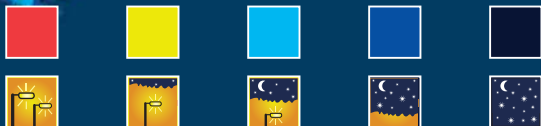


Campaign to Protect Rural England

# Night blight!

Rapidly spreading light pollution chases the stars from the night... closing our window to the universe

Key Satellite measurements of light at night



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# Summary

**This report is a background document to a new joint campaign by the Campaign to Protect Rural England and the British Astronomical Association against light pollution, which is**

- A waste of energy
- A contributor to air pollution and climate change
- A serious obstacle to our view of the wonder, beauty and mystery of the night sky
- Contributing to the destruction of the tranquillity, quality and character of the English countryside.

We set out new evidence, based on satellite data, of the rapid spread of light pollution across the United Kingdom. We examine the sources and the impacts of this problem. We look at what is now being done to tackle light pollution and consider what more might be done. Our report concludes by making recommendations for action – by citizens and consumers, retailers, business, commerce and the property sector, the Highways Agency, local government, central government and public bodies.

‘Can we see the whole of life or only know a hemisphere of it before death? I’ve no idea of the answer myself. But the sight of stars always sets me dreaming...’  
**Vincent Van Gogh<sup>1</sup>**

## Let there be *(at least some)* dark

The sky at night has been enchanting and puzzling human beings since long before the dawn of civilisation. Nothing else in the natural world achieves quite such a combination of beauty and mystery. Nothing else has inspired so much art, science and religion.

B Mizon



Comet Hale-Bopp visible in a starry night sky, rural Dorset

On a dark, clear night you can see some 3,000 stars spread across the overturned bowl of the sky. You can gaze at the soft luminescence of the Milky Way – the great heart of our own galaxy – splashed across the heavens. With your naked eye you can see up to five planets and the Andromeda galaxy, the nearest outside of the Milky Way. The faint light we now see from this neighbouring city of stars has been hurtling towards us through space at 186,300 miles per second. Even so, it has taken 2.2 million years to reach Earth.

The night sky is the ultimate Area of Outstanding Natural Beauty and Site of Special Scientific Interest. But while earthbound AONBs and SSSIs are designated by Government and have at least some formal legal protection, there is nothing whatsoever to prevent our view of the heavens – the birthright of us all – from being destroyed.

And that is what is gradually happening. The grandeur, awe and beauty of the night is being blown away by our



Veil of light pollution obscuring the Southern stars

careless, wasteful use of electric light outdoors. Orange and pink sky glow spreads further and further out from our towns and cities. When light pollution intrudes into a clear, dark night only a few dozen of the very brightest stars and planets are visible. You can usually see more aircraft lights than heavenly bodies. Many children have never seen the real Milky Way.

CPRE has a special interest in seeing this pollution tackled because darkness at night is one of the things which – up to now, at least – has defined the countryside and made it so different from towns and cities. A moonlit rural landscape, the bare branches of a big, ancient tree silhouetted against a star filled sky, are precious and increasingly endangered things.

Yet artificial light is one of the great hallmarks of civilisation. Exterior lighting can give us a sense of security and make roads and pavements safer. It can enhance historic and architecturally important buildings, make entire urban quarters more attractive and provide greater opportunities for sports and other entertainment.

We do not advocate dark streets and we are not opposed to exterior lighting. But we are firmly against its careless, inconsiderate and wasteful use – which is what causes light pollution. It occurs as:

**Sky glow** – the orange<sup>2</sup> glow we see for miles around urban areas, and increasingly in the countryside, caused by a scattering of artificial light by dust particles and water droplets in the sky.

**Glare** – the uncomfortable brightness of a light source when viewed against a darker background; and

**Light trespass** – light spilling beyond the boundary of the property on which a light is located, sometimes shining through windows and curtains.

CPRE first addressed light pollution in its leaflet *Starry, Starry Night*, published jointly with the British Astronomical Association in 1994. The association had already begun its own Campaign for Dark Skies several years earlier. This report reviews the main concerns over light pollution and proposes action to be taken by government – local and national, by businesses and consumers to combat the spread of light pollution.

