

Light Pollution and Dark Skies in the Blackdown Hills Area of Outstanding Natural Beauty: A Good Lighting Guide



Blackdown Hills
Area of Outstanding Natural Beauty

www.blackdownhillsaonb.org.uk

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Blackdown Hills Area of Outstanding Natural Beauty Partnership

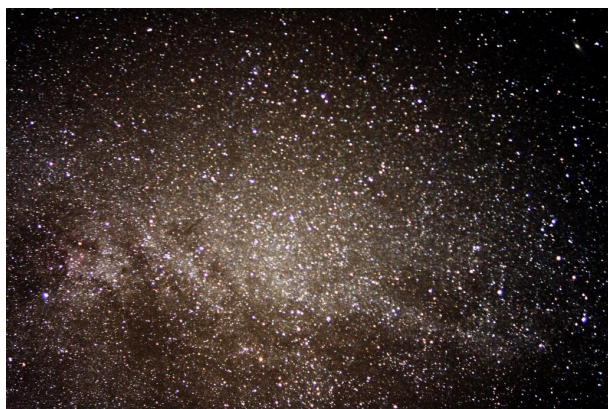
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Devon
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Context

The Blackdown Hills Area of Outstanding Natural Beauty (AONB) is one of a family of AONBs established in England and Wales under the National Parks and Access to the Countryside Act 1949. Along with National Parks, AONBs are 'protected landscapes' formally recognised as representing the finest countryside in England and Wales, where special policies should apply to safeguard and manage the countryside for the benefit of this and future generations.

The Blackdown Hills were designated an AONB in 1991. The primary purpose of the designation is to conserve and enhance the natural beauty of the landscape; 'natural beauty' is not just the look of the landscape, but includes landform and geology, plants and animals, landscape features and the rich history of human settlement over the centuries.

Natural starry skies are one of the sights which make the Blackdown Hills so special. Night time darkness is a key characteristic of the area's sense of tranquillity and relative remoteness. Light pollution has the potential to erode and destroy that tranquillity and sense of remoteness. It erodes the ability to see and understand the dark night skies and beauty of our galaxy. Light pollution has adverse impacts on wildlife and human health, and wastes money and energy.



The Milky Way as seen from Churchstanton

The adopted AONB Management Plan 2014 - 2019 identifies '*Dark night-time star-filled skies contrasting with the light pollution of the surrounding towns*' as one of the special qualities of this AONB. It sets out the following objectives and policies in respect of this:

Landscape character objective LC 3;
The Blackdown Hills landscape is valued as a place where a sense of tranquillity can be enjoyed free from man-made noise and visual intrusion.

Policy LC 3/B;
Support measures to conserve and enhance tranquillity and dark skies.

Planning and development objective PD 5;
The tranquillity of the Blackdown Hills AONB is conserved and enhanced by restricting or reducing noise and light pollution and major developments within or affecting the AONB.

Policy PD 5/A;
Encourage quiet enjoyment of the AONB and avoid or restrict developments, activities and events, including artificial light installations, which detract from the tranquillity of the Blackdown Hills.

What is light pollution?

