External Environment

External Environment Overview

5.1

In this section

This section will detail:

1 / Decisions over retaining and enhancing biodiversity on your site

2 / How to integrate blue + green infrastructure to improve your building's climate resilience

3 / Sustainable water strategies

4 / Strategies to minimise pollution and polluting behaviours

Executive summary

> When it comes to construction impacting on local biodiversity the following hierarchy should be applied; avoid, mitigate, compensate. Biodiversity is key to the Herefordshire Core Strategy and the goal should be to deliver biodiversity net gain.

> A sustainable drainage system than manages surface water run-off - from swales to green roofs - can have a big impact on your site's resilience to climate change, whilst also enhancing biodiversity and providing amenity opportunities.

> As with renewable energy generation, a water strategy should look to reduce demand, to make systems more efficient, and then to consider sustainable drainage solutions like rainwater harvesting.

> In order to create a healthy environment air quality should be prioritised and monitored. Creative site design and landscaping strategy can reduce air and noise pollution - when in support of a sustainable transport strategy that encourages low-polluting, active transport.

> Light design must avoid impact on wildlife, neighbours and road users. Light design must be efficient, and energy wastage minimised.

Introduction

The natural species in Britain is in decline with 15% threatened with extinction and native woodlands now covering only 2.5% of the country *(Rewilding Britain)*. The built environment has contributed greatly to this decline over the years, with habitats destroyed for development and species displaced. The challenge is to halt this decline for the benefit of our generation and future generations.

Enhancing and conserving **biodiversity** is an important element of sustainable development. National Policy (NPPF) outlines that 'new development has a key role in the preservation, restoration and re-creation of priority habitats, ecological networks, green infrastructure and the protection and recovery of priority species populations'.

51 **Image 51**: Otter Holt at Kington Medical Practice

52 **Image 52**: Hazelnuts for Doormice at Kington Medical Practice

Conservation and enhancement of environmental assets and biodiversity along with creation of new habitats and biodiversity are required for compliance with Core Strategy policies SS6, LD1 and LD2. Identification of green infrastructure and protection of existing green corridors are also fundamental to Core Strategy policy LD3. This chapter begins by looking at how this can be considered within development both within the setting and as part of the built environment. Alongside the green infrastructure, blue infrastructure is an important consideration not only for improving biodiversity but also for water management. Core Strategy policies SS6 and in particular SD3 highlight the importance of water consumption and conservation with key design considerations on this topic discussed in this chapter. The chapter concludes with a brief discussion on air, light and noise pollution in alignment with Core Strategy policy SS6.

Policies

- Policy SS6 Environmental quality & local distinctiveness
- Policy SS7 Addressing climate change
- Policy SD3 Sustainable water management and water resources
- Policy LD1 Landscape and Townscape
- Policy LD2 Biodiversity and Geodiversity
- Policy LD3 Green Infrastructure

Definitions

- **Biodiversity:** is the variety of all life on Earth (see p73 for full definition)

Further Information

- Rewilding Britain

Biodiversity and natural habitats

Mitigation hierarchy: Development should minimise the impacts on **biodiversity** by implementing the mitigation hierarchy to first avoid and then mitigate. In doing so this will minimise the impacts on **biodiversity** and will lead to achieving **biodiversity net gain**.

The choice of site, siting and layout of a building can allow existing habitats to be retained and avoid development having an impact on the existing natural environment. The development of brownfield sites is actively encouraged over nature rich sites, with **designated sites** protected from development. The design of the site should consider the requirements of the building, but also the natural environment with the retention of existing natural features contributing to the protection of the landscape character and enhancing the **biodiversity** of the site.

When avoidance is not possible, mitigation is critical and measures to reduce impact must be applied. Buffer zones to minimise habitat disturbance, screening and planting can be used. Finally, if the first two options are not feasible compensation measures either on or off site must be applied.

