a power station to simultaneously generate both electricity and useful heat.   |
| Community heating   | Community heating systems replace individual heating systems within buildings with locally-based heating plant, often based on CHP. Hot water from the CHP unit and other heat sources is pumped to homes and other buildings using a network of highly insulated pipes. Heat is then transferred using a small heat exchanger, to radiators and water heating cylinders just as in conventional heating systems.  |

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| Conservation Area  | A Conservation Area is an area considered worthy of preservation or enhancement because of its special architectural or historic interest. In Conservation Areas, it is the protection of the quality and special interest of the neighbourhood or area as a whole that is intended, rather than specific buildings. For example, the layout of boundaries, roads, vistas and viewpoints, trees and green features, street furniture and surfaces, the characteristic building materials of the area, the mix of different uses, and the design of shop fronts may all be taken into account when deciding whether an area has a particular special architectural or historic interest. |
| Considerate Constructors Scheme                            | The Considerate Constructors Scheme is the national initiative, set up by the construction industry, to improve its image. Sites that register with the scheme sign up and are monitored against a Code of Considerate Practice, designed to encourage best practice beyond statutory requirements. The scheme is concerned about any area of construction activity that may have a direct or indirect impact on the image of the industry as a whole. The main areas of concern fall into three main categories: the environment, the workforce and the general public. The very best performing sites are recognised with Annual National Awards.                                     |
| Construction Industry Research and Information Association | CIRIA is a member-based research and information organisation dedicated to improvement in the construction industry. Members include representatives from all parts of the supply chains of the modern built environment, covering building and civil engineering as well as transport and utilities infrastructure.  |
| Core Strategy  | A Core Strategy Document is the key compulsory Local Development Document specified in UK planning law. Every other Local Development Document is built on the principles it sets out, regarding the development and use of land in a Local Planning Authority's area. The principles should be in accordance with the community strategy.  |
| CRC Energy Efficiency Scheme                               | The CRC Energy Efficiency Scheme (formerly known as the Carbon Reduction Commitment) is the UK's mandatory climate change and energy saving scheme, due to start in April 2010 that will apply to large non energy-intensive organisations in the public and private sectors. It has been designed to raise awareness in large organisations, especially at senior level, and encourage changes in behaviour and infrastructure.  |
| DCLG   | Department for Communities and Local Government (formerly Office of the Deputy Prime Minister (ODPM))   |
| DEC  | Display Energy Certificate  |
| Decentralised energy                                       | Often associated with CHP, decentralised energy is concerned with the deployment of many small energy sources in contrast to conventional systems that rely on large scale centralised power stations.  |
| DEFRA  | Department for Environment Food and Rural Affairs   |
| Development Plan Document                                  | A Local Development Framework must include Development Plan Documents (DPDs) which outline the key development goals of the Local Development Framework. Development Plan Documents are subject to rigorous procedures of community involvement, consultation and independent examination. Once adopted, Development Control decisions must be made in accordance with the DPDs unless material considerations indicate otherwise. DPDs must be examined with a Sustainability Appraisal to ensure economic, environmental and social effects of the plan are in line with sustainable development targets.   |
| Display Energy Certificate                                 | From 1 October 2008 all large public sector buildings in England and Wales will have to display a Display Energy Certificate which will show up to three years data on the energy used in that building. 'Large' is defined in the regulations as over 1,000 square metres, and the requirements apply to all Local Authority buildings and to public sector buildings with large numbers of visitors. Certificates must be supplied by an accredited assessor, who will also issue an advisory report that the occupier must retain. Failure to display the certificate may lead to a penalty charge of £500 and failure to retain the report to a charge of £1,000.                   |
| District heating   | District heating is a system for distributing heat generated in a centralised location for residential and commercial heating requirements such as space heating and water heating. The heat is often obtained from a co-generation plant burning fossil fuels but increasingly biomass. District heating plants can provide higher efficiencies and better pollution control than localised boilers.   |
| DPD  | Development Plan Document   |
| EcoHomes   | EcoHomes is an environmental rating scheme for homes in the United Kingdom. It is the domestic version of the Building Research Establishment's Environmental Assessment Method BREEAM, which can also be applied to a variety of non-residential buildings. It was replaced by the Code for Sustainable Homes in April 2007.   |