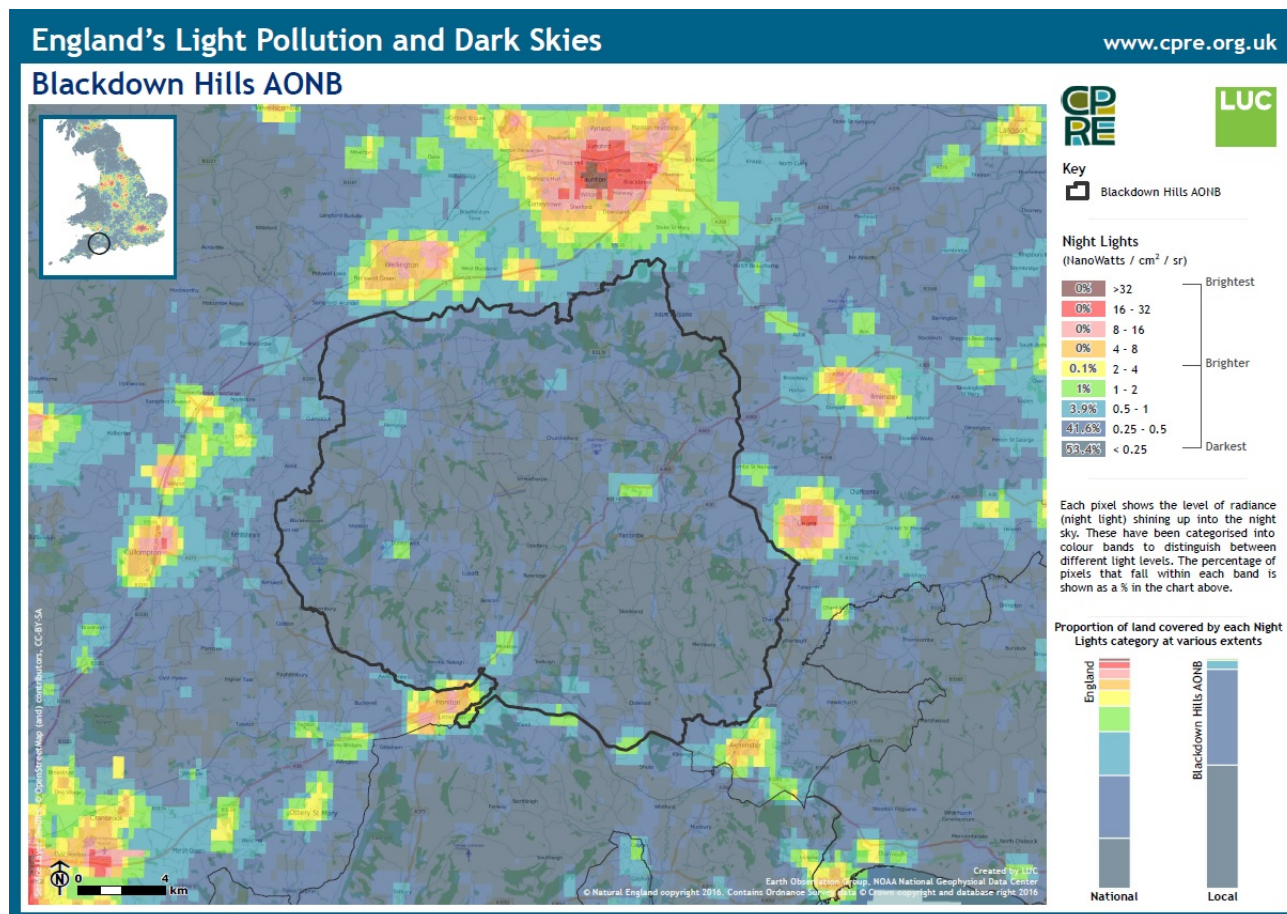
Light pollution is artificial light which shines where it is neither wanted, nor needed. It is the result of lighting which is poorly designed, badly directed or unnecessarily bright.

Fortunately light pollution is reversible. In relation to restoring dark night skies this involves simple actions to control, limit, and reduce light pollution. This guide is therefore intended to help provide information and advice to individuals, businesses and decision makers interested in reducing and avoiding light pollution.

Background

In 1993 and again in 2000 the CPRE published maps of light pollution for the whole of the country. Recently a more sophisticated study, gathering data by satellite, recorded light emitted into the skies at 1:30am during September nights in 2015. This showed starkly, unsurprisingly, that the larger urban areas had the most light pollution. The effect of that is few, if any, of the stars can be seen from those areas with the naked eye. More reassuring, the extent of light pollution in rural areas appeared to be reduced from the earlier studies. It shows the South West is one of the darker parts of the country, and the AONBs and National Parks have some of the darkest night skies allowing the stars and Milky Way to be enjoyed from these areas. The Blackdown Hills is the fifth darkest AONB in England, with very low levels of night time brightness; 95% of the AONB is in the two very darkest categories contrasting with surrounding towns as the map below shows.

It's not just about humans being able to experience starry skies and tranquillity. Poor lighting has wide ranging, and adverse, impacts on wildlife. Birds on migration become disorientated, exhausted, and die circling and flying into brightly lit structures. Insects are attracted to artificial lights and around a third are killed, significantly reducing the insects in the ecosystem. The diurnal patterns of mammals, birds, and insects become disrupted in constantly lit areas and the stress leads to compromised breeding success. However, some predators may benefit from their prey being active and exposed by or attracted to artificial light. The natural feeding patterns of some bats are disrupted by light, particularly light at the blue end of the spectrum, and the competitive balance between different bat species can be altered. Some nocturnal animals that avoid light have the extent and frequency of their foraging restricted by lighting.