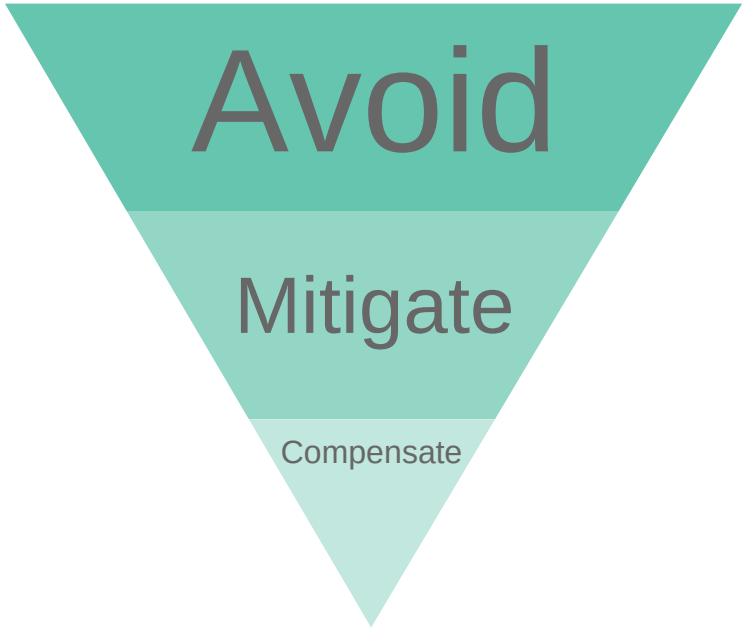


Image 53: Mitigation Hierarchy

Best Practice Recommendations

- Achieve a **Biodiversity Net Gain** across the development.

Definitions

- **Biodiversity:** is the variety of all life on Earth, among living organisms from all sources, including land, sea, and other aquatic ecosystems and encompasses the genetic variety within species, between species and the variety of ecosystems the species create.
- **Biodiversity Net Gain:** an approach to development that leaves the biodiversity of a site in a better state than before. It relies on the application of the mitigation hierarchy to avoid, mitigate or compensate for biodiversity losses.
- **Designated Sites:** for example Special Areas of Conservation, Special Protection Areas, Ramsar Sites, Sites of Special Scientific Interest, National Nature Reserves and Local Nature Reserves

Retain plants and protect living creatures: It is important to protect and conserve the plants and animals that already live on the site. Ecological and Arboricultural surveys will identify the flora and fauna on the site that need to be protected. These surveys may need to be completed at certain times of the year appropriate to the different species. Priority must be given to rare or critical habitats and species and protection measures will need to be put in place both during and after construction. The design should allow to retain these existing areas of valuable biodiversity where feasible and appropriate whilst also exploring the opportunities for enhancement.

Image 54:
Green and Blue Bat Box

Enhance and create new habitats and support biodiversity: Enhancing existing areas of valuable biodiversity can be delivered in all scales of development; at neighbourhood, street and household level. Habitats can be a physical part of a new development, without impacting on the aesthetic and functionality of the building. Measures can include:

- Nest and bat boxes, integrated into the building facades (see Bat Conservation Link for examples)
- Integration of sustainable drainage systems, reducing presssure on the underground network whilst also providing ecological benefits
- Creating habitats, for example wildflower meadows, ponds, wetlands and marshes.
- Establishing green corridors and creating connections between existing habitats
- Green roofs and walls, often providing new habitats in areas where it could not seem feasible
- Tree planting (right tree, right place) and soft landscaping
- New planting to support local species, incorporating wildlife friendly native planting, to extend existing habitats

These proposals will not only enhance biodiversity, they will also provide spaces that will benefit the health and well-being of the occupants in the buildings within these landscapes.

Further Information

- CIRIA (2019)
- Bat Conservation Trust
- Woodland Trust: Tackling climate change with the right trees in the right place

Rewilding: Rewilding is an approach to supporting biodiversity. It involves the restoration of ecosystems to the point where nature is allowed to take care of itself. It seeks to reinstate natural processes and, where appropriate, missing species – allowing them to shape the landscape and the habitats within.

Such an approach encourages a natural balance between people and nature and can provide opportunities for communities to diversify and create nature-based economies, but ultimately results in reversing biodiversity loss. Although often discussed at large and national scale rewilding can happen in all developments, from connecting habitats and setting aside large areas for nature to creating wildlife friendly gardens.

Multifunctional green & blue infrastructure: Green and blue infrastructure refers to water and vegetation and is used to describe integrated networks of natural and semi-natural spaces that can bring many useful benefits, for example clean air and water.

These benefits are vitally important in the context of climate and biodiversity emergencies and ensuring these are considered from the outset within the design can potentially offset the negative impact of a development and provide opportunities for biodiversity contributing to important targets, such as achieving Biodiversity Net Gain. They also have a wider value in placemaking and health and wellbeing.