There is a need for a government policy and targets on light pollution; neither exists at present. Changes in attitude

will, however, probably be as important as any changes in policy, regulation and legislation. There is growing awareness about the problem – but not nearly enough. For many firms, individuals and authorities, light pollution is not ‘on the map’. It is deeply worrying, for instance, that a leading and highly fashionable firm of British architects (Alsop Architects) and a borough council (Barnsley) can propose a vast ‘halo of light’ in the skies above the town as part of their regeneration plans, without apparently giving the issue of light pollution any serious thought.

But our report begins with a dramatic new way of looking at the extent of the problem, and the rate at which it is growing. This really does put light pollution on the map.



Sky glow of Bath University viewed from Bannerdown

# A rapidly worsening problem

**CPRE has obtained new satellite data which shows how rapidly light pollution is growing in the UK.**

Weather satellites owned and operated by the US Air Force carry an Operational Line Scanner, an instrument which detects moonlight reflected upwards from clouds in order to measure the extent of cloud cover over different parts of the Earth's surface at night<sup>3</sup>. But from 500 miles up this scanner can also detect lights from towns and cities, fires, gas flares and heavily lit fishing boats when there is no cloud cover. Scientists from the US National Oceanographic and Atmospheric Administration (NOAA) have developed ways of using this instrument to measure the total brightness of artificial night time lights within small areas of the Earth's surface.

For every one of these areas the light detector on the satellite makes repeated measurements of light beaming upwards, capturing the rays from various angles, as it passes overhead dozens of times.

Abnormal, transient brightness, such as might be caused by a large fire, is filtered out in order to provide a reliable estimate of the amount of artificial light normally beaming upwards from every part of planet Earth at night.

What is actually being measured is the combination of all of the individual light sources within each small area. Thus one relatively small but powerful light source – say a floodlit stadium – within an individual area might be measured as

the equivalent of a suburb lit by street lights. The analysis can register the light from small, isolated rural communities of about 100 homes surrounded by unlit countryside.<sup>4</sup> Some of the light being captured consists of reflections from the ground, but most of it is direct rays from exterior electric lights.

The data can be used to create remarkable maps of artificial night-time light, composed of huge numbers of tiny pixels – each one corresponding to an area and given a unit value and a colour shading according to the power of the light beaming up from it. These maps provide an approximate but adequate overall measure of light pollution in each locality. The analysis appears to pick up some of the 'sky glow' being cast out from well lit areas into unlit countryside.<sup>5</sup>

NOAA has been creating such maps for the years 1993 and 2000, so that the change over a seven year period can be examined. This exercise is being carried out for the Millennium Ecosystem Assessment, a global effort by international scientific organisations, UN agencies and governments to compile information on the state of the earth's ecosystems and how they are changing. The night light data provides a new way of looking at urban expansion and energy use.

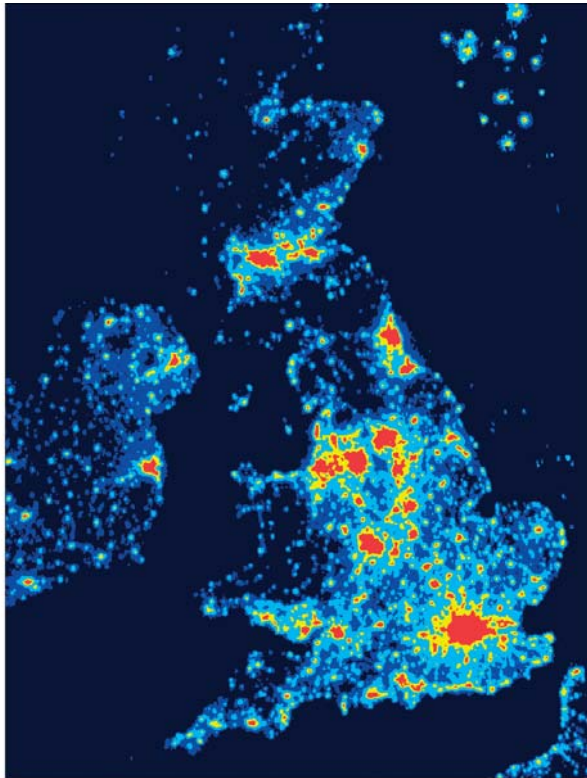
NOAA has provided CPRE with this as yet unpublished data for the entire United

Kingdom. So, for the first time, we have a high resolution, nationwide indicator of light pollution in the British Isles which tells us how its extent is changing with the passing of time.