Star gazing in locations with dark night skies is proving to be a popular tourist attraction. This Dark Sky tourism often involves an overnight stay, adding to the income of the rural economy. Spring and autumn are popular times, which bring visitors to places in the shoulder months of the traditional tourist season, and star gazing provides an added attraction for Christmas and New Year visitors. Poor lighting could ruin the very qualities which attract visitors to the area.

The Blackdown Hills AONB is keen to achieve recognition of its dark night skies. This does not necessarily mean *less lighting* but *good lighting* - that does not create light pollution and can frequently provide better illumination than poorly considered and designed schemes. Simple changes to the way you light your home or business can have a big impact.



Culmstock Beacon

Light Intrusion: things to consider

Every form of artificial light which shines outside the areas intended to be illuminated is light pollution. There are a number of forms:

- **Light trespass**, when light enters a neighbouring property
- **Over illumination** where there is excessive light
- **Glare**, often from an unshielded light source resulting in contrasting dark shadows and excessively bright areas
- **Clutter** is excessive groupings of lights which can cause confusion and distraction from obstacles intended to be illuminated
- **Sky glow** over areas where light is escaping upwards.



Glow over Taunton, as seen from Staple Hill in the northern Blackdown Hills.

Light units which point upwards, and those which direct light across a site, contribute to light pollution. Lights pointing out from a site can not only cause light trespass but also be dangerous to drivers through dazzle and

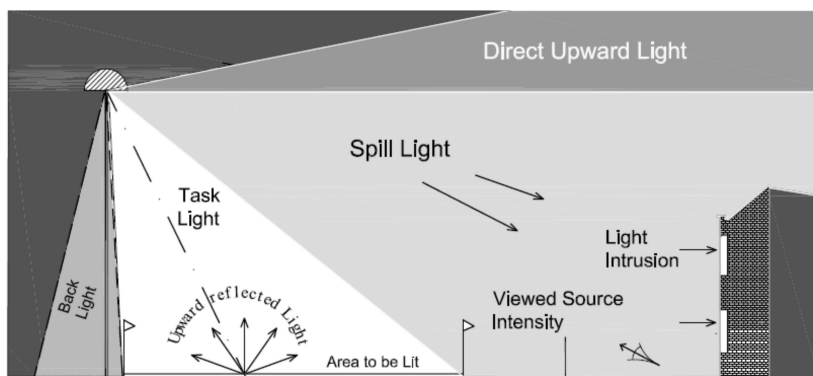


Diagram courtesy Institution of Lighting Professionals

glare. Human sleep patterns can be upset and there is an increasing body of research on the adverse effects of light pollution on a wide range of wildlife.

So called 'security lighting' often creates strong shadows for intruders to hide in, as well as glare and dazzle which limits the ability of witnesses to identify key features of the perpetrators.

Retrofit shields and baffles can reduce significantly light pollution from existing light fittings. Fittings with exposed glass covers and upward globes are particularly problematic. Horizontally mounted flat glass light units are the least polluting and can be designed to spread light down onto a wide area. Bob Mizon's paper *Lighting types, qualities and impacts* and the Institute of Lighting Professionals *guidance notes on reduction of obtrusive light* both give examples and explain this in further detail – links to these are provided in the *where to find out more* section. There you can also find a link to a useful glossary of lighting terms.

Reducing the power of lights, dimming, and limiting the time lights are on, not only reduces the potential for light pollution but also saves money.

Light can also reflect from surfaces and create light pollution and problems for householders and wildlife, so attention to the type of light source is important in good lighting. Correct installation is also important to ensure the performance offered by the manufacturer is achieved.

Consent

Some lighting can be installed without permission or consent. The forms that do require explicit permission include:

- Lighting installations which materially alter the external appearance of a building
- Lighting installations on Listed Buildings which affect their character
- Illumination of outdoor advertisements
- Most forms of lighting on columns [eg sports, street, security lighting].