Examples of green and blue infrastructure ranges from green roofs, hedgerows, ponds, and urban tree planting to park creation and river restoration.

55 **Image 55**: Wild Flower Grassland at Kington Medical Practice

Further Information

- National Design Guide, Ministry of Housing, Communities and Local Government (2021)
- Rewilding Britain

Living roofs: Green infrastructure and landscape design can influence the microclimate positively and in cities help to minimise the urban heat islande ffect. Where green space is scarce in urban areas **green roofs** can provide a protected habitat which can add to the biodiversity of a site.

56 **Image 56**: Green Roof, Architype

©LeighSimpsonPhotographer

There are a number of benefits to creating a **living roof** these include:

- Reducing the internal temperature of a building in the summer
- Improving the life span of a flat roof
- Providing sound insulation
- Reducing storm water run-off, vegetated roofs are able to retain, on average, around 82% of rainfall
- Improvements in air quality adjacent to the roof
- Reductions in heating bills
- Improvements to water quality when passing through a green roof
- Habitat creation

Living roofs can have a dual and layered function, with PV panels mounted above the vegetation layer. **Brown roofs** are particularly worth considering on brownfield sites to provide a habitat for the flora and fauna that previously inhabited the site. The inclusion of large expanses of green roofs should be reviewed as part of a whole site water management strategy as sometimes the loss/retention of such high levels of rainfall isn't always desirable as the amenity benefits of creative rainwater design (at street level) are lost. The potential for a **living roof** should be considered early on in the design process.

Definitions

- **Green or living roof:** A roof that has vegetation and a growing medium planted over a waterproof membrane. There are many variations, but typically they are categorised as either intensive (roof gardens) or extensive (that provide ecological value rather than recreational).
- **Brown roof:** A roof where the growing medium is left to self-vegetate from windblown and bird lime seed disposal. Brown roofs provide an opportunity to recycle some waste material such as cleaned rubble from the construction process.

Best Practice Recommendations

- Incorporate living roofs as part of the whole sustainable water management strategy, minimising large expanses of flat roof.

Water consumption, conservation, drainage and reuse

Sustainable drainage: The integration of a Sustainable Drainage System (SuDS) should be facilitated as a primary drainage solution and is a requirement of the Flood and Water Management Act 2010. The aim is to manage surface water runoff from a development taking into account water quantity (flooding), water quality (pollution), whilst enhancing biodiversity and providing amenity opportunities. SuDS are generally designed to store and slowly release run-off - either to the ground (infiltration), to a watercourse, or to the surface water sewer system. Natural SuDS systems provide the greatest losses (evaporation and evapotranspiration), biodiversity, and amenity benefits, and they are very effective at removing pollution.

It is important to consider SuDS within a development from the very start, with a maintenance strategy in place for the lifetime of the development. This will ensure that the proposed Green and Blue Infrastructure is fully integrated in the landscape, to achieve the greatest range of benefits. Whilst this approach is preferred it is not always possible and some engineering options may need to be installed, such as soakaways etc. However, Green and Blue Infrastructure should always be the preference.

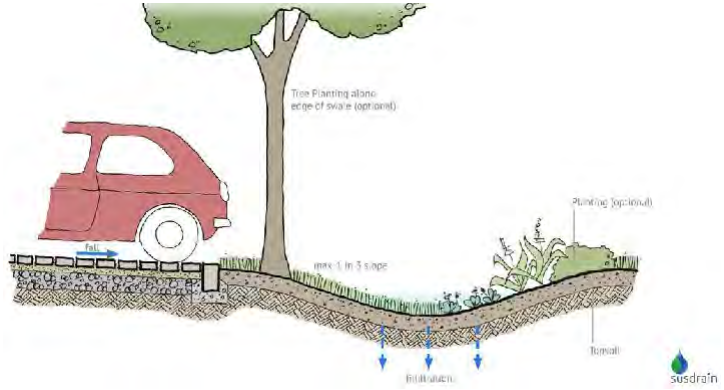


Image 57: Swale, Image by Susdrain.

As identified by Susdrain there are a number of components to SuDS, and these are enabled by features such as green roofs, rainwater harvesting, permeable paving, swales, rain gardens, trenches, basins, ponds and wetlands.