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| Ecological footprint           | The ecological footprint is a measure of human demand on the Earth's ecosystems. It compares human demand with planet Earth's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste. Using this assessment, it is possible to estimate how much of the Earth (or how many planet Earths) it would take to support humanity if everybody lived a given lifestyle.  |
| Energy conservation            | Energy conservation is the practice of decreasing the quantity of energy used. It may be achieved through energy efficiency, in which case energy use is decreased while achieving a similar outcome, or by reduced consumption of energy services.   |
| Energy efficiency              | Efficient efficiency is using less energy to provide the same level of energy service. An example would be insulating a home to use less heating and cooling energy to achieve the same temperature. Another example would be installing fluorescent lights and/or skylights instead of incandescent lights to attain the same level of illumination. Efficient energy use is achieved primarily by means of a more efficient technology or process rather than by changes in individual behaviour.   |
| Energy management system       | Energy management system can refer to a system in an organisation to achieve energy efficiency through well laid out procedures and methods, and to ensure continual improvement, which will spread awareness of energy efficiency throughout an entire organisation. The term can also refer to a computer system which is designed specifically for the automated control and monitoring of the heating, ventilation and lighting needs of a building or group of buildings such as university campuses, office buildings or factories. Most of these energy management systems also provide facilities for the reading of electricity, gas and water meters. The data obtained from these can then be used to produce trend analysis and annual consumption forecasts. |
| Energy Performance Certificate | From October 2008 EPCs will be required whenever a building is built, sold or rented out. The certificate provides 'A' to 'G' ratings for the building, with 'A' being the most energy efficient and 'G' being the least, with the average up to now being 'D'. Accredited energy assessors produce EPCs alongside an associated report which suggests improvements to make a building more energy efficient.   |
| Energy Saving Trust            | The Energy Saving Trust provides energy saving advice for the general public. It runs regional centres throughout the UK and provides advice on saving energy in the home on Energy Efficiency Hotline.   |
| EPC                            | Energy Performance Certificate  |
| EST                            | Energy Saving Trust   |
| Eutrophication                 | Eutrophication is an increase in chemical nutrients in an ecosystem, and may occur on land or in water. However, the term is often used to mean the resultant increase in the ecosystem's primary productivity (excessive plant growth and decay), and further effects including lack of oxygen and severe reductions in water quality, fish, and other animal populations.   |
| Feed-in tariff                 | Feed-in tariffs (FIT) became available in the UK on 1 April 2010. Under this scheme energy suppliers have to make regular payments to householders and communities who generate their own electricity from renewable or low carbon sources such as solar electricity panels (PV) or wind turbines.  |
| FIT                            | Feed-in tariff  |
| Forest Stewardship Council     | The Forest Stewardship Council (FSC) is an international non-profit, multi-stakeholder organisation established in 1993 to promote responsible management of the world's forests. Its main tools for achieving this are standard setting, independent certification and labeling of forest products. This offers customers around the world the ability to choose products from socially and environmentally responsible forestry.  |
| FSC                            | Forest Stewardship Council  |
| GDP                            | Gross domestic product  |
| Global warming                 | Global warming is the increase in the average temperature of the Earth's near-surface air and the oceans since the mid-twentieth century and its projected continuation.  |
| Green roof                     | A green roof is a roof of a building that is partially or completely covered with vegetation and soil, or a growing medium, planted over a waterproofing membrane. This does not refer to roofs which are merely coloured green, as with green roof shingles. It may also include additional layers such as a root barrier and drainage and irrigation systems.   |
| Greenhouse gas                 | Greenhouse gases are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. Common greenhouse gases in the Earth's atmosphere include water vapor, carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons.  |