If in doubt, contact your local council's planning department for advice.

Lights and the law

Light pollution is categorised as a statutory nuisance under the Clean Neighbourhoods and Environment Act 2005. This means that if you produce artificial light which encroaches onto a neighbour's property, you could be served with an abatement notice by the local council. Using the information in this guide should help you to rectify a problem before it comes to this.

The Blackdown Hills AONB's position

Building on the adopted AONB Management Plan and mindful of the simple improvements that can be made to provide good and adequate lighting without prejudicing dark skies, the Blackdown Hills AONB Partnership takes the position that all artificial external lighting within its borders, or within the setting of the AONB, should be muted, screened, and the minimum required. It acknowledges that there are occasions when special features, such as the Wellington Monument, are lit for celebrations and particular effects for limited periods of time.



Wellington Monument © National Trust

General principles

To accord with this aim, no external lights should be erected or installed in, or within the setting of, the AONB unless:

- (a) They can be shown to be essential for security or safety, and the minimum necessary to achieve it;
- (b) They are directed downwards and designed or shielded to prevent upward, sideways, and outward spillage;
- (c) They give a light whose colour and intensity are appropriate for the wider setting and for wildlife;

- (d) They do not highlight a structure or feature that would have an adverse visual impact on the surrounding landscape; and
- (e) They utilise the most energy- and pollution-efficient equipment that is reasonably available.

In order to meet these aims where existing lighting is identified as having an adverse effect on the character of the AONB, the AONB Partnership will encourage the removal or modification of the lighting units.

Where applicable new lighting schemes in the AONB should be explicitly approved by the local planning authorities, and planning conditions requiring lighting to be approved should be used.

Modifying and installing external lighting that meets the above criteria will help to ensure that the AONB's special character and attractive environment will not be spoilt by sky glow or intrusive light.

Good Lighting

"We light our environment with the efficiency of someone trying to water a flowerpot with a lawn sprinkler. What is needed is lighting which illuminates what you are looking at and not your eyeballs" Robert Dick, astronomy instructor, Carlton University, USA.

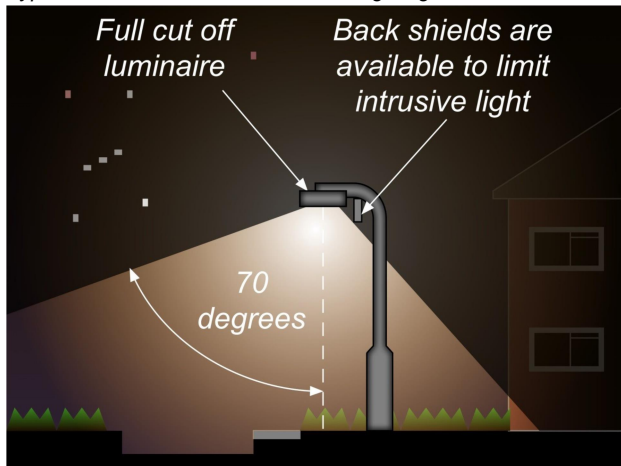
Good lighting delivers the right amount of light, where it is needed, and when it is needed. In many cases lighting does not need to be on constantly. Significant economies can be made by fitting motion sensors so that lights only come on when activity likely to need light is sensed. Simple 'curfew' periods when lights are switched off, such as very late evening and early morning, can reduce amounts of wasted light. In areas where some lighting is appropriate, a programme of dimming lights can operate at periods where there is minimal use of the location. All these arrangements help reduce the potential for light pollution, reduce the harmful effects of extended periods of 'daylight' on wildlife and humans, reduce costs and save energy.

Common Issues

Street lighting

Lighting that is in the public domain has been receiving close attention in recent years. Many highway lighting authorities have taken considerable steps to install flat glass units, parallel with the surface to be lit, which have internal optics designed to illuminate the street or highway without emissions above the horizontal or excessive stray light around the column. This makes the light source itself invisible other than at very close quarters. Dimming and switch off periods late at night and very early morning further reduce light pollution and save money. Initial research has shown that dimming is infrequently noticed and that crime does not increase.

