





Comet Wirtanen and Pleiades over Cranborne Chase AONB  
00:30 2018 Dec 16 30sec Canon EOS 600D

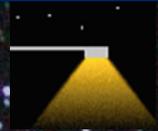
# What Future for Our Dark Skies?

Light pollution, responses  
and remedies

Bob Mizon

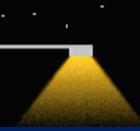
BAA Commission for Dark Skies

[www.britastro.org/dark-skies](http://www.britastro.org/dark-skies)



*“Too much lighting isn't planned – it just happens”*

Ian Phillips, former Chairman, Landscape Institute



Glowing to waste:

Europe alone sends

>£3 BILLION

skywards every

year in the form

of wasted light

(A. Mohar,

Dark-Sky Slovenia).

CfDS



Increasing damage to:

The world's dark habitats

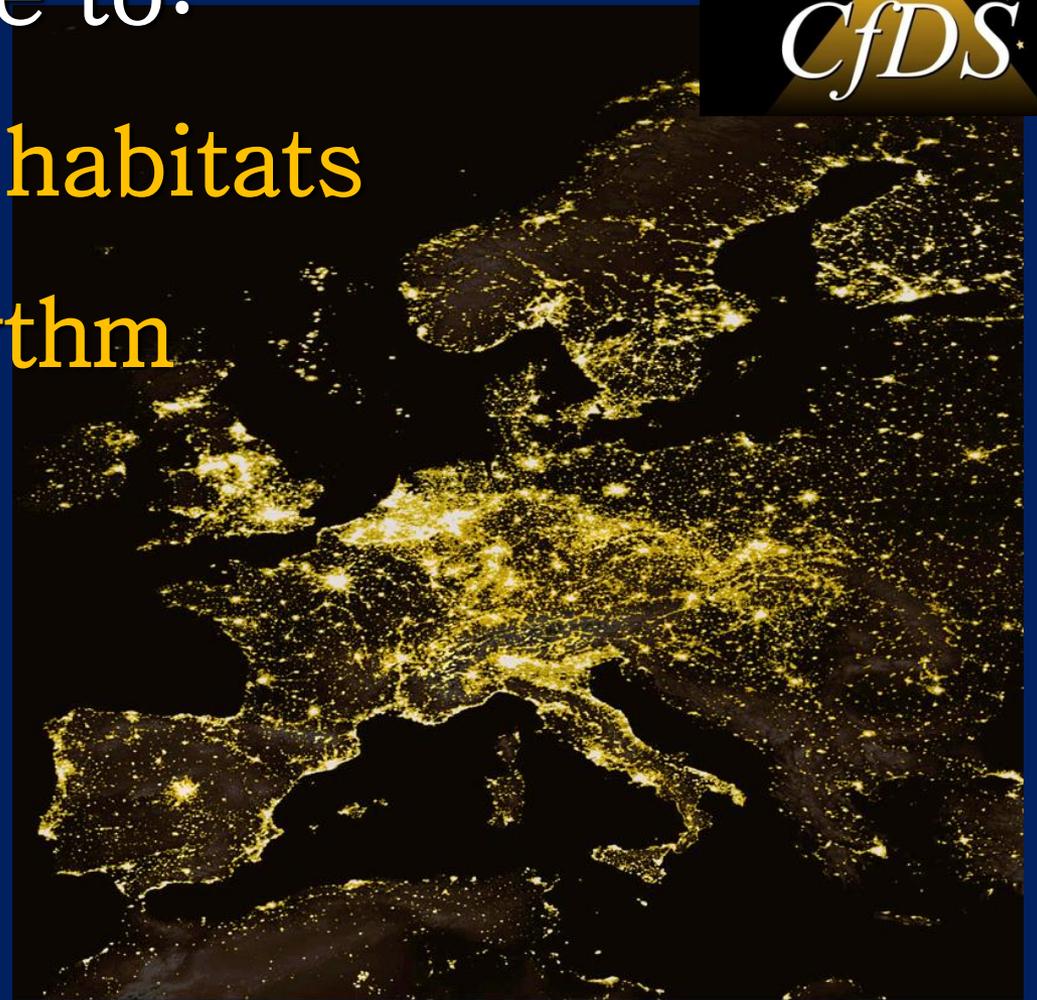
The circadian rhythm

The night sky

Wasted

Money

Energy



Since 1989, the Commission for Dark Skies has been working with:

- central, regional and local government
  - industry
  - local organisations
  - lighting professionals
- those who make, choose and install exterior lighting

promoting *'star-quality' lights* that protect the celestial and terrestrial environments through careful control of brightness and direction of emissions.





- central government



### Be considerate of others

- Choose the correct bulb for the task: 300-500W is far too bright for a small area; it wastes energy and can dazzle possible witnesses.
- 150W is often more appropriate, and uses less energy – saving you money.
- Don't leave yourself open to complaints by allowing your light to shine through others' windows and onto their property.
- If you are found to be causing a statutory artificial light nuisance you may be served a notice by your local authority that requires you to minimise or stop the nuisance. Failure to abide by such a notice can result in a fine.



*Don't leave yourself open to complaints by failing to site your light carefully.*

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This leaflet was created jointly with Campaign to Protect Rural England (CPRE), Campaign for Dark Skies (CfDS) and the Institution of Lighting Professionals (ILP).