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| Grey water                        | Grey water is non-industrial waste water generated from domestic processes such as dish washing, laundry and bathing. Grey water comprises 50-80% of residential waste water. Grey water comprises waste water generated from all of the house's sanitation equipment except for the toilet (water from toilets is blackwater, or sewage).  |
| Gross Domestic Product            | The gross domestic product is one of the measures of national income and output for a given country's economy. It is the total value of all final goods and services produced in a particular economy in a given year.  |
| Ground Source Heat Pump           | Ground source heat pumps use pipes buried in the garden to extract heat from the ground. This is usually used to warm water for radiators or underfloor heating systems. It can also be used to pre-heat water before it goes into a more conventional boiler.  |
| GSHP                              | Ground source heat pump   |
| Hydroelectricity                  | Hydroelectricity is electricity generated by hydropower, ie, the production of power through use of the gravitational force of falling or flowing water. It is the most widely used form of renewable energy. Once a hydroelectric complex is constructed, the project produces no direct waste, and has a considerably lower output level of the greenhouse gas carbon dioxide (CO <sub>2</sub> ) than fossil fuel powered energy plants.  |
| ILE                               | Institution of Lighting Engineers   |
| Institution of Lighting Engineers | The key purpose of the ILE is to promote excellence in all forms of lighting. This includes interior, exterior, sports, road, flood, emergency, tunnel, security and festive lighting as well as design and consultancy services. The institution is a registered charity, a limited company and a licensed body of the Engineering Council.  |
| LAA                               | Local Area Agreement  |
| Landfill Tax                      | The UK Landfill Tax was introduced in 1996 and was the UK's first environmental tax. Landfill tax is seen as a key mechanism in enabling the UK to meet its targets set out in the Landfill Directive for the landfilling of biodegradable waste. Through increasing the cost of landfill, other advanced waste treatment technologies with higher gate fees are made to become more financially attractive.  |
| LCLIP                             | Local Climate Impacts Profile   |
| LDD                               | Local Development Document  |
| LDF                               | Local Development Framework   |
| Leeds Healthy School Standard     | The Leeds Healthy Schools Programme (LHSP) is a dynamic initiative which offers an exciting range of resources to schools that promote wellbeing. At the centre of the programme is 'the Leeds Healthy School Standard'. This provides schools with a self-evaluation tool for Every Child Matters (ECM) outcomes and routes to achieving National and (Leeds) Advanced Healthy School Status using a whole school, participative approach. The standard helps schools to define their ethical stance, and make explicit the links between the curriculum, mental health, physical health and the environment in the context of a local and global community. |
| Leeds Nature Areas                | Site of local or district wide importance for the enjoyment, study or conservation of wildlife, geological features and landforms. In neighbourhoods lacking such sites those with the greatest potential are designated.   |
| Leeds Strategic Plan              | The Leeds Strategic Plan is a significant milestone in partnership working in Leeds as it is the first time that the council has agreed, with its partners, and with government, a single shared set of outcomes and priorities for the city. The Leeds Strategic Plan also embraces the Local Area Agreement for the city.   |
| Lifetime Homes                    | What makes a Lifetime Home is the incorporation of 16 design features that together create a flexible blueprint for accessible and adaptable housing in any setting. The Lifetime Homes concept increases choice, independence and longevity of tenure, vital to individual and community wellbeing.  |
| Listed Building                   | A listed building in the United Kingdom is a building or other structure officially designated as being of special architectural, historical or cultural significance. It is a widely used status, applied to around half a million buildings. A listed building may not be demolished, extended or altered without special permission from the local planning authority (who typically consult the relevant central government agency, particularly for significant alterations to the more notable listed buildings).   |
| LNR                               | Leeds Nature Reserve  |



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| Local Area Agreement                                  | Local Area Agreements (LAAs) set out the priorities for a local area agreed between central government and a local area (the local authority and Local Strategic Partnership) and other key partners at the local level. LAAs simplify some central funding, help join up public services more effectively and allow greater flexibility for local solutions to local circumstances.   |
| Local Climate Impacts Profile                         | An analysis of local climate patterns over time.   |
| Local Development Document                            | Local Development Documents are a set of documents specified in UK planning law which a Local Planning Authority creates to describe their strategy for development and use of land in their area of authority. Established as part of the Planning and Compulsory Purchase Act 2004 in UK law, a local planning authority must include Local Development Documents in their Local Development Schemes. The Local Development Documents taken as a whole must set out the authority's policies relating to the development and use of land in their area.          |
| Local Development Framework                           | The Local Development Framework replaces the previous system of county level Structure Plans and district level Local Plans, and Unitary Development Plans for unitary authorities. The previous system was perceived as being too inflexible and difficult to change in a timely manner. The Local Development Framework system is intended to improve this situation by replacing the old plans with a new portfolio of documents (Local Development Documents) that can be tailored to suit the different needs of a particular area and can be easily updated. |
| Local Strategic Partnership                           | Local strategic partnerships (LSPs) exist in nearly all local authority areas in England and Wales. They bring together representatives from the local statutory, voluntary, community and private sectors to address local problems, allocate funding, discuss strategies and initiatives. They aim to encourage joint working, and community involvement and prevent 'silo working' (ie different agencies that share aims working in isolation) with the general aim of ensuring resources are better allocated at a local level.                               |
| Low Carbon  | Low carbon technologies are those that can help reduce carbon emissions. Renewable and/or low carbon energy supplies include, but not exclusively, those from biomass and energy crops; CHP/CCHP (and micro-CHP); waste heat that would otherwise be generated directly or indirectly from fossil fuel; energy-from-waste; ground source heating and cooling; hydro; solar thermal and photovoltaic generation; wind generation.   |
| LSP   | Local Strategic Partnership / Leeds Strategic Plan   |
| LZC   | Low or zero carbon technology  |
| Micro-CHP   | Micro combined heat and power or micro-CHP is an extension of the now well established idea of cogeneration to the single/multi family home or small office building.  |
| Micro generation                                      | Microgeneration is the production of heat and/or electricity on a small-scale from a low carbon source. Microgeneration can provide low carbon energy to a range of building sizes including homes, businesses, schools and communities. Solar photovoltaics, wind, hydro, solar thermal, heat pumps, biomass, CHP, hydrogen and fuel cells are all examples of microgeneration.   |
| Mitigation  | Mitigation of global warming involves taking actions to reduce greenhouse gas emissions and to enhance sinks aimed at reducing the extent of global warming. This is in distinction to adaptation to global warming which involves taking action to minimize the effects of global warming.  |
| MW  | Megawatts  |
| Natural Resources and Waste Development Plan Document | The Natural Resources and Waste Development Plan Document is part of the Local Development Framework. The plan sets out where land is needed to enable Leeds to manage resources, like minerals, energy, waste and water, over the next 15 years and identifies specific actions which will help Leeds use its natural resources in a more efficient way.  |
| NAQS  | National Air Quality Strategy  |
| National Air Quality Strategy                         | The Air Quality Strategy for England, Scotland, Wales and Northern Ireland describes the plans drawn up by the Government and the devolved administrations to improve and protect ambient air quality in the UK in the medium-term. The strategy sets objectives for the main air pollutants to protect health. Performance against these objectives will be monitored where people are regularly present and might be exposed to air pollution.   |
| National Indicator                                    | The Single Set of 198 National Indicators (the National Indicator Set – NIS) was announced by CLG in October 2007, following the Government's Comprehensive Spending Review 2007. The NIS will be the only set of indicators on which central government will performance manage local government, replacing all other existing sets of indicators, including Best Value Performance Indicators (BVPIs) and Performance Assessment Framework (PAF) indicators, from 1 April 2008.  |