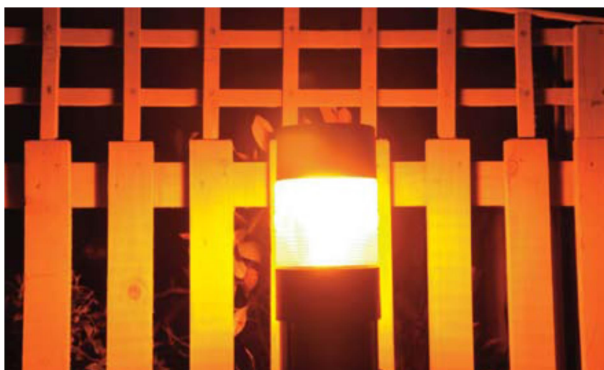
Typical well directed full cut-off street lighting, with shields.



Courtesy Commission for Dark Skies

Domestic

External domestic lighting often tends to be chosen for security purposes, although it is often unnecessarily bright for the lighting task, left on constantly and directed so that it can dazzle potential witnesses to any misdemeanour while providing the criminal with useful shadows to hide in. Unfortunately, such lighting usually involves the simple and cheap floodlights available in DIY stores, which also cause light nuisance into neighbouring properties, glare into the eyes of walkers and car drivers and add to pollution of the night sky.



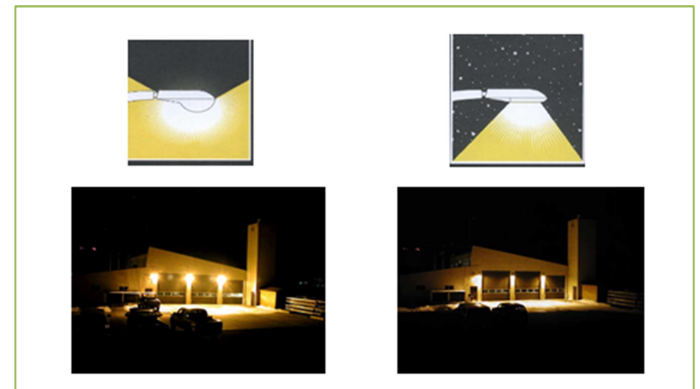
The modern 'grand design' to have large glass walls and gable ends to new dwellings and conversions means there is considerable potential for internal domestic lighting to spill out. Blinds or curtains need to be used in these situations.

Farms, businesses and community buildings

Farmyard lighting is often a larger-scale version of domestic 'security' lighting. However, the light output of the light fittings should be proportionate to the task and it is better to install multiple, flat glass asymmetric lower lumen light fittings around the yard than try to blast the area with a single, high power light fitting from one end. Skylights in barns and other agricultural buildings can also send light upwards, polluting the night sky, especially in those that are lit throughout the night. Ideally louvres or blinds should be fitted but if the internal lights have integral shades above them then only reflected rather than direct light will be emitted.

Similar situations occur with other businesses that operate during hours of darkness. Motion sensors and timers can be helpful and illuminated signage minimised – consider whether buildings, signs and parking areas need to be lit outside business hours. In some cases, if they are operating shifts and load, deliver, and receive goods during the night then lighting needs to be carefully designed to eliminate light pollution and to keep costs to a minimum.

Diagram showing the impact of shielded light fittings on commercial premises



Courtesy International Dark Sky Association

Various uses such as service stations, pubs and village halls also have a requirement for external lighting. Up-lighters on buildings spill light into the night sky when down-lighters could achieve a similar illumination effect.

The lighting of parking areas is all too frequently by one or two large lights directed across the area, spilling light sideways and upwards. There is also the danger of dazzle, both to traffic on the site and on the approach road. Many of the negative effects would be negated by using the latest lighting fittings that do not allow upwards or sideways dispersion of light. Lighting from the edges of the site inwards is generally more effective and less problematic than lighting from a central position outwards. Dimming regimes can reduce light pollution and costs, and benefit wildlife.

Recreation and sports lighting

With the widespread attention given to street lighting recently, Sports lighting is gradually taking over from road lighting as the most significant source of light waste and skyglow in the United Kingdom. Like other kinds of lighting it can cause skyglow, light intrusion, glare, and unnecessary sideways light dispersion. It is comparatively easy to direct sports lighting onto the area to be lit using the technical capabilities of lighting units. Correct angling and shielding are vital if pollution, light nuisance and waste are to be avoided, and for small areas such as tennis courts or a single football pitch flat glass units are necessary.