#### CPRE

Campaign to Protect Rural England (CPRE) campaigns for a beautiful and living countryside. They work to protect, promote and enhance our towns and countryside to make them better places to live, work and enjoy, and to ensure the countryside is protected for now and future generations. Phone: 020 7981 2800; Email: [info@cpre.org.uk](mailto:info@cpre.org.uk); Web [www.cpre.org.uk](http://www.cpre.org.uk)

#### CfDS

Campaign for Dark Skies (CfDS) aims to preserve and restore the beauty of the night sky by campaigning against excessive, inefficient and irresponsible lighting that shines where it is not wanted nor needed. Web: <http://www.britastro.org/dark-skies/>

#### Institution of Lighting Professionals

The Institution of Lighting Professionals (ILP) is the UK and Ireland's largest and most influential professional lighting association, dedicated solely to excellence in lighting. Phone: 01788 576492; Email: [info@theilp.org.uk](mailto:info@theilp.org.uk); Web [www.theilp.org.uk](http://www.theilp.org.uk)

**Local authorities are the main enforcers of light nuisance legislation and are therefore the best point of contact for light-related queries. For more information, please contact your local authority.**

## Getting Light Right



**Simple tips to get your floodlight working best for you and the environment**

 Department for Environment Food & Rural Affairs



# • central government



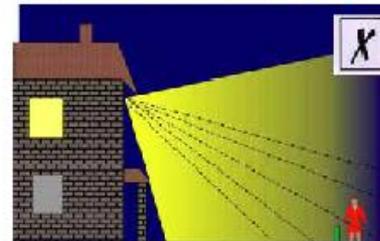
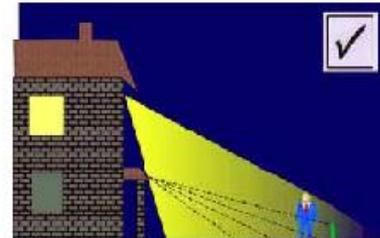
## Did you know...?

- Poorly located floodlights could actually be helping mask break-ins.
- Poorly located floodlighting could also be a nuisance to your neighbours.
- Using too strong a light can dazzle witnesses.

*Follow these simple tips and your light will be more effective.*

## Site your light carefully

- When the light is installed, ensure that it shines only where needed, on an area where intruders might be seen by people nearby.
- A light in a secluded, unseen area is a courtesy light for the burglar.
- Check, at night, when the light has been installed, that it shines only within your premises.
- Take care to avoid light above the horizontal, which causes light pollution of the night sky.



*Check, at night, that light shines only within your premises; and take care to avoid light above the horizontal, which causes light pollution.*

## Only use it when needed

- Adjust the timer to the minimum period necessary to save energy and cut your bills.

## Angle your light downwards

- As you can see from the pictures below, a floodlight that isn't angled correctly can prevent people nearby from seeing what's happening.
- At night, try seeing for yourself what your light illuminates and what it masks. Check it does what you want it to do.



*Light angled correctly    Light angled incorrectly*

*Make sure your light shines only where needed: a light angled downwards can be more effective than one angled outwards.*

- regional government



- local government



# CfDS Good Lighting awards

University of Bath: Mike Tabb →



**Winsford,  
Dorothy House:  
Charles Draper,  
Alison Bruce,  
Tom Harper,  
Bob Mizon**



- industry



- Local organisations





...though some organisations remain to be convinced!

Night sky over Stonehenge (UNESCO World Heritage Site)

Maintained by English Heritage

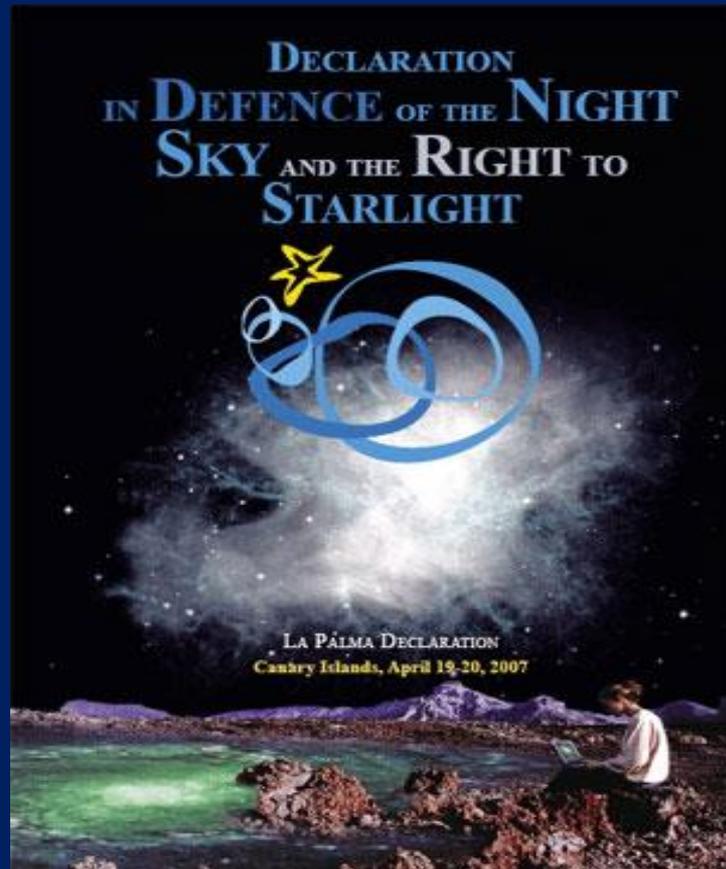
- lighting professionals



- Meetings, national and international conferences and seminars



- links with like-minded organisations throughout the world, all working to promote the turning of the tide of light pollution.





Most world countries now  
have dark-sky groups.



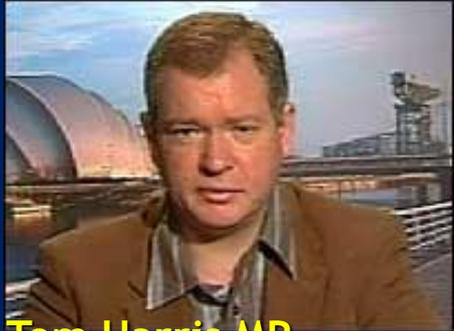
1995 The HA sets the  
standard for  
environmentally sound  
lighting practice:  
NATA, TD34, TA49.