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| Nottingham Declaration on Climate Change               | Launched in October 2000 in Nottingham, the Declaration has now been signed by more than 300 English councils. All Scottish and Welsh councils have signed their own versions of the declaration. The Nottingham Declaration recognises the central role of local authorities in leading society's response to the challenge of climate change. By signing the Declaration councils pledge to systematically address the causes of climate change and to prepare their community for its impacts.   |
| NRWDPD   | Natural Resources and Waste Development Plan Document   |
| ODPM   | Office of the Deputy Prime Minister (now named the Department for Communities and Local Government (DCLG)).   |
| Pan European Forestry Certification                    | The PEFC Council (Programme for the Endorsement of Forest Certification schemes) is an independent, non-profit, non-governmental organisation, founded in 1999 which promotes sustainably managed forests through independent third party certification. The PEFC provides an assurance mechanism to purchasers of wood and paper products that they are promoting the sustainable management of forests.   |
| Part L   | Part L of the Building Regulations (in England and Wales) was introduced by government on 6 April 2006, and it concerns the implementation of energy efficiency measures.   |
| Passive solar  | Passive solar technologies are means of using sunlight for useful energy without use of active mechanical systems (in contrast to active solar). Such technologies convert sunlight into usable heat (water, air, thermal mass), cause air-movement for ventilating, or future use, with little use of other energy sources. A common example is a solarium on the equator-side of a building.  |
| PEFC   | Programme for the Endorsement of Forest Certification   |
| Photochemical smog                                     | In the 1950s a new type of smog, known as photochemical smog, was first described. This forms when sunlight hits various pollutants in the air and forms a mix of inimical chemicals that can be very dangerous. A photochemical smog is the chemical reaction of sunlight, nitrogen oxides (NOx) and volatile organic compounds (VOCs) in the atmosphere, which leaves airborne particles (called particulate matter) and ground-level ozone.  |
| Photovoltaic   | Photovoltaics (PV) is the field of technology and research related to the application of solar cells for energy by converting sunlight directly into electricity. Due to the growing demand for clean sources of energy, the manufacture of solar cells and photovoltaic arrays has expanded dramatically in recent years.  |
| Planning Policy Guidance and Planning Policy Statement | Planning Policy Guidance Notes (PPGs), and their replacements Planning Policy Statements (PPSs), are prepared by the government after public consultation to explain statutory provisions and provide guidance to local authorities and others on planning policy and the operation of the planning system. They also explain the relationship between planning policies and other policies which have an important bearing on issues of development and land use. Local authorities must take their contents into account in preparing their development plan documents. The guidance may also be relevant to decisions on individual planning applications and appeals. |
| PM <sub>10</sub>                                       | Particles of 10 micrometers or less   |
| PPG  | Planning Policy Guidance  |
| PPS  | Planning Policy Statement   |
| PV   | Photovoltaic  |
| Recycle  | Recycling involves processing used materials into new products in order to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce pollution by reducing the need for 'conventional' waste disposal, and lower greenhouse gas emissions as compared to virgin production.   |
| Regional Economic Strategy                             | The Regional Economic Strategy (RES) is a plan for how Yorkshire and Humber will grow faster and better than its competitors by 2015. It explains what the region needs to do to grow its £87bn economy, how it will do it, and who will be responsible for making it happen. It provides a set of common priorities for the region, helping businesses, public agencies, voluntary groups and communities to focus their investment and effort on what will really make a difference for Yorkshire and Humber.   |
| Regional Spatial Strategy                              | The objective of the Regional Spatial Strategy (RSS) is to contribute to the achievement of sustainable development. The RSS, incorporating a Regional Transport Strategy (RTS), provides a broad development strategy for the region for a 15-20 year period. The RSS also informs the preparation of Local Development Documents (LDDs), Local Transport Plans (LTPs) and regional and sub-regional strategies and programmes that have a bearing on land use activities.   |