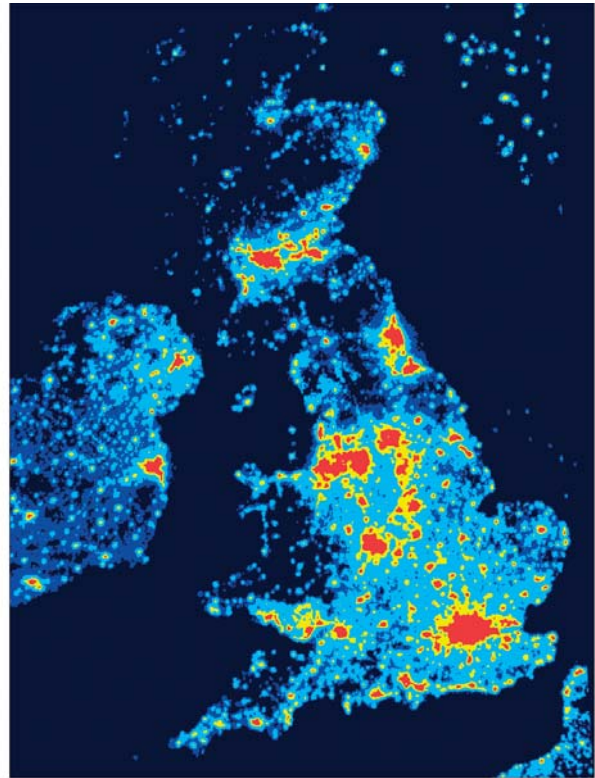
The increase in brightness over the seven year period was much greater than we had anticipated. Light pollution appears to be rapidly worsening. Some pixels – representing a few per cent of England's land surface in total – had become darker. Perhaps a switch to modern, 'full cut off', street lighting (see page 11 below) is the reason. But the great majority of the nation's land surface had become more brightly lit at night.

The maps, as we said earlier, are made up of tiny square pixels less than a mile wide. The value assigned to each of these ranges from 0 to 255. A zero value means the instrument on the satellite is detecting no night time light at all in that pixel. At 255 the instrument is, effectively, saturated (a pixel might be brighter but the detection equipment cannot tell the difference). Between 0 and 255 the number varies in direct proportion with the brightness of the light. Our analysis found that between 1993 and 2000 the average pixel in the UK became 12 units brighter at night.

To create our maps, we divided the pixels among five colour bands according to their brightness value. In the darkest blue band (below the value of 2), which covers the



1993



2000

Key ■ 0 – 1.7 ■ 1.71 – 50 ■ 50.01 – 150 ■ 150.01 – 240 ■ 240.01 – 255

sea and the most thinly populated, remote parts of the country, the analysis is picking up virtually no artificial lights at night. In the bright red band (above 240), which overlies large parts of all of the larger towns and cities, the satellite detector is near or at the point of saturation. Although some pixels within the red area may be much brighter than others, they are all too bright for any differentiation.

Between deep blue and bright red lie two bands of progressively lighter blue and a brighter, yellow band. The yellow band surrounds the red areas and joins many of them together in a network of light. The yellow corresponds to sprawling suburbs, medium sized towns and lit stretches of road which join them.