# Highways Agency's contribution recognised

**“The right  
amount of light,  
directed where  
needed”**

**Archie Robertson CE, HA**



**Tom Harris MP**



**Robert Key  
MP**



**Des Turner MP**

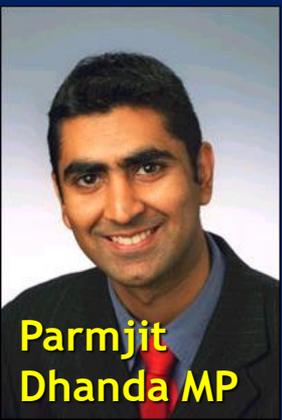


**Andrew  
Murrison MP**



**Ian Gibson MP (chairman)**

**Parliamentary Science  
and Technology Select  
Committee 2003**



**Parmjit  
Dhanda MP**



**Brian Iddon MP**



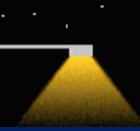
**Geraldine Smith MP**



**Evan Harris  
MP**

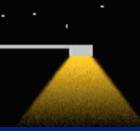


**Tony McWalter MP**



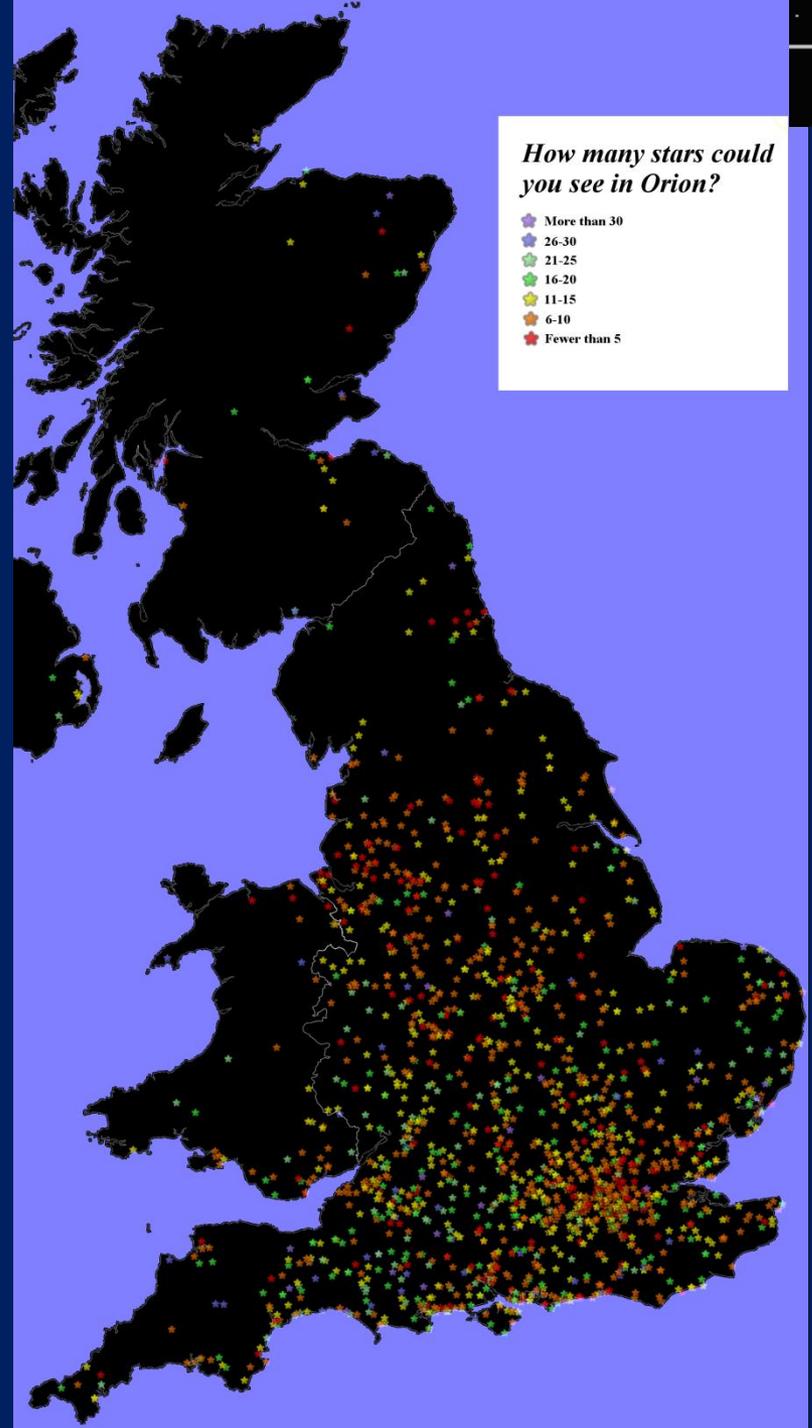
The Clean Neighbourhoods Act 2005 makes intrusive light a statutory nuisance alongside noise. It is rarely firmly enforced.