Development should be directed, where possible, to areas with the lowest risk of flooding, taking into account the impacts of climate change. However, in Flood Zone areas where flood mitigation is required, the inclusion of a SuDS strategy is particularly important in this instance. Other flood mitigation measures can include:

- Impermeable boundary walls, fences and gates
- Bunds/landscaping at the perimeter of the development; and
- Sizing of rainwater goods to contain larger volumes of water when required.

Definitions

- **Sustainable drainage systems (SuDS):** a method of drainage design to manage surface water runoff locally (as close to source as possible), to mimic natural drainage and encourage its infiltration, attenuation and passive treatment.

Best Practice Recommendations

- Implement SuDS as the primary drainage solution through Green and Blue Infrastructure.
- Development should not add to surface water run-off and should aim to reduce existing run-off rates and volumes.

Urban drainage & surface water runoff:
Traditional drainage solutions in built-up areas, are designed to quickly carry water away by using gullies and underground pipe systems in order to avoid flash flooding. Water quality and amenity aspects of drainage have largely been ignored. In urban areas it is important that areas of hard landscaping such as parking, are broken up with soft landscaping and large expanses of impermeable surfaces are avoided. SuDS can and should be utilised in these settings.

Building design to improve water management:
When designing a building the reduce, reuse, recycle hierarchy for water conservation should be followed. It is worth noting that the cost usually increases with the hierarchy, while the benefits decrease, and so spending time in implementing reduction measures is a worthwhile investment.

Low flush or dual flush WC's, flow restrictors on taps and low flow shower heads, percussion or sensor taps, waterless urinals and leak detection should all be installed to help reduce water consumption and reduce water stress.

Best Practice Recommendations

- New build residential water efficiency of 75 litres/person/day as a minimum.
- New build non-residential equivalent to BREEAM 3 for water consumption as a minimum.

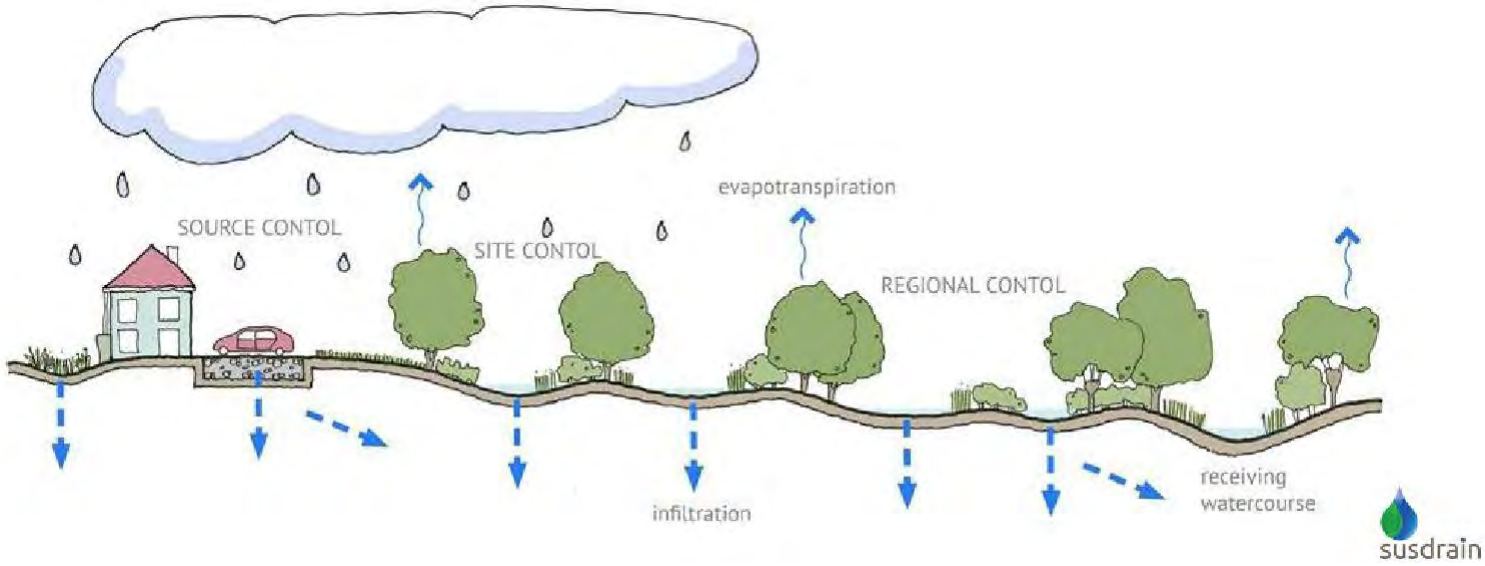


Image 58: Sustainable Urban Drainage Systems (SuDS), Image by Susdrain.