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| Renewable energy                          | Renewable energy is energy generated from natural resources such as sunlight, wind, rain, tides and geothermal heat – which are renewable (naturally replenished). In 2006, about 18% of global final energy consumption came from renewables, with 13% coming from traditional biomass, such as wood-burning. Hydroelectricity was the next largest renewable source, providing 3% (15% of global electricity generation), followed by solar hot water/heating, which contributed 1.3%. Modern technologies, such as geothermal energy, wind power, solar power, and ocean energy together provided some 0.8% of final energy consumption. |
| Renewable Heat Incentive                  | The Renewable Heat Incentive (RHI) is designed to provide financial support that encourages individuals, communities and businesses to switch from using fossil fuel for heating, to renewables such as wood fuel.  |
| RES                                       | Regional Economic Strategy  |
| RHI                                       | Renewable Heat Incentive  |
| Royal Town Planning Institute             | The Royal Town Planning Institute is the organisation for urban planning professionals in the UK and Ireland, founded in 1914. The RTPI's work involves promoting good planning, developing and shaping policy affecting the built environment, consistently raising the standards of the planning profession, supporting its membership through continued professional development, education and training for future planners.  |
| RSS                                       | Regional Spatial Strategy   |
| RTPI                                      | Royal Town Planning Institute   |
| SA  | Sustainability Appraisal  |
| SAP                                       | Standard Assessment Procedure   |
| SBD                                       | Secured by Design (Association of Chief Police Officers - Flagship Security Scheme)   |
| SBEM                                      | Simplified Building Energy Model  |
| SEA                                       | Strategic Environmental Assessment  |
| SEGI                                      | Site of Ecological or Geological Interest   |
| SFRA                                      | Strategic Flood Risk Assessment   |
| Simplified Building Energy Model          | SBEM provides an analysis of the energy consumption of buildings other than dwellings, used in support of the National Calculation Methodology (NCM) and the Energy Performance of Buildings Directive (EPBD). The calculation method is also used in determining CO <sub>2</sub> emission rates for new buildings for compliance with the new Part L of the Building Regulations (England and Wales) and equivalent Regulations in Scotland and Northern Ireland.  |
| Site of Special Scientific Interest       | A Site of Special Scientific Interest or SSSI is a conservation designation denoting a protected area in the UK. SSSIs are the basic building block of site-based nature conservation legislation and most other legal nature/geological conservation designations in Great Britain are based upon them, including National Nature Reserves, Ramsar Sites, Special Protection Areas, and Special Areas of Conservation.   |
| Site Waste Management Plan                | A site waste management plan provides a structure for waste delivery and disposal at all stages during a construction project. Typically it will identify the following: who will be responsible for resource management; what types of waste will be generated; How the waste will be managed – will it be reduced, reused or recycled? which contractors will be used to ensure the waste is correctly recycled or disposed of responsibly and legally; how the quantity of waste generated from the project will be measured.  |
| Site of Ecological or Geological Interest | These sites are designated by the local authority as being of country wide importance for their flora, fauna or geology.  |
| Solar gain                                | Solar gain (also known as solar heat gain or passive solar gain) refers to the increase in temperature in a space, object or structure that results from 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.  |
| SPD                                       | Supplementary Planning Document   |
| SPG                                       | Supplementary Planning Guidance   |
| SSSI                                      | Site of Special Scientific Interest   |