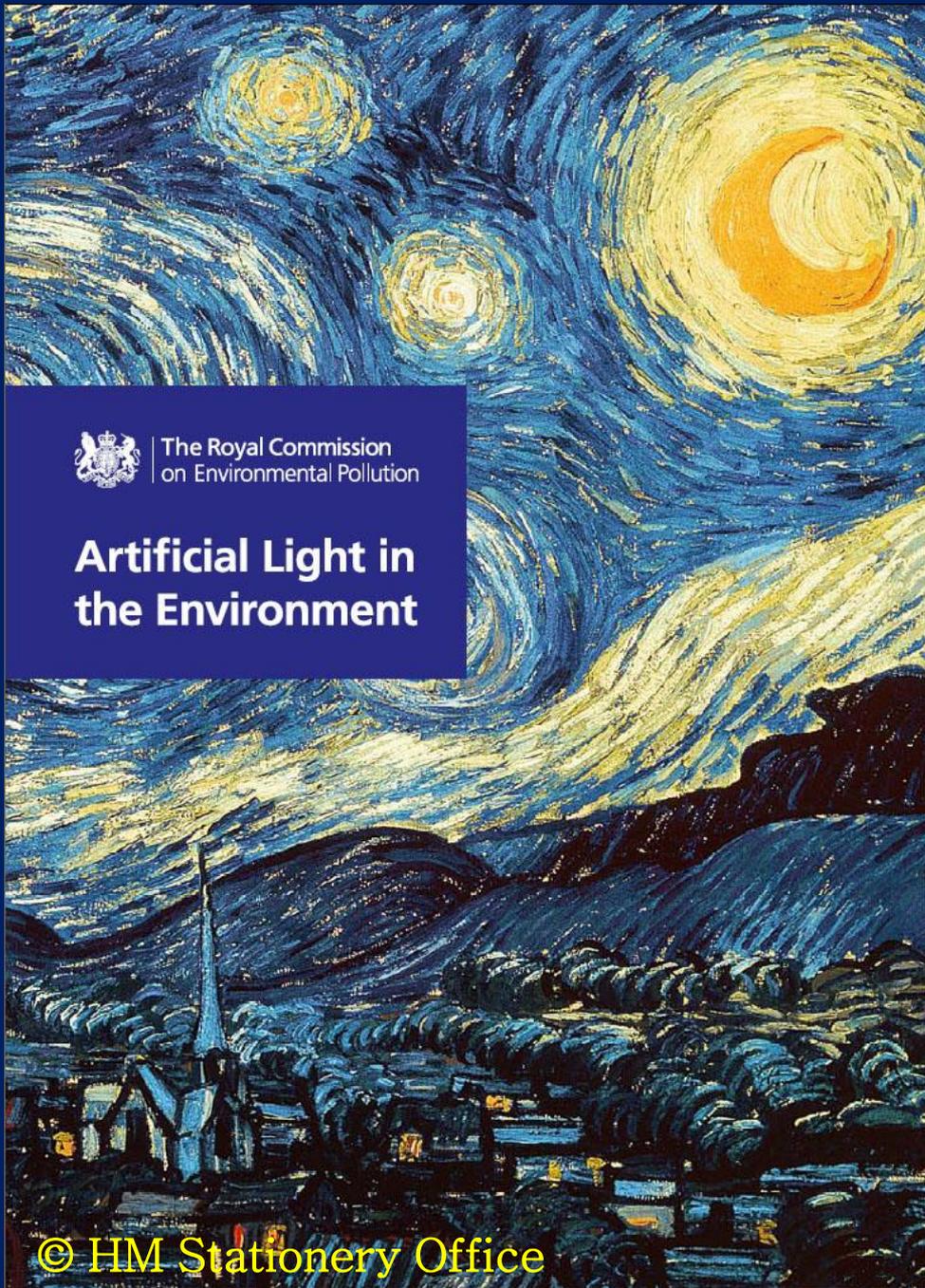
There is still no law specifically to protect the night sky. If Slovenia, Liechtenstein, the Czech Republic and most recently France can do it, so can we!



Transport premises excluded – why?

Since 2007, thousands of people have taken part in the annual CPRE/CfDS star count. 2% of respondents see more than 30 stars in Orion, compared to 54% who saw fewer than 10 stars— a level which indicates severe light pollution.





The Royal Commission  
on Environmental Pollution

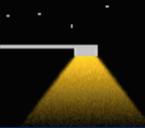
## Artificial Light in the Environment

# Royal Commission on Environmental Pollution: *Artificial Light and the Environment* (December 2009)



“Imagine a vista of outstanding natural beauty, to say nothing of historic and cultural significance, permanently obscured from public view by a cloud of non-toxic, but visually impenetrable, artificial vapour. Such a prospect seems unthinkable in Britain today. Yet we seem to tolerate the daily destruction of arguably the most culturally universal and historically pristine of natural vistas – the night sky, filled with constellations of stars, and planets and galaxies. The responsible pollutant, however, is not an impenetrable vapour, but the light that we so freely emit into our surroundings”.

Royal Commission on Environmental Pollution:  
*Artificial Lighting in the Environment*, 2009



# Royal Commission on Environmental Pollution: *Artificial Light*

*and the Environment* (December 2009):