Further Information

- Sustainable drainage
- Saving water
- CIRIA (2019)
- SuDS Handbook for Herefordshire Council

Heating water is one of the largest energy requirements in buildings. Reducing the amount of water to heat will help keep running costs down, whilst also reducing operational energy demand.

It is most effective to reduce water consumption before considering rainwater and greywater harvesting (reuse and recycling). Both methods reduce the demand for mains water, relieve pressure on supplies, reduce the risk of flooding and pressure on drainage systems whilst also reducing water bills for those whose water is metered. Because of these benefits rainwater and greywater recycling is classed as a sustainable drainage solution. However, rainwater harvesting is not necessarily appropriate for all buildings and needs to be balanced with the operational energy used to operate the system.

As our climate changes, flooding is becoming a greater risk to the built environment. Development should be designed to adapt to flood risk, and should not only be a feature for those in medium and high risk areas, Flood Zones 2 and 3 respectively. Examples include; setting appropriate finished floor levels, with habitable rooms in homes lifted above flood level, locating services at higher than usual positions, fixing points for flood shuttering and flood resilient fittings, such as tiling of walls and floors at ground floor.

Provision should also be made for safe access to and from a development in the event of a flood.

Recycling provision: The design of a building should consider how buildings operate in practice and how people access and use them on a day-to-day basis both now and in the future. Provision must be made for the storage and collection of waste, designing for recycling and separation. The location must allow for ease of use for occupants ensuring they are well-integrated into the design of streets, spaces and buildings, to minimise visual impact, unsightliness and avoid clutter, particularly when incorporated onto a street frontage.

59 **Image 59**: Integrated Bin Stores at Goldsmith Street by Mikhail Riches

Definitions

- **Rainwater harvesting:** the collection of clean/ treated runoff from roofs and hard surfaces for use for toilet flushing, laundry water supply or irrigation.
- **Greywater recycling:** the use of waste water from baths, showers and hand basins for toilet flushing, irrigation or washing machine supply.

Further Information

- Harvesting rainwater for domestic uses: and information guide
- Avoiding Rubbish Design

Building with Nature

Image 60:
60 Building with Nature Logo

Building with Nature is a voluntary approach that enables developers, who want to go beyond the statutory requirements, to create places that really deliver for people and wildlife. It brings together guidance and good practice to recognise high quality green infrastructure at all stages of the development process including policy, planning, design, delivery, and long-term management and maintenance. It has been developed by practitioners and policy makers, academic experts and end-users, and has been tried and tested in multiple schemes from Cornwall to Scotland.

The framework of standards is divided into four themes: core, wellbeing, water and wildlife.

There are three levels of accreditation:

- **Design Award:** High quality green infrastructure demonstrated at the planning and design stage of development;
- **Good Award:** High quality green infrastructure, delivering benefits within the boundary of the scheme;
- **Excellent Award:** Exemplary quality green infrastructure, delivering benefits within and beyond the boundary of the scheme. This accreditation seeks to ensure the natural environment is considered holistically.

This accreditation seeks to ensure the natural environment is considered holistically.

Further Information

- Building with Nature

Air Pollution

All development should adopt sustainable design principles that lead to lower emissions and an improved environment. Air pollution in development can arise from many sources and activities, including traffic and transport, industrial processes, domestic and commercial premises, energy generation, agriculture, waste storage/ treatment and construction sites. The primary impacts on air pollution are from transport, and the support of green transport methods and traffic management schemes will help improve the air quality. Sustainable transport and design to reduce the need to travel and promotion of active travel are covered in Section 6.

The location of outdoor space for recreation in relation to sources of air pollution, such as busy roads should be considered, and the distance between them maximised. If distance cannot be achieved screening must be considered. Routes through developments should be located away from busy roads and new development should not create a 'street canyon 'effect or building configuration, that could lead to pollution not dispersing effectively.

Green infrastructure not only improve biodiversity on the site but can also contribute to reducing a mbient air pollution by trapping fine particulates whilst also absorbing gases. For these reasons green infrastructure must be a part of the design.

Hedges and large planting can also be used for screening from a pollution source, with some plants more beneficial than others.