What does all of this mean, in terms of light pollution experienced on the

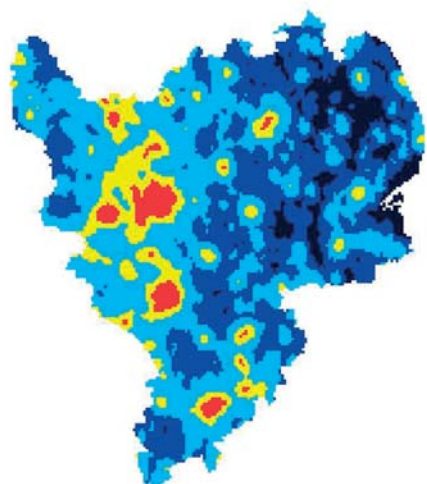
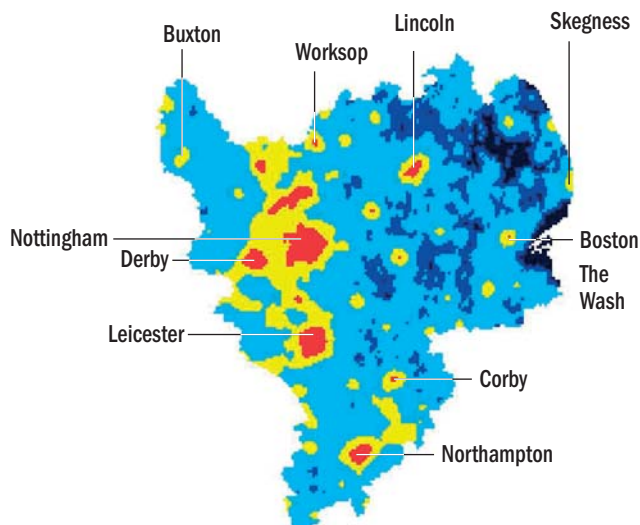
ground? The answer depends on your precise, local circumstances. It would, for example, be possible for you to be in one of the darkest areas on the map – yet still have your view of the stars obscured by a single bright light close to you.

In general, however, there is a good chance of seeing the Milky Way on a clear, moonless night from a vantage point within one of the deepest blue areas. Our very own galaxy becomes harder and harder to view within the next two, lighter blue bands. (If, however, you are in a relatively dark pocket, with no external lights within a few hundred metres, the chances become higher; much depends on the amount of dust and water droplets in the air). There is no chance of seeing the Milky Way on even the clearest night within the red and yellow bands where most of the population lives.

Across England, 26 per cent of all pixels, representing just over a quarter of the nation's total land area, had shifted up a brightness band while only two per cent had shifted down a band. The biggest change of all involved the two lighter blue bands, with great tracts of the lowland countryside becoming more brightly lit at night. The proportion of England's land area within the darkest band fell from 15 per cent in 1993 to 11 per cent in 2000.

These maps provide a fresh perspective on the rapid loss and fragmentation of England's tranquil areas which CPRE first exposed in its *Tranquil Area* maps<sup>6</sup>. And they expose a major growth in light pollution over just seven years.

To view or order a printed copy of our regional maps of light pollution, view the light pollution section of our website, [www.cpre.org.uk](http://www.cpre.org.uk), or telephone freephone 0800 163680 and ask for CPRE Publications.






**East Midlands 1993****East Midlands 2000**

Key ■ 0 - 1.7 ■ 1.71 - 50 ■ 50.01 - 150 ■ 150.01 - 240 ■ 240.01 - 255

In the table below we show how the area of each county and region in England was divided between the five different brightness bands in 2000, the proportion of their areas which shifted up a band – becoming brighter – between 1993 and 2000, and the proportion which shifted down.