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| Stakeholder                        | A person, group, organisation, or system who affects or can be affected by an organisation's actions.  |
| Standard Assessment Procedure      | The Standard Assessment Procedure (SAP) is the UK Government's recommended method system for measuring the energy rating of residential dwellings. The first version was published in 1995, to be replaced by newer versions in 1998, 2001 and 2005. It calculates the typical annual energy costs for space and water heating, and, from 2005, lighting. The CO <sub>2</sub> emissions are also calculated.   |
| Strategic Environmental Assessment | SEA is a legally enforced assessment procedure required by Directive 2001/42/EC (known as the SEA Directive). The SEA Directive aims at introducing systematic assessment of the environmental effects of strategic land use related plans and programs. It typically applies to regional and local, development, waste and transport plans, within the European Union. Some plans, such as finance and budget plans or civil defence plans are exempt from the SEA Directive, it also only applies to plans that are required by law, which interestingly excludes national government's plans and programs, as their plans are 'voluntary', whereas local and regional governments are usually required to prepare theirs.   |
| Strategic Flood Risk Assessment    | Assesses all known sources of flooding, probability of flooding, risks associated with flooding, recommend land uses and mitigation measures.  |
| SUDS                               | Sustainable Urban Drainage Systems   |
| Supplementary Planning Document    | Established as part of the Planning and Compulsory Purchase Act 2004 in UK law, a Supplementary Planning Document is a Local Development Document that may cover a range of issues, thematic or site specific, and provides further detail of policies and proposals in a 'parent' Development Plan Document.  |
| Supplementary Planning Guidance    | Supplementary Planning Guidance (SPG) is non-statutory guidance which supplements Unitary Development Plan (UDP) policies.   |
| Sustainability                     | Sustainability has become a complex term that can be applied to almost every facet of life on Earth, particularly the many different levels of biological organization and is expressed in human organisation concepts, such as sustainable cities, and human activities and disciplines, such as; sustainable agriculture, sustainable architecture and renewable energy. For humans to live sustainably, the Earth's resources must be used at a rate at which they can be replenished. However, there is now clear scientific evidence that humanity is living unsustainably, and that an unprecedented collective effort is needed to return human use of natural resources to within sustainable limits. Since the 1980s, the idea of human sustainability has become increasingly associated with the integration of economic, social and environmental spheres. In 1989, the World Commission on Environment and Development (Brundtland Commission) articulated what has now become a widely accepted definition of sustainability: "[to meet] the needs of the present without compromising the ability of future generations to meet their own needs."   |
| Sustainability Appraisal           | In UK Planning Law a Sustainability Appraisal is an appraisal of the economic, environmental and social effects of a plan from the outset of the preparation process to allow decisions to be made that accord with sustainable development. Since 2001, Sustainability Appraisals have had to be in conformity with the Strategic Environmental Assessment EU directive.  |
| Sustainable Development            | Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but in the indefinite future.  |
| Sustainable Urban Drainage         | Sustainable Drainage Systems (SuDS), sometimes known as Sustainable Urban Drainage Systems (SUDS), 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 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. This is to counter the effects of conventional drainage systems that often allow for flooding, pollution of the environment - with the resultant harm to wildlife - and contamination of groundwater sources used to provide drinking water. The paradigm 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. |
| SWMP                               | Site Waste Management Plan or Surface Water Management Plan  |
| TCPA                               | Town and Country Planning Association  |
| Teleworking                        | Teleworking is a work arrangement in which employees enjoy flexibility in working location and hours. In other words, the daily commute to a central place of work is replaced by telecommunication links.   |