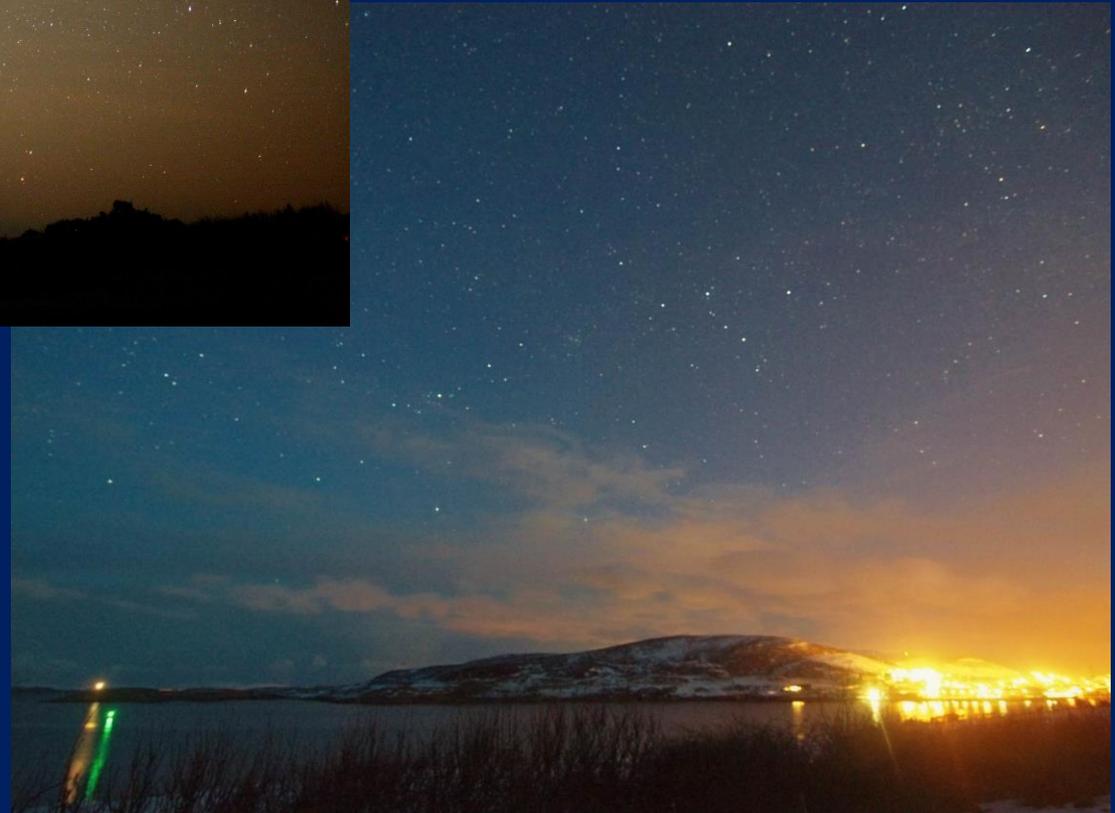
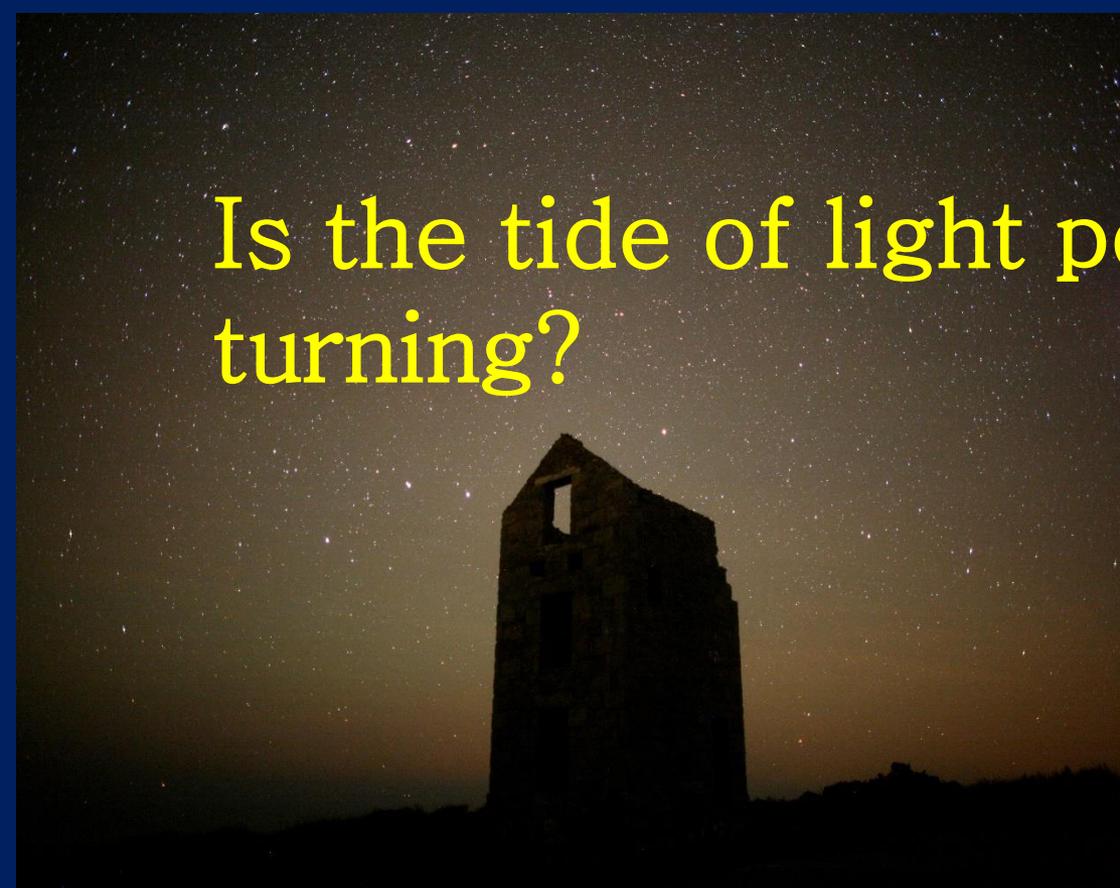
“At present, none of these issues appears to have any natural locus within Government, with different departments considering different aspects and some key departments such as transport explicitly not considering impacts on the natural environment. Light has been the poor relation for too long.”

“Government needs to accept the fact that light, like noise and chemicals, in the wrong quantity, in the wrong place and at the wrong time can cause problems and must be addressed explicitly in policy development.”

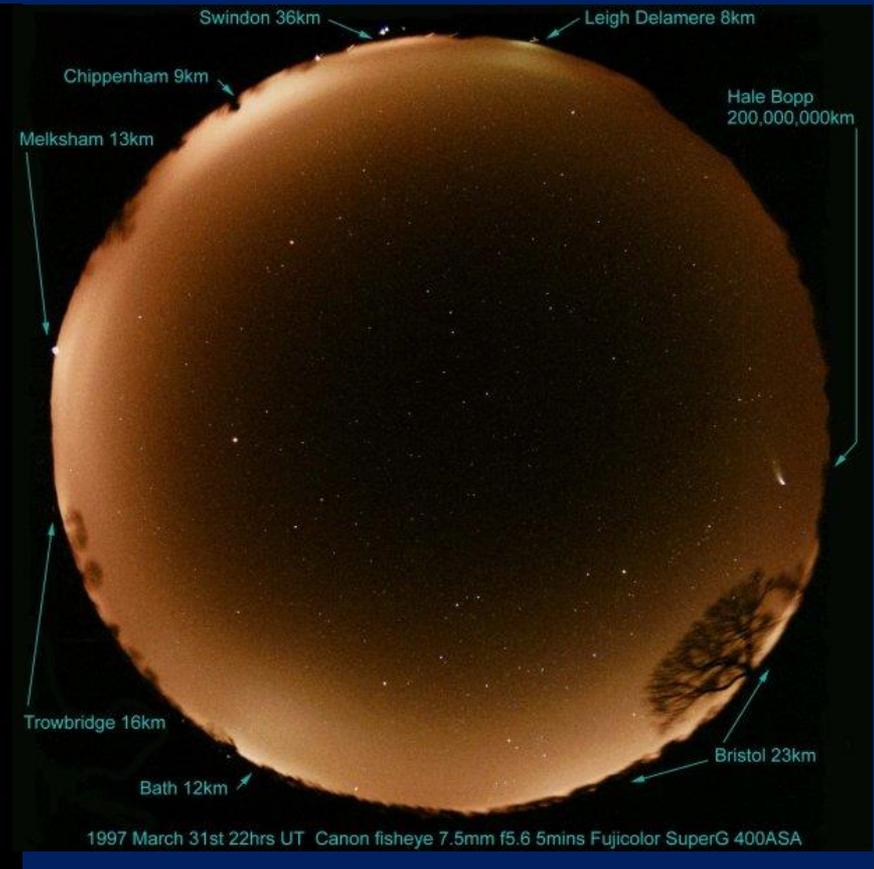
“We recommend that DEFRA and equivalent bodies elsewhere in the UK take the lead in co-ordinating interdepartmental activity on artificial light.”