Basic good design should result in no additional exposure to increased air pollution for existing or future occupants.

How to manage pollution through design: New development should be designed to minimise public exposure to pollution sources by:

- Locating habitable rooms away from busy roads
- Avoiding building configuration along busy roads that inhibits effective pollution dispersion (street canyons),
- Considering the proximity of sensitive receptors such as schools, hospitals and play areas to busy roads.
- Introducing green infrastructures and barriers to reduce pollutants
- Installation of on-site renewable and/or low carbon energy
- If gas boiler installation is required installing one with low NOx emissions
- Providing good ventilation – this could be through natural ventilation (if external conditions are appropriate) or mechanical ventilation
- Good onsite management during the construction phase

New development provides an opportunity to reduce and improve overall emissions in the area. This can be done by incorporating new, cleaner and sustainable technologies from the outset to generate heat and energy. The use of efficient and/or renewable sources, such as solar water heating or air and ground source heat pumps in developments can help minimise polluting emissions.

All gas-fired boilers must have low NOx emissions and meet a minimum standard of 40mgNO×/kWh, although the use of ultra-low technology (less than15mgNO×/kWh) is encouraged. Where gas fired Combined Heat and Power (CHP), biomass or biofuel boilers are proposed the applicance should meet an emissions standard of:

- Spark ignition engine: less than less than 150 mgNOx/Nm3
- Compression ignition engine: less than 400 mgNOx/Nm3
- Gas turbine: less than 50 mgNOx/Nm3 *(IAQM)*

Good natural ventilation to a building should be provided. However, fitting an MVHR ventilation unit, which is required to achieve the Passivhaus standard minimises the impact outdoor air pollution will have on the indoor air quality. This is particularly relevant to overcome exposure to poor air quality and for sensitive developments such as hospitals and schools. MVHR units include filters which filter particulates from entering the system along with pollen etc.

If design cannot fully reduce the impact to an acceptable level then mitigation measures may be used to either protect receptors or minimise the need for vehicle use. Many developments will require a mix of design and mitigation measures that have been tailored to be appropriate for the site. Mitigation measures are in the main related to support and promotion of sustainable transport as well as supporting the development of alternative technologies.

Offsetting by providing money for schemes that improve overall air quality should be a last resort but may need to be combined with good design and mitigation in some circumstances. Appropriate contributions can be negotiated or contributions can be calculated using Defra's damage cost approach. This as with mitigation is related to support of sustainable transport, allowing financial contributions to be made to improving traffic management measures, public transport and new services, improvements in walking and cycling facilities along with air quality improvements.

It is important that the impact on air quality is also considered during the demolition and construction phase. Good site management and the use of low emission technology will enable emissions to be reduced during this phase.

Further Information

- Review of interventions to improve outdoor air quality and public health
- Institute of Air Quality Management

Temporary emissions of dust during the construction phase are of concern as they add to the overall exposure of particulate matter to residents, visitors and site workers. Each stage should be considered through demolition, site preparation, ground works, construction as well as materials storage, transport and handling, both on and off site. For larger developments a dust management plan should be included as part of the Construction Environmental Management Plan (CEMP).

Air Quality Assessments should be completed f or larger developments. Such assessments will assess current baselines in the area, consider the cumulative impact of known future developments in the area and predict the future impact with and without the proposed development, including any mitigation measures. Air Quality Neutral Assessments will be instead be required for developments near Air Quality Management Areas (AQMA)

Light pollution

External lighting schemes must be well designed to ensure they do not have an adverse on neighbours and road users or the wider landscape and ecology in both rural and urban settings. Light design must minimise glare and spillage. Ultimately light pollution is a sign of wasted energy and poor efficiency and only the minimum for security, safety and operational reasons should be installed. To minimise wastage lights should be switched off when not required for these purposes.

Light pollution can occur as:

- Sky Glow – upward light, often seen from a distance from urban areas with streetlights the main contributor
- Light Trespass/Nuisance – light spillage beyond a property's boundary, with security lights normally being the cause of this
- Glare – the uncomfortable brightness of a light source, particularly against a night sky

Artificial light can be classed as a statutory nuisance and so the design is important ensuring the intensity and direction does not disturb others. The affect lighting has on the night sky should also be minimised to avoid impacting on wildlife and disturbing the natural habitats and behaviours of nocturnal animals and birds.