	Percentage of local area in each of the five light pollution bands in 2000 (see key on page 7)					Percentage of local area moving up or down a band between 1993 and 2000	
	Dark blue 0-1.7	Blue 1.71-50	Light blue 50.01 - 150	Yellow 150.01-240	Red 240 - 255	Increase by 1 band or more (getting brighter)	Decrease by 1 band or more (getting darker)
<b>North East</b>							
Durham	16%	22%	34%	25%	4%	28%	2%
Northumberland	45%	28%	22%	4%	1%	30%	1%
Teeside*	0%	0%	26%	37%	36%	24%	0%
Tyne and Wear*	0%	0%	1%	19%	80%	6%	0%
REGIONAL TOTAL	31%	23%	24%	13%	9%	28%	1%
<b>North West</b>							
Cheshire	0%	1%	52%	35%	12%	29%	0%
Cumbria	29%	32%	35%	3%	0%	40%	1%
Greater Manchester	0%	0%	5%	21%	74%	14%	0%
Lancashire	5%	14%	41%	32%	8%	20%	1%
Merseyside	0%	0%	3%	27%	70%	15%	0%
REGIONAL TOTAL	15%	19%	35%	17%	13%	30%	1%
<b>Yorkshire and the Humber</b>							
Humberside*	3%	17%	63%	13%	5%	35%	0%
North Yorkshire	19%	38%	38%	4%	0%	30%	2%
South Yorkshire	0%	0%	35%	46%	19%	17%	4%
West Yorkshire	0%	0%	29%	39%	32%	13%	3%
REGIONAL TOTAL	11%	25%	42%	14%	7%	27%	2%



Percentage of local area in each of the five light pollution bands in 2000 (see key on page 7)						Percentage of local area moving up or down a band between 1993 and 2000	
	 Dark blue 0-1.7	 Blue 1.71-50	 Light blue 50.01 - 150	 Yellow 150.01-240	 Red 240 - 255	Increase by 1 band or more (getting brighter)	Decrease by 1 band or more (getting darker)
<b>East Midlands</b>							
Derbyshire	0%	1%	66%	29%	4%	27%	2%
Leicestershire	0%	7%	62%	26%	5%	31%	1%
Lincolnshire	5%	27%	63%	5%	0%	46%	1%
Nottinghamshire	0%	2%	65%	22%	11%	25%	1%
Northamptonshire	0%	2%	79%	17%	2%	38%	1%
Rutland	0%	3%	94%	2%	0%	41%	0%
REGIONAL TOTAL	2%	12%	67%	16%	3%	37%	1%
<b>West Midlands</b>							
Hereford & Worcester	19%	18%	50%	12%	1%	30%	2%
Shropshire	18%	18%	58%	5%	1%	41%	2%
Warwickshire	0%	3%	70%	24%	3%	24%	1%
West Midlands	0%	0%	8%	15%	77%	6%	1%
Staffordshire	0%	1%	67%	26%	6%	30%	1%
REGIONAL TOTAL	11%	11%	56%	15%	7%	30%	1%
<b>East of England</b>							
Bedfordshire	0%	0%	69%	27%	5%	17%	1%
Cambridgeshire	0%	7%	78%	13%	2%	34%	1%
Essex	1%	3%	66%	23%	7%	20%	2%
Hertfordshire	0%	0%	47%	44%	9%	10%	3%
Norfolk	12%	33%	51%	4%	1%	26%	5%
Suffolk	7%	25%	59%	8%	1%	27%	5%
REGIONAL TOTAL	5%	16%	61%	15%	3%	25%	3%
<b>South East</b>							
Buckinghamshire	0%	0%	67%	26%	8%	17%	1%
Berkshire	1%	9%	47%	29%	13%	21%	1%
East Sussex	1%	12%	72%	13%	3%	21%	2%
West Sussex	3%	11%	67%	18%	2%	15%	5%
Greater London	0%	0%	1%	9%	91%	2%	0%
Hampshire	3%	10%	64%	15%	8%	22%	3%
Isle of Wight	9%	21%	55%	14%	0%	11%	5%
Oxfordshire	0%	5%	81%	13%	1%	27%	1%
Surrey	0%	0%	45%	37%	17%	13%	0%
Kent	1%	5%	68%	22%	5%	20%	2%
REGIONAL TOTAL	1%	7%	61%	19%	12%	19%	2%
<b>South West</b>							
Avon*	0%	0%	54%	31%	15%	18%	1%
Cornwall	18%	37%	39%	6%	0%	17%	5%
Devon	37%	24%	33%	6%	1%	18%	5%
Dorset	24%	21%	42%	9%	4%	16%	9%
Gloucestershire	2%	15%	74%	8%	2%	35%	1%
Somerset	18%	20%	58%	5%	0%	24%	3%
Wiltshire	12%	18%	61%	8%	1%	30%	5%
REGIONAL TOTAL	20%	22%	48%	8%	2%	22%	5%
<b>ENGLAND</b>							
ENGLAND	11%	16%	51%	14%	7%	26%	2%
<b>NORTHERN IRELAND</b>							
NORTHERN IRELAND	8%	27%	57%	6%	1%	50%	0%
<b>WALES</b>							
WALES	46%	16%	28%	8%	1%	19%	4%
<b>SCOTLAND</b>							
SCOTLAND	62%	17%	17%	3%	2%	17%	1%
<b>UK TOTAL</b>							
UK TOTAL	31%	17%	38%	10%	4%	24%	2%