Is the tide of light pollution turning?



# Is the tide of light pollution turning?



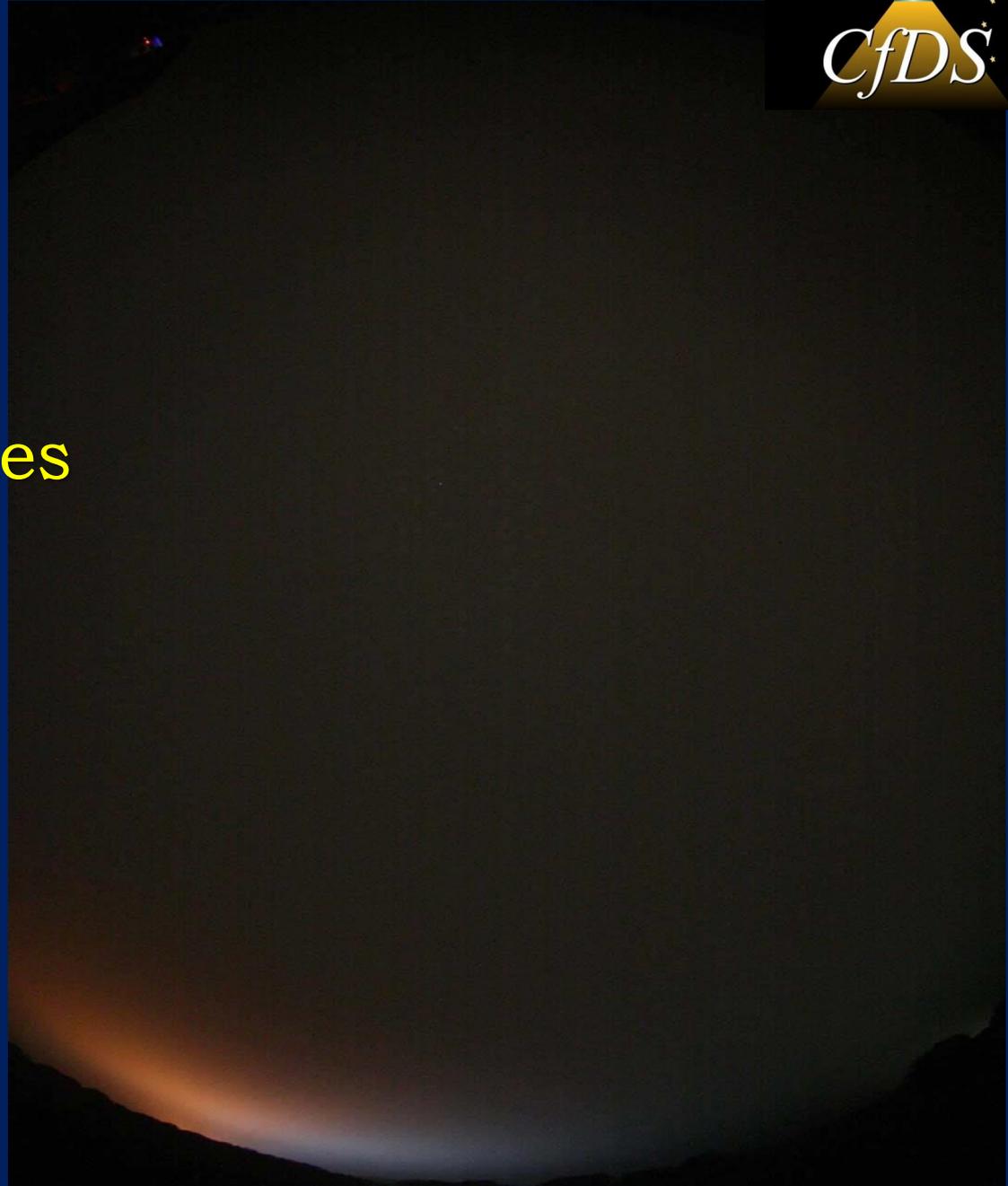


## The LED Revolution:

two cheers for the new generation of lighting? American Medical Association expresses serious concern about blue-rich LEDs.

The LED  
Revolution:  
Orange skyglow  
replaced by white.

Hereford from 10 miles  
Photo Chris Baddiley



The benefits of switching to LED lights, which use less energy than conventional lighting, could be lost if people use the cost savings to pay for extra lighting. Scientists fear this "rebound effect" might partially or totally cancel out LED savings and increase emissions.

"The great hope was that LEDs would lead to lower energy usage, but what we're seeing is those savings being used for increased lighting," said Professor Kevin Gaston, of the Environment and Sustainability Institute of the University of Exeter.

"We're not just seeing this in developing countries, but also in developed countries. You now struggle to find anywhere in Europe with a natural night sky – without that skyglow we're all familiar with."

The scientists used data from the first-ever calibrated satellite radiometer designed especially for night lights (VIIRS, Visible/Infrared Imager Radiometer Suite on the NOAA satellite Suomi-NPP).

Globally, the increase in light emission closely corresponds to the increase of the Gross Domestic Product (GDP), with the fastest growth occurring in developing countries.

There is, however, hope that things will change for the better.