Effective floodlighting – no sky glow



Image provided courtesy of Abacus Lighting

Courtesy www.astronomyknowhow.com

Good design and effective implementation are both important. That includes not just the night time lighting but the urbanising appearance of lighting poles, columns, and towers in the day time. Particularly in rural

situations the temptation to install a couple of tall towers, each with a bank of lights, should be resisted. A number of shorter poles with pairs of lights is likely to be much less visually intrusive, equally effective, and less likely to contribute to light pollution. In all cases it is important that lights are correctly installed and not 'tipped up' in an attempt to spread light further.

A key point to note with sports lighting is that higher levels of performance have higher standards of illumination. It would not, therefore, be sensible or cost effective to apply the standard for a Premier League stadium to a village football pitch. Furthermore, the lights should only be on at full power for the duration of the match or event and switched off as soon as safety allows.

Manèges are popular all weather exercise areas for horses in rural areas. Unfortunately lighting is often an afterthought and achieved by old style, and inefficient, floodlights – or newer style LED floods – directed from short posts across the area. To encourage correct design and implementation of lighting it is recommended that unless the local planning authorities explicitly authorise lighting of manèges as part of the planning permission process they should be unlit in the AONB.

Lighting solutions

There are numerous resources which illustrate 'good lighting' at all scales, some of which are referenced in the *where to find out more section*. The importance of aiming lights so that they light only the areas intended to be illuminated is emphasised.

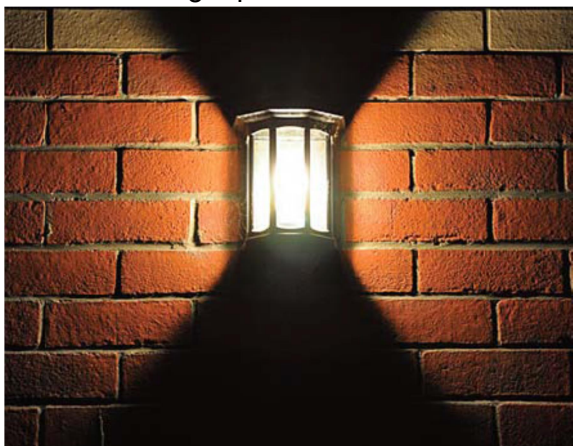
When considering lighting schemes the manufacturers can provide contour diagrams of light intensity which demonstrate the capabilities of a particular light fitting. Manufacturers, suppliers and designers

should be able to advise on solutions that meet requirements for safety or decorative effect for example while avoiding light pollution. As has already been mentioned, flat glass, sometimes asymmetric fittings are the most appropriate for lighting entrances, driveways, and routes. They are also likely to be effective, as smaller scale units, for 'security' lighting.



Light fitting with hood to direct light downwards. Image provided by Thorn, courtesy of Institution of Lighting Professionals

Units that are particularly liable to cause pollution are simple and traditional bulkhead and lantern style lights that emit light in all directions. Similarly wall lighters, that are currently popular with designers, have their place when they direct light downwards and illuminate a surface, for example a path to the door of a hotel or restaurant. However, when they point light sideways and upwards, creating significant light pollution, not only is there the danger of glare to people using the area but there may be dark shadows on the ground beneath, which creates a hazard. Illuminated bollards need to be designed with baffles to project light downwards otherwise they dazzle pedestrians and drivers, and contribute to light pollution.



Wall lighting can throw light in every direction

Checklist for installing exterior lighting

- Follow the manufacturer's installation instructions
- Ensure that you only light the target area
- Be careful not to allow light to fall outside the boundary of your property, including into a neighbour's windows, onto the pavement, or out into the countryside
- Check that motion detectors can only be activated from inside your property – you may need your neighbours' help with this exercise. Lights should not be triggered by movement outside the boundary of your property.
- Make sure your lights are angled correctly and are not too bright. This will improve your security and reduce light pollution. To see how much difference this can make go to www.britastro.org/dark-skies/floodlights.html

Effectiveness

Whilst the pressures to reduce light pollution and energy use are leading to a greater number of effective and energy efficient lighting units becoming available, we are still at a stage where it is likely that cheaper lighting units will not perform to the desired standards. Some existing lights can be made less problematic simply by adjusting them to point downwards and the incorporation of effective motion sensor switches can reduce the time they are on and the energy used.