|                                       |  |
|---------------------------------------|--|
| Town and Country Planning Association | The Town and Country Planning Association campaigns for the reform of the UK's planning system to make it more responsive to people's needs and aspirations and to promote sustainable development.  |
| UDP                                   | Unitary Development Plan   |
| UK Climate Impacts Programme          | The UK Climate Impacts Programme (UKCIP) was established in 1997 to help co-ordinate scientific research into the impacts of climate change, and to help organisations adapt to those unavoidable impacts. The majority of UKCIP's funding is from the Department for Environment, Food and Rural Affairs. UKCIP is based at the Environmental Change Institute at Oxford University.  |
| UKCIP                                 | UK Climate Impacts Programme   |
| Unitary Development Plan              | The Unitary Development Plan is the statutory development plan for the whole of the Leeds district. It provides a framework for all new developments and is used as a basis for making decisions regarding land use and planning applications. The plan takes regard for rural and urban development as part of integrated planning policy for the whole of the metropolitan district. The original UDP was drawn up in the 1990s and approved in 2001. The 2001 plan has been reviewed in 2006 following public consultation and a public inquiry.  |
| VOC                                   | Volatile organic compound  |
| Volatile Organic Compound             | Volatile organic compounds (VOCs) are organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.   |
| Waste and Resources Action Programme  | The Waste and Resource Action Programme, WRAP, is a not-for-profit company created in 2000 as part of the UK Government's waste strategies. WRAP's mission is to help develop markets for material resources that would otherwise have become waste. WRAP also provides advisory services to local authorities and helps influence public behaviour through national communication programmes.   |
| Water Framework Directive             | The Water Framework Directive is a European Union directive which commits European Union member states to achieve good qualitative and quantitative status of all water bodies by 2015.  |
| Wind turbine                          | A wind turbine is a rotating machine which converts the kinetic energy in wind into mechanical energy. If the mechanical energy is then converted to electricity, the machine is called a wind generator, wind turbine, wind power unit (WPU), wind energy converter (WEC), or aerogenerator.  |
| WRAP                                  | Waste and Resources Action Programme   |
| Yorkshire Forward                     | Yorkshire Forward is the regional development agency and non-departmental public body for the Yorkshire and the Humber region of the UK. It supports the expansion and development of business in the region by encouraging public and private investment, and by connecting people to economic opportunity. It works to improve levels of education, learning and skills, and to enhance the region's environment and infrastructure.   |
| Yorkshire Water                       | Yorkshire Water Services Limited is a water supply and treatment utility company servicing West Yorkshire, South Yorkshire, the East Riding of Yorkshire, part of North Lincolnshire, most of North Yorkshire and part of Derbyshire, in England. The company has its origins in the Yorkshire Water Authority, one of ten regional water authorities created by the Water Act 1973, and privatised in 1989. The company has been part of the Kelda Group since 1999.  |
| Zero carbon                           | <p>Building A Greener Future (July 2007) set out that all new homes are to be built from 2016 in such a way that, after taking account of:</p> <ul style="list-style-type: none"> <li>– emissions from space heating, ventilation, hot water and fixed lighting</li> <li>– expected energy use from appliances</li> <li>– exports and imports of energy from the development (and directly connected energy installations) to and from centralised energy networks,</li> </ul> <p>the building will have net zero carbon emissions over the course of a year. In 2008 a Government consultation retains the approach of looking at net emissions (including from appliances) over the course of a year. It proposes that, to meet the zero carbon homes standard, homes should:</p> <ul style="list-style-type: none"> <li>– be built with high levels of energy efficiency</li> <li>– achieve at least a minimum level of carbon reductions through a combination of energy efficiency, onsite energy supply and/or (where relevant) directly connected low carbon or renewable heat; and</li> <li>– choose from a range of (mainly offsite) solutions for tackling the remaining emissions.</li> </ul> |

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## Acknowledgements

Many people have provided very helpful comments in the compilation of this SDP. There is not space to thank all of the colleagues from within Leeds City Council and the external consultees who have helped to shape this guidance. In particular, Emma, Hannah, Meriel and Nikki are thanked for their help in providing photographs, case studies and references throughout the document.

## TEN URBAN DESIGN PRINCIPLES

for use by Leeds City Council in its day to day development activities

*"Good design provides the background to everybody's lives and can help bring communities together. It develops a sense of local pride and creates lasting confidence"* (Vision 2 – high quality design is a cross-cutting issue, and thriving places is one of the eight strategic themes)

These principles respond directly to Vision 2, LCC mission statement, core values and the themes in the Council Plan (creating better neighbourhoods and confident communities, making the most of people, competing in a global economy, integrated transport, and, looking after the environment).

All these principles should be used together to support and steer the work of all LCC Departments and be part of our commissioning, design, procurement, negotiation and other processes. These should also be advocated beyond the work of the Council – for use by our partners and all those influencing urban design quality throughout Leeds (including investors, developers, designers etc.)

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investing – working – involving – regenerating – delivering – creating – improving – connecting – managing – reviewing



### INVESTING effectively –

#### **Recognise that good design is good business (1)**

Good design provides longer lasting, sustainable solutions for us and future generations to use and enjoy. It increases value (economic, social and environmental).