"Other studies and the experience of cities like Tucson, Arizona, show that well designed LED lamps allow a two-thirds or more decrease of light emission without any noticeable effect for human perception," said researcher Dr Christopher Kyba, German Research Centre for Geoscience. Dr Kyba's earlier work has shown that the light emission *per capita* in the USA is three to five times higher than in Germany. He sees this as a sign that prosperity and security can be achieved with conservative light use. "There is a potential for the solid state lighting revolution to save energy and reduce light pollution, but only if we don't spend the savings on new light," he added.

“A metamorphosis has gradually occurred in the *Lighting Journal's* pages in recent years. Up to and including the 1990s, many of the products illustrated allowed light sideways and upwards, with little apparent desire to optimise energy use, and no thought for limitation of the emissions to where they might be needed. Now, it is difficult to find any such products in those pages; advertisements and features now show road lights that are full cut-off, illuminating only below and minimising spill. Articles now appear about the negative impacts of wasted light (on human health and wildlife, for example). Light pollution of the night sky is constantly mentioned”.

# If night becomes day...



## Lighting and Sleep – a Health Time-Bomb?

In his final think-piece as Editor of *Lighting Journal*, Carl Gardner takes over the megaphone from Max Watts to speculate on the long-term effects of artificial lighting, and in particular LEDs, on the sleep patterns of people in industrialised societies

As we all spend almost one-third of our lives doing it, you'd think that sleep would be the easiest activity to do well. Yet recent reports estimate that one-third of people suffer from insomnia or other difficulties with their sleep patterns – and the problem is growing. Young children, worry and stress exacerbated by economic problems and drinking too much coffee and other stimulants are three of the most obvious reasons for this phenomenon. However, I wonder how much the disruption of our sleep patterns could be light-related?

In recent years scientists have discovered a great deal about how light controls our circadian rhythms and in particular the production of the hormone melatonin, which stimulates sleep. Unfortunately, while this knowledge has permeated down into the lighting professions, it is not something that is more generally appreciated by the population at large. What we now know is that quantities of the right light – particularly natural daylight – at the right time can ensure a well-functioning 24-hour biological clock... and good sleep. But the wrong lighting at the wrong time or the absence of strong daylight, can disrupt this pattern and cause poor sleep.

### Not Nocturnal

Obviously human beings didn't evolve as nocturnal animals – our ancestors would usually have gone to sleep not long after dusk and awoke with the dawn (although in the summer, they may have taken a sleep during the afternoon, to compensate for the long day length). It is only in the last 130 years that we have had the power to extend the working/waking day

significantly through artificial lighting, so it wouldn't be surprising if our physiological systems have found it hard to adapt.

The other complicating factor is that, since the 19th century, most industrialised work has been done indoors, in enclosed spaces with more or less artificial lighting and little natural light. In the winter months, millions of people in the industrialised world go to work in the dark, come home in the dark and experience very little bright, natural daylight during the working day. This lack of daylight is an obvious factor in causing poor sleep, as we know that high lighting levels, best provided by exposure to daylight and sunlight, is necessary to 'entrain' the circadian system and ensure a consistent, healthy 24-hour sleep-wake pattern. Artificial lighting systems in the workplace which mimic daylight patterns and compensate for this lack of high natural light levels do exist – but they are expensive to buy and run and are unlikely to be adopted on a national scale.

However, the problem may also result from the 'wrong' light at the wrong time – i.e. our exposure to multiple artificial light sources during the evening hours, when our bodies should be preparing for sleep. These could cumulatively reduce our bodies' ability to produce melatonin. For example US research published in *Lighting Journal* (December, 2010) showed that exposure to a mere 100 lux of cool-white light street lighting for an hour reduced melatonin levels by between 3 and 10%.

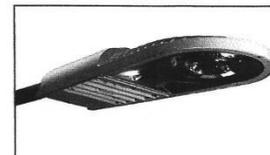
### Not So Cool for Sleep

In fact, 'cool' LED lighting was the most effective melatonin reducer in these experiments. So perhaps the rapid growth in

the use of LEDs in Western societies, driven by the need to save energy, could be making sleep disruption even worse. Most LEDs have a much higher short-wave spectral content (the most effective in suppressing melatonin) than the light sources they are displacing (tungsten and SON) which are biased towards longer wavelengths. How many of us have blue LED clocks in our bedrooms so we can tell the time when we're awake in the night? Could we simply be confounding our own sleeplessness? One only has to list the most obvious white light sources we may now encounter in an average afternoon and evening period to see that there could be a growing cumulative problem here:

- In workplace lighting
- In street lights (alongside other 'white light' sources)
- In bars, cafes and restaurants
- In TVs and PC screens (an often forgotten source)
- In public transport – trains and buses
- In digital clocks and other devices, even in otherwise 'dark' bedrooms
- In bedside lights – and increasingly in all residential light fittings

OK, some readers (particularly those with a vested interest in LEDs) will say that this is alarmist – and I admit that this contention may be little more than a suspicion or a vague hypothesis. However, it seems to me that the long-term effects of this cumulative spectral shift in our lit environment do need some serious investigation as a possible causal factor in the growth in insomnia and disrupted sleep. After all, good sleep is a precondition of a healthy body and a happy society – and as lighting professionals we should be working to ensure both, not unwittingly undermining them.



LED bedside lights, LED TVs and LED street lights – all contributing to disrupted sleep patterns?



# The first and longest stride – awareness and education

- Great public awareness of the fact that light is not always well done, and that it has its ‘dark’ side.
- Clean Neighbourhoods and Environment Act 2005 section 102 (Select Committee on light pollution in 2003)
- Royal Commission on Environmental Pollution
  - 2010



- National structure of local officers and supporters to spread the message and inform as many people and agencies as possible that the problem is present, is worth solving and can indeed be reversed.
- The lighting industry now promotes good practice and the production of better lamp designs The Institution of Lighting Professionals now promotes and sells the publication “Towards Understanding Skyglow”, a technical guide to light pollution issues written by CfDS committee member Dr Christopher Baddiley, an expert in optical design.
- The Highways Agency (Highways England) will not now fit lamps that shine above the horizontal.