\*former county boundary.

# The sources of light pollution

**A century ago, the brightly coloured areas on our night light maps of the UK would have covered only a tiny proportion of their current area.**

The great majority of Britain's land mass would have been in the darkest band. Light pollution has become a significant issue in the UK over the last 50 years. More and more motorways, roads and streets have been lit. Glaring flood lights for sports and recreational facilities have sprung up everywhere, many of them in or next to open countryside. Add to that the increasing use of powerful security lights in private gardens, and the growing use of floodlights to illuminate 'heritage' buildings.

## Roads and streets

Before the 1950s it was common practice to extinguish street lighting after midnight. Even when street lamps were left on, the relatively small number of lights meant that it was still possible to appreciate the night sky in towns and cities. By the beginning of the 21st century there were approximately 6.2 million street lights in the UK and 4.7 million in England<sup>7</sup>.

Most roads within towns and cities are illuminated, and increasingly the roads, junctions and service stations which connect them are brightly lit, creating ribbons of light through the countryside. When motorways are widened from three

to four lanes, they are usually then lit. And as more and more urbanisation spreads gradually across the countryside, the total area of land surface lit at night also grows.

The problem is that many street lights cast much of their illumination sideways and upwards, where it is not needed and contributes most to light pollution. Globe-shaped lights, used in some street lighting schemes, are particular culprits; they also leave a large area of the ground in shadow. Street lights should be shielded with reflectors and hoods so that all of their light is angled sharply downwards.



Bath in the 1950s



Bath today

When I was a child and there was no lighting in our village it was exciting to walk in the dark. We knew everyone by their footstep and their flashlight. I love walking in the dark – but I can't do it anymore. There isn't any dark in my village.

**CPRE supporter from Nottinghamshire.**

International Dark-Sky Association



Globe lights fail to light the area below, spilling light sideways and upwards

Fortunately, some highway authorities (local councils) and the Government's Highways Agency are replacing wasteful street and road lights with Full Cut Off (FCO) luminaires. These ensure that light beams are directed below the horizontal. In some places where conventional, inefficient road lights have been replaced with FCOs on taller poles there is a need for only four FCOs for every five of the old lights. The Institution of Lighting Engineers says 'light pollution can be substantially reduced without detriment to the lighting task'<sup>8</sup>.

Illuminated road studs are a cheaper and less light polluting alternative to street lights on more rural roads. They look like cat's eyes, but instead of reflecting the lights from headlights back at drivers to show where the edge and centre of the road are these devices use light emitting diodes. These diodes are lit through the

night, allowing drivers to see the line of a bendy road beyond the beam of their headlights. The studs can be powered by a battery which is charged up by a very small photovoltaic (solar powered) panel. Such studs have already been installed in several locations in the UK. They are much cheaper than street lights to install, maintain and operate, they cause virtually no light pollution and they are less obtrusive during daylight.

The Highways Agency, responsible for lighting the strategic road network of motorways and other major intercity routes, has made big strides in cutting light pollution. This is good news, because many of these lights are on roads in or next to the countryside. The agency has told us that some two thirds of its total number of lights are now Full Cut Off HPS (high pressure sodium) lights, with the remainder consisting of

the more light polluting LPS (low pressure sodium) type. It argues that cutting light pollution accords with one of its key objectives – to minimise the impact of the trunk road network on both the natural and built environment. Older lights are gradually being replaced throughout the network but the agency could not give us any date by which they will all have been phased out. It can, however, take action to cut light pollution in environmentally sensitive areas with 'special requirements'<sup>9</sup>.