*Checklist: life cycle costing, 'robust design' assessments (long-life/flexible for change), market considerations (short-medium-long term), delivery mechanisms (funding sources and processes), 'sustainable accounting', economic/social/environmental aspects together, CABE (value of good urban design)...*



### WORKING together –

#### **Get the team right (2)**

Good design requires many skills and built environment disciplines, including architects, urban designers, landscape architects, engineers (highways, civil, structural, services), town planners, developers, heritage consultants, access consultants, ecologists, surveyors, public art consultants, manufacturers, project managers and others. Good inter-disciplinary working is fundamental to successful design and procurement.

*Checklist: identify broad range of team members (do not be too narrowly focused), identify team leader, encourage creative working, initiate a series of design workshops at the outset (including designers, planners and client)...*



### INVOLVING the community –

#### **Make places for (and by) people (3)**

Good design processes include participation by the community to provide places and buildings which are better tailored to need, engender a sense of ownership and reduce crime. Design processes must cater for all including people of different age, gender, ethnic background and disabled people. This should create and retain people-friendly places that are well-used and well-loved.

*Checklist: identify stakeholders, consider appropriate participatory approach...*



### REGENERATING throughout Leeds –

#### **Close the gap and move forward (4)**

Good design of existing and new places is a fundamental need for sustainable regeneration of areas and communities – creating places to live, work, shop, play, rest, worship, care etc. Mixing uses, tenures, densities, forms to create lively, attractive places for all people. Quality design should improve and renew our neighbourhoods/villages/towns/city centre.

*Checklist: opportunities for real contribution for renewal of community, mixed use, activity, new valued spaces, design strategies/frameworks/action plans, themes of Renaissance Leeds/Vision 2/Neighbourhoods for Living, City Centre Urban Design Strategy...*





## **DELIVERING sustainable environmental solutions – Provide for future generations (5)**

Good design is sensitive to the impact on the Earth's resources and the needs of future generations. Solutions should minimise energy use, waste production, and pollution (in construction and throughout the life of the development). Solutions should enhance and protect the natural environment/biodiversity and realise good opportunities for sustainable energy production. Local resources (materials and skills) should be encouraged.

*Checklist: consider sustainability at inception stage, do sustainable appraisals at key stages of the project, climate/micro-climate considerations (inc. orientation, construction and natural energy production), energy/waste/drainage strategies, travel plans (encouraging use of more sustainable transport - walking, cycling, public transport etc)...*



## **CREATING excellent new places – Take a visionary approach (6)**

Good design looks forward to improve our quality of life, taking all opportunities for excellent new buildings, streets, spaces and landscape. Good design is a catalyst: initiating positive change in attitude, perception and use of a place. New places should be attractive, vibrant (appropriate to time of day) and safe.

*Checklist: take a broad view, 'blue sky' thinking with practical considerations too, ODPM/CABE good practice guidance, research international best practice, 'secured by design' principles, Renaissance Leeds/Neighbourhoods for Living/City Centre Urban Design Strategy/Unitary Development Plan themes, principles and policies...*



## **IMPROVING existing identity – Analyse and enhance the character (7)**

Good design responds to the distinctive qualities of existing places – the forms, movement patterns, spaces and uses provide a strong basis for design responses.

*Checklist: thorough audit/analysis/aspirations (iterative process – see NFL, CCUDS etc), consider context at different scale (region-town-neighbourhood-street), themes (form-movement-space-use), issues/checklists/principles of NFL, CCUDS, Renaissance Leeds, town centre strategies, heritage designations/appraisals (listed buildings, conservation areas etc.), village/neighbourhood design statements etc...*



## **CONNECTING places – Create visual and physical links (8)**

Good design responds creatively to movement to and through a place – streets, buildings, landscape, boundaries, walls etc. – drawing people through, providing continuity, linkages, cohesive places, legible places and joining communities.

*Checklist: look beyond the project/site, respond to adjoining places/neighbourhoods, opportunities to connect, sustainable transport links (pedestrian, cyclist, public transport then the private car), serial vision/sequential views studies, landscape character analysis/concept...*



## **MANAGING the investment – Look after the place (9)**

Good design must be sustained by management and maintenance of the place in a comprehensive way. Flexibility and robustness of design is an essential ingredient at the outset (see principle 1).

*Checklist: be equipped to provide/ensure management - budget, resources, personnel...*



## **REVIEWING our work – Improve continuously (10)**

Good design and poor design have an impact – this must be audited and monitored to inform us to ensure continuous improvement and more effective work

*Checklist: audit trail, spot checks – across a range of work...*



*Investing – working – involving – regenerating – delivering – creating – improving – connecting – managing – reviewing*

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# Building for Tomorrow Today

## Sustainable Design and Construction

Leeds Local Development Framework

Development Plan Document  
August 2011