

Minimising impact of artificial lighting on people and wildlife

1 Purpose

This document provides information on how to reduce the potentially disturbing impacts of artificial lighting (temporary or permanent) on people and sensitive nocturnal wildlife.

2 Summary of the problems caused by lighting

People's enjoyment of their homes and particularly their ability to sleep at night can easily be affected by stray light shining onto their property.

Nocturnal animals have evolved to navigate their habitats and forage for food in low light levels or even complete darkness. This behaviour is generally an adaptive evolutionary strategy to avoid being predated by daytime hunters, to avoid competing for the same food supply as daytime foraging animals, to exploit a night-time food supply that is not readily available to daytime foraging animals, or a combination of these. Whatever the reason there is growing evidence that manmade artificial light sources can have disruptive and detrimental impact on the natural behaviour of many nocturnal animals and can contribute to the other conservation stresses causing population decline.

3 Barriers and conflicts to reduced lighting

The biggest barriers to reducing the impacts of lighting on wildlife are:

- Public perception that more light is better, particularly where people gain a sense of security or personal safety from bright lighting, or require lighting for recreational activities;
- 24 hour business operations where general and task lighting is a safety consideration;
- Lack of good science resulting in lack of good guidance;
- Lack of knowledge among ecologists and local authorities;
- Lack of pressure from central government, wildlife regulatory agencies or local planning policy.

4 Detrimental impacts from artificial lighting

Artificial light sources from premises or operations can cause impacts on neighbouring communities ranging from nuisance to more serious health and wellbeing issues from disturbed sleep patterns.

It is also known that artificial lighting disrupts the normal behaviour of many nocturnal animal species in ways that can make them more vulnerable. The detrimental effect of artificial lighting is most clearly seen in bats. All our resident bat species have suffered dramatic reductions in numbers in the past century for a variety of reasons and lighting can be a contributory factor. Light falling on a bat roost exit point, regardless of species, will at least delay bats from emerging, which shortens the amount of time

Minimising impact of artificial lighting on people and wildlife

available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital feeding time is lost.

At worst, bats may abandon a roost that are exposed to bright illumination. Bats are faithful to their roosts over many years and this type of disturbance or displacement can have a significant effect on the future of the colony and maybe the conservation status of the species. It is likely to be a breach of the national and European legislation that protects British bats and their roosts.

In addition to causing disturbance at the roost, artificial lighting can also affect the feeding behaviour of bats and their use of commuting flight routes. There are two aspects to this:

- a) direct presence of lit conditions disrupting flight paths; and
- b) many insects are attracted to short-wave length light (UV and blue), which can draw them into lit areas and deplete the number in dark area where bats are foraging.

Studies have shown that some bat species (noctules, serotines, pipistrelles and Leisler's) take advantage of the concentration of insects around white street lights. However this is not true for all bat species. Long-eared bats, barbastelle, greater and lesser horseshoe bats and the *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's bats) generally avoid external lights. It is known that insects are attracted to lit areas from far afield and this could result in depleted prey density in adjacent habitats where light-avoiding bats are foraging.

Lighting can also be harmful if it illuminates important foraging habitats such as river corridors, woodland edges and hedgerows used by bats. Studies have shown that continuous lighting along roads creates barriers which some bat species will not cross.

5 Actions to minimise adverse impacts caused by lighting

Developments and work sites need to carefully consider what lighting is needed and reduce any unnecessary lighting, in terms of both timing and spatial deployment. The potential impacts of obtrusive light on neighbouring communities and wildlife should be a routine consideration in the environmental assessment process and linked carefully with other ecological assessments. Risks should be eliminated or minimised wherever possible. Some locations are particularly sensitive to obtrusive light and lighting schemes in these areas should be carefully planned.

Do

- Employ a competent professional lighting designer who will apply the principles of providing the right type of light, the right amount of light, in the right place, at the right time and controlled by the right system. A competent professional lighting designer should be able to design and model a lighting installation that meets the safety or operational needs of the scheme, but with

Minimising impact of artificial lighting on people and wildlife

adequately mitigated impacts on wildlife. Record the identification and mitigation of wildlife impacts in design reports.

- Promote close collaboration between lighting designers, installers and professional ecologists. The professional ecologist will confirm the presence of sensitive wildlife, including bat roosts and other animal resting places, foraging areas, bat flight lines. The ecologist will also advise on lighting measurements and mitigation measures. Record the identification and mitigation of wildlife lighting impacts in ecological assessment reports.
- Minimise the spread of light to at, or near horizontal and ensure that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required.
- Consider the height of lighting columns. A lower mounting height is not always better as more columns will be required. Column height should be carefully considered to balance task and mitigation measures.
- Use temporary close-boarded fencing until vegetation matures, to shield sensitive areas from lighting.
- Limit the times that lights are on to provide some dark periods. A lighting designer can vary the lighting levels as the use of the area changes reducing lighting levels or perhaps even switching installations off after certain times. This use of adaptive lighting can tailor the installation to suit human health and safety as well as wildlife needs.
- Consider no lighting options where possible such as highlighting roads with white lining, good signage, LED cats eyes to make best use of vehicle headlights.
- Keep glare to a minimum by ensuring that the main beam angle of all lights directed towards any potential observer is not more than 70°. Higher mounting heights allow lower main beam angles, which can assist in reducing glare. In areas with low ambient lighting levels, glare can be very obtrusive and extra care should be taken when positioning and aiming lighting equipment.
- In rural areas the use of full horizontal cut off luminaires installed at 0° uplift will, in addition to reducing sky glow, also help to minimise visual intrusion within the open landscape.
- Consider the spectral composition (wavelength) and colour temperature of lighting to reduce attractiveness to insects. Select lights with minimal ultraviolet to blue light wavelengths, preferably with peak wavelength output higher than 550nm. Similarly, where white lighting is required try to select the neutral to warmer colour temperature < 4,200 kelvin.
- Consult with Local Planning Authorities to understand how they have designated environmental zones into their Development Plans with respect to light emissions and what mitigation measure they would require for different zones (see Section 6, table 1).
- Undertake post-installation commissioning tests to check that lighting systems have been installed in accordance with the design and that mitigation measures are adequate.

Minimising impact of artificial lighting on people and wildlife

Don't

- Install excessive lighting. Use only the minimum amount of light needed for the task.
- Directly illuminate bat roosts or important areas for nesting birds.
- Use light sources that emit either ultra-violet or infra-red radiation - unless these wavelengths are a specific functional requirement.
- Install lighting in ecologically sensitive areas such as: near ponds, lakes, rivers, areas of high conservation value; sites supporting particularly light-sensitive species of conservation significance (e.g. glow worms, rare moths, slow-flying bats) and habitat used by protected species.
- Position lights above highly reflective surfaces.

6 Emerging planning guidance

National planning guidance is continuing to develop to provide clearer protection for our natural and historic environment. The guidance looks at when light pollution concerns should be considered, including impacts on wildlife, and is covered within the on-line planning practice guides.

It has been recommended that Local Planning Authorities specify environmental zones for exterior lighting control within their Development Plans in accordance with Table 1.

Table 1 – Environmental Zones for light emissions

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

Minimising impact of artificial lighting on people and wildlife

7 References

- Institute of Lighting Professionals GN01:2011 – Guidance Notes for the reduction of obtrusive light.
- Royal Commission on Environmental Pollution – RCEP Report on Artificial Light in the Environment – 23/04/12
- Bat Conservation Trust – Light Symposium Notes 21/05/14
- Bat Conservation Trust Interim Guidance: Artificial lighting and wildlife - Recommendations to help minimise the impact of artificial lighting - 03/06/14.