Not only should a scheme be demonstrated to be effective at the planning stage but it also needs to be checked after installation to ensure that replacement, less effective, units have not been used or that the correct units have not been installed incorrectly.

Correctly installed good lighting simply means that the light is directed where it is needed rather than being dissipated and wasted. Wall lights and bollards are other examples

where correct internal fittings directing light downwards can not only provide safe lighting on steps and walkways but also provide pleasing aesthetic effects. Without the correct fittings glare and dazzle can occur, which puts the users of the areas at risk.

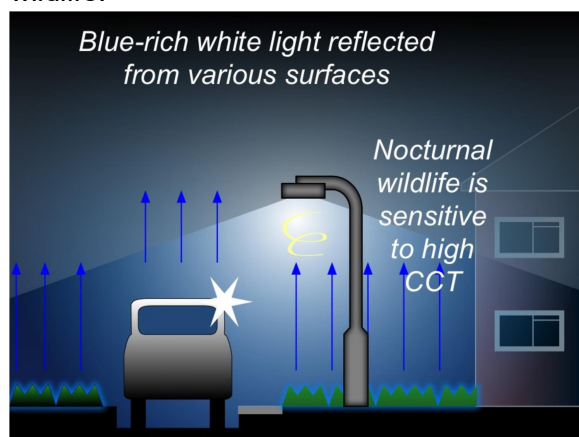
In a nutshell:

- Fit the right light for the right task
- Use the minimum level of brightness
- Install and adjust all lights correctly
- Operate lights for the minimum required time.

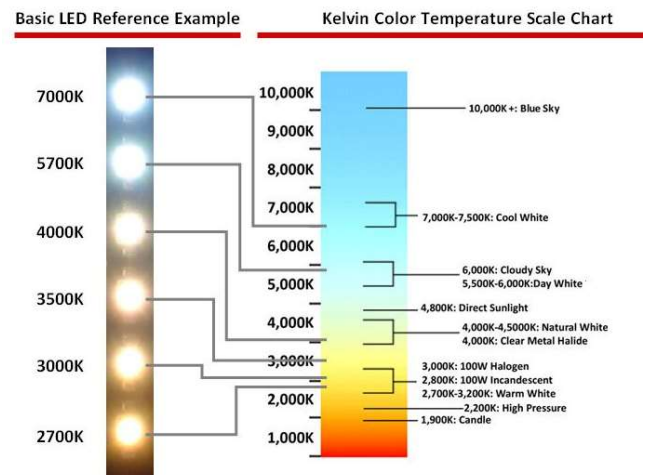
Types of light

Technology is moving from tungsten lighting to halogen lighting and onwards to LED lighting.

LED lighting is particularly attractive because of its low energy use, low cost, longevity and other positive factors. However, there are some complications relating to the type of light that is emitted. Often the light is described by its light temperature, which is measured in degrees Kelvin. Lights which are described as 'daylight' are often in the 5000 - 6000 degrees Kelvin range which is blue-rich, and often too bright for the task. In addition there are concerns that not only does that type of light bounce from the ground and from vegetation, and therefore dissipate upwards causing pollution, but it also has negative effects on wildlife.



Courtesy Commission for Dark Skies (high CCT, i.e blue-rich)



courtesy www.theledlight.com

A 'warm white' light in the region of 2700 - 3000 degrees Kelvin is currently regarded as the most user friendly light, moving away from the orange tinge of traditional tungsten lights but not having the problems of blue/white lights of the so-called 'daylight' bulbs.

There is, however, a technical issue because the blue rich daylight bulbs appear to be rather easier to manufacture and therefore there is a tendency to use them because of their lower cost. That temptation should be avoided! Lighting schemes should not be based entirely around the cost savings of conversion to LED. Consideration should be given to the benefits of using the more appropriate light spectrum of the warm white lights in the 2700 - 3000 degree Kelvin bracket.