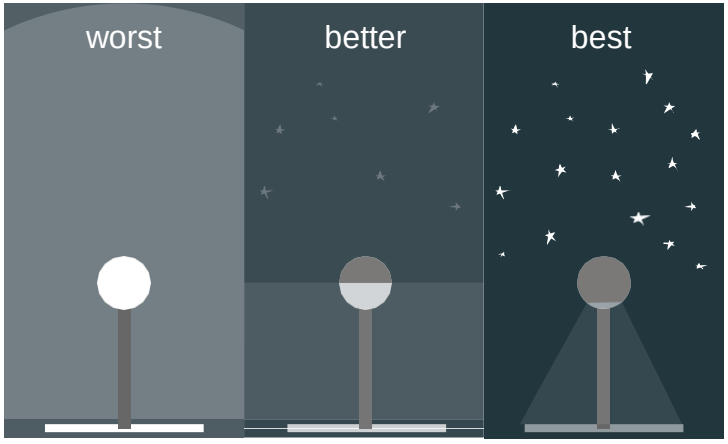
Best Practice Recommendations

- Development above householder level to be Air Quality Neutral or better

Artificial lighting should be sited in the most appropriate locations to cause minimal disturbance to occupiers and wildlife, while still illuminating the intended area. Consideration should be given to lighting associated with buildings of special historic and architectural interest in order to avoid harm to the significance of the heritage asset and that of the wider area, including conservation areas.

To achieve the necessary minimisation of obtrusive light the applicant should adhere to the following general principles taken from the Institute of Lighting Professionals, Guidance Notes for the Reduction of Obtrusive Light, GN01: 2011.

A light impact assessment can be required for some developments.



61 **Image 61**: Light directed downwards and at a lower intensity reduces light pollution

Noise pollution

Noise pollution can be detrimental to health and quality of life and so consideration should be made in the planning of a new development for this. This may mean that noise sensitive development is located away from existing sources as well as the possible introduction of noise sources to be a consideration in planning approval. Noise within the living and working environment is a key aspect of sustainable development. It is important that good acoustic design is considered at an early stage in the development management process. In accordance with the Noise Policy Statement for England (NPSE) (March 2010) the following principles should be applied:

- Avoid significant adverse impacts on health and quality of life from **environmental**, **neighbour** and **neighbourhood noise** within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from **environmental**, **neighbour** and **neighbourhood noise** within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of **environmental**, **neighbour** and **neighbourhood noise** within the context of Government policy on sustainable development.

Definitions

- **Environmental noise:** includes noise from transportation sources
- **Neighbour noise:** includes noise from inside and outside people's homes
- **Neighbourhood noise:** includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street

Further Information

- Noise Policy Statement for England (NPSE) (March 2010)

Image 62:
62 BREEAM Logo

Building Research Establishment's (BRE) Environmental Assessment Methodology (BREEAM) is one of the most renowned standards for non-residential development. There are different BREEAM schemes, including new construction which relates to individual buildings and BREEAM Communities for development on a wider scale

Assessment and certification can take place at a number of stages in the built environment life cycle, from design and construction through to operation and refurbishment.

The main output from a certified BREEAM assessment is the rating. A certified rating reflects the performance achieved by a project and its stakeholders, as measured against the standard and its benchmarks. The rating enables comparability between projects and provides reassurance to customers and users, in turn underpinning the quality and value of the asset. The

BREEAM ratings range from Acceptable (In- Use scheme only) to Pass, Good, Very Good, Excellent to Outstanding and it is reflected in a series of stars on the BREEAM certificate.

Embodied carbon assessment should be completed independently to a BREEAM standard to ensure a rounded approach to both operational and embodied carbon.

Image 63:
63 BREEAM Assessment Categories

Further Information

- BREEAM

Best Practice Recommendations

EN1	Achieve Biodiversity Net Gain across the development.
EN2	Incorporate living roofs as part of the whole sustainable water management strategy, minimising large expanses of flat roof.
EN3	Implement SuDS as the primary drainage solution through Green and Blue Infrastructure.
EN4	Development should not add to surface water run-off and should aim to reduce existing run-off rates and volumes.
EN5	New build residential water efficiency of 75 litres/person/day as a minimum.
EN6	New build non-residential equivalent to BREEAM 3 for water consumption as a minimum.
EN7	Development above householder level to be Air Quality Neutral or better.