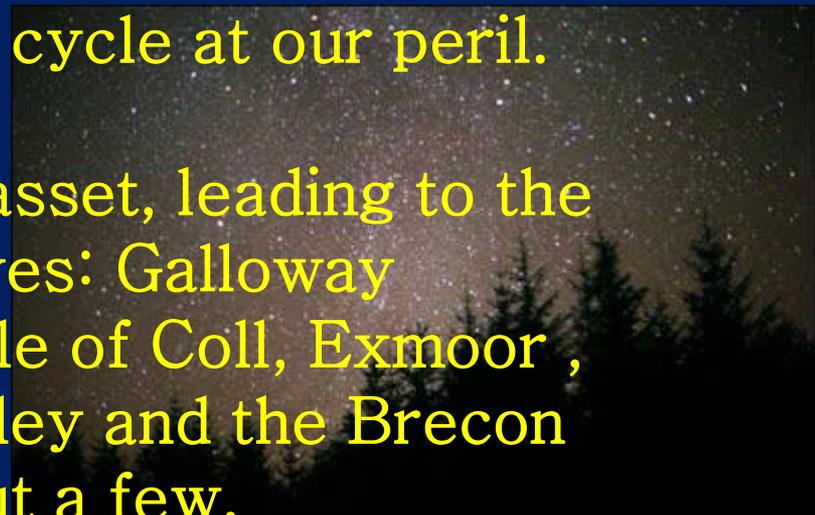


- CPRE, NSCA, Buglife and many other environmental protection organisations raise awareness of the issues.

- Skybeams now subject to regulation and licensing, thanks largely to the work of CfDS committee member Martin Morgan-Taylor.

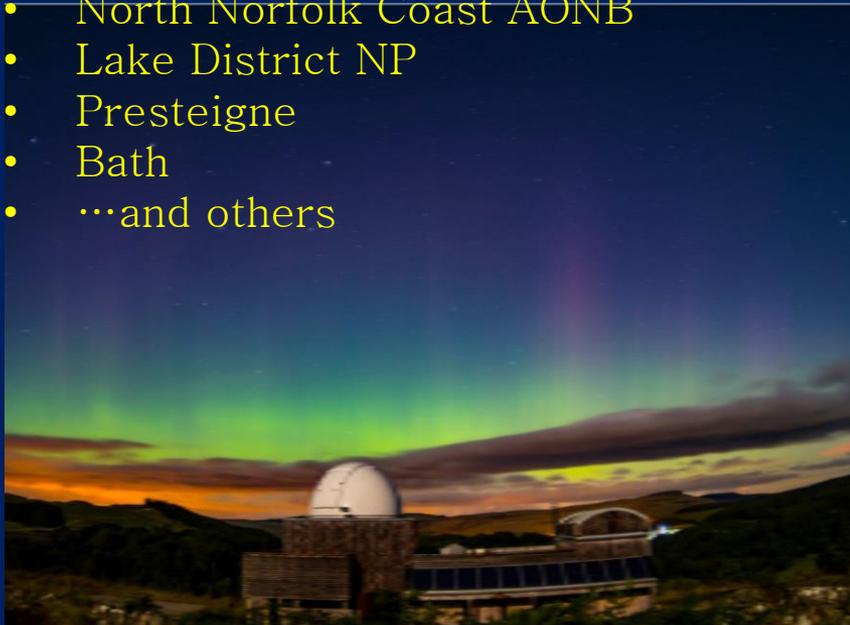
- Greater awareness of the impact of wasted light upon the night-time environment, wildlife and human health, as increasing evidence emerges that we tamper with our ancient day-night cycle at our peril.

- The night sky seen as a positive asset, leading to the establishment of dark-sky preserves: Galloway Forest Park, the island of Sark, Isle of Coll, Exmoor, Northumberland-Kielder, Elan Valley and the Brecon Beacons National Park, to name but a few.



# Dark Sky Places of the future:

- North York Moors NP
- Isle of Wight SW
- Lundy
- Bardsey Island
- Romney Marsh
- New Forest NP
- Cranborne Chase AONB
- Dedham Vale AONB
- N Wessex AONB
- North Norfolk Coast AONB
- Lake District NP
- Presteigne
- Bath
- ...and others





As a result of international efforts, lights are being changed to new designs conforming to standards, guidelines and laws that have been laid down in many countries worldwide.



## FRENCH LAW DEC 2018

In all public and private areas, from January 1st, 2020, all new lighting installations shall comply as follows:

Upward Light Ratio  $< 1\%$

CCT  $< 3000\text{K}$

Light flux  $< 35 \text{ lm/m}^2$  (the sources' light flux (lamps, LED chips) divided by the area to be lit)

Lighting of closed activity areas will be switched off by 1h after the end of the activity.

Former lighting devices that can be adjusted to comply with the Act will have to be adjusted before January 1st, 2020.



# The rise of astro-tourism

All this progress means that we have reached a new threshold in countering light pollution. So many people now know and care, so many media outlets report upon it, so many lighting professionals are ‘on board’:

in the coming years, as energy prices continue to bite and environmental concerns permeate the thinking of legislators, we will see a return to sane lighting practices that offer a well-lit night-time scene while preserving our ancient view of the stars above. We should all be working towards that simple goal.

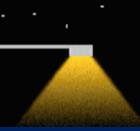


# Light pollution barely mentioned in Government's 25 Year Environment Plan

Dear Mr Gove...

... We, the committee of the BAA's  
Commission for Dark Skies, firmly believe  
that the Government's 25-year Environmental  
Plan (25YEP) should embrace equally all  
parts of our environment, including the one  
which currently has no protection in any  
legislation: the night sky.... No reply

And the  
future?





Sky wonders – ours for ever? Prioritise solutions to the world climate/biodiversity crisis. Saving energy and preserving dark habitats by REAL control of lighting.

Thank you



[bob.mizon@yahoo.co.uk](mailto:bob.mizon@yahoo.co.uk)