Summary

The Blackdown Hills AONB **recommends**, in order to avoid light pollution, that where applicable all external lights are explicitly authorised by the local planning authority and that the authorisation should comply with this guidance. This Good Lighting Guide provides details and elaborates on how to achieve good lighting, good security, and minimal light pollution whether or not consent is required.

As the range and availability of light fittings is continuously evolving, it is advisable to make an internet search of the major manufacturers when a lighting scheme is being considered. Reputable manufacturers and suppliers will provide plans of light contours, so that the likely light distribution pattern can be assessed.

Good lighting guide checklist:

- All old-fashioned 'security' lights should be phased out and all new ones should be of the horizontally mounted flat glass asymmetric type. Old ones should be renewed at the earliest opportunity.
- Lighting should illuminate only the area or premises to be lit, and nowhere else.
- Motion sensors and timers limit lighting to situations when it is needed and save energy and money.
- Bulkhead and lantern style lights, and illuminated bollards, should have internal baffles and/or external shields fitted to avoid upwards and sideways displacement of light, or alternative, well-directed types of units should be fitted.
- Top of pole globe lighting should be avoided.
- Lighting of car parks, service stations, village halls, farm yards and other businesses should be from the outside

inwards, and using horizontally mounted flat glass lighting units.

- Glass gable ends and skylights should be fitted with blinds or louvres.
- LED lighting saves energy and hence money, however the blue rich, so called daylight, units should be avoided.
- All planning applications that involve lighting should identify the lighting layout, the type of lighting units, and their management in their submitted documents.
- If a development does require lighting and the appropriate details are not provided then the planning authority should require these details before making a decision on the proposal.

Where to find out more

Lighting types, qualities and impacts paper:

[www.ccwwdaonb.org.uk/uploads/docs/Our Work/AONB lights fittings BMizon.pdf](http://www.ccwwdaonb.org.uk/uploads/docs/Our_Work/AONB_lights_fittings_BMizon.pdf)

Commission for Dark Skies:

www.britastro.org/dark-skies/

www.britastro.org/dark-skies/cfds_advice.php?topic=security
This includes 'how to' advice on security lighting and an interactive demonstration of floodlighting

CPRE Night Blight:

<http://nightblight.cpre.org.uk/maps/>

<https://nightblight.cpre.org.uk/>

www.cpre.org.uk/media-centre/latest-news-releases/item/4314-new-interactive-maps-reveal-england-s-darkest-and-most-light-polluted-skies

<http://nightblight.cpre.org.uk/what-is-light-pollution?qclid=CJ3f68fUt9ICFe4V0wodCfqMiQ>

Institution of Lighting Professionals:

www.theilp.org.uk/documents/getting-light-right-defra/1getting-light-right-defra.pdf

www.theilp.org.uk/documents/obtrusive-light/guidance-notes-light-pollution-2011.pdf

www.theilp.org.uk/documents/crime/lightingagainstcrime.pdf

International Dark Sky Association:

www.darksky.org

www.darksky.org/resources/glossary
A glossary of lighting terminology

Environment and ecology:

Ecological Consequences of Artificial Night Lighting, Rich and Longcore, 2006.
ISBN 1-55963-129-5

Artificial Light in the Environment, Royal Commission on Environmental Pollution 2009
Chapter 4 ISBN: 9780108508547
www.gov.uk/government/uploads/system/uploads/attachment_data/file/228832/9780108508547.pdf.pdf

[www.bats.org.uk/publications_download.php/1330/BCT Interim Guidance Artificial Lighting June 2014.pdf](http://www.bats.org.uk/publications_download.php/1330/BCT_Interim_Guidance_Artificial_Lighting_June_2014.pdf)

[http://www.bats.org.uk/data/files/Bats and Lighting - Overview of evidence and mitigation - 2014 UPDATE.pdf](http://www.bats.org.uk/data/files/Bats_and_Lighting_-_Overview_of_evidence_and_mitigation_-_2014_UPDATE.pdf)

<https://www.theilp.org.uk/documents/a-review-of-the-impact-of-artificial-light-on-invertebrates/impact-of-artificial-light-on-invertebrates-docx.pdf>

<https://www.theilp.org.uk/documents/bats-and-lighting-in-the-uk/bats-and-lighting-in-the-uk.pdf>

Links and resources correct at time of publication, September 2017.