The Highways Agency is responsible for some 150,000 road and street lights – a very small proportion of the national total of some 6.2 million, according to the Institution of Lighting Engineers. The great majority of road and street lighting is the responsibility of highway authorities – county councils or unitary councils. And whilst almost all of this lighting is to be found in our towns, cities and suburbs, the light pollution it causes spreads for miles into the countryside in the form of orange sodium skyglow.

Progress in reducing light pollution appears to be much slower and patchier among highways authorities, with some demonstrating far more concern and action than others. The British Standards

**You can see the chain of lights around the perimeter of the area... the marshes are no longer a place of mystery and remoteness but are contained and encircled by these damn lights!**  
**CPRE supporter from Canterbury.**

Institution has a Code of Practice for road and street lighting (BS 5489) which highway authorities can and should subscribe to. The code acknowledges that rays beaming upwards from street lights should always be minimised. But instead of calling for Full Cut Off luminaires to be introduced everywhere, the code confines itself to saying that their installation should 'be considered' in the countryside and environmentally sensitive areas, at roundabouts and on elevated roads and bridges.

There is no central record kept to show the rate at which lights are being replaced, and whether the replacements are of the low light pollution, Full Cut Off type, although at the time of completing this report the Department for Transport was trying to compile an inventory. Nor have we been able to find any reliable estimate for the proportion of England's total number of road and street lights which falls into this category – but it is a small minority. The old, orange low pressure sodium lights still predominate. Many of these need replacing – and soon, for England now has a rapidly growing glut of elderly and potentially dangerous lighting columns. According to the Institution of Lighting Engineers, 61 per cent of England's street lights are more than 20 years old and 27 per cent are over

A CPRE volunteer from Kent told us how she used to enjoy the night view of 'a discreetly floodlit Dover Castle in the distance cradled by folding hills'. But now she finds 'a vivid and sulphurous glare created by street and, presumably, security lighting erected in the new 'port zone' development... the yellowness rises above this harsh lighting into the sky above it. One can see the castle through it, but only if one knows it's there, as it is a sad grey little blob'.

30 years old; the design life of most types of lighting column is, however, only 25 years. The Government's Ten Year Plan for Transport<sup>10</sup> makes a pledge to clear the nation's large backlog of road maintenance, and the spending plans attached to it are intended to fund the replacement of a large portion of the ageing stock of light columns. The Government puts the cost of this at about £1 billion.

There is, then, an enormous opportunity to reduce light pollution – provided Full Cut Off lighting takes the place of the old low pressure sodium lights.

#### Homes and gardens

Powerful exterior lighting which blasts illumination across gardens and into neighbouring properties has become common in suburbia and more rural housing. The owners can see all of their gardens for 24 hours of the day and perhaps feel safer at night (although we could find no solid evidence that such lighting reduces the risks of break-ins). But such lights are in danger of becoming a scourge of good neighbourliness, akin to loud noise and *Leylandii*.

Sales of exterior domestic security lights have grown significantly over the last 20

J Ball/CfDS image library



Roundabout before it was lit with Full Cut Off lighting



...the same roundabout afterwards



Sky glow from Poole ferry terminal

‘Whixley [in North Yorkshire]... ‘enjoys’ a nightscape more fitted to an industrial location than a rural setting... housing near the school has to contend with a scene which is reminiscent of a high security prison’. **CPRE volunteer.**

years<sup>11</sup>. Over this period higher efficiency, longer lasting lights have come onto the market. But despite Institution of Lighting Engineers recommendations that 150 watt tungsten halogen bulbs are ‘more than adequate’ for security lighting at home, retailers continue to promote 300-500 watt domestic security lights – often lacking either installation instructions or shades and fittings which prevent them from blasting light sideways and upwards. Such a light can make viewing the stars difficult if not impossible for an observer hundreds of metres away<sup>12</sup>.

#### Industry and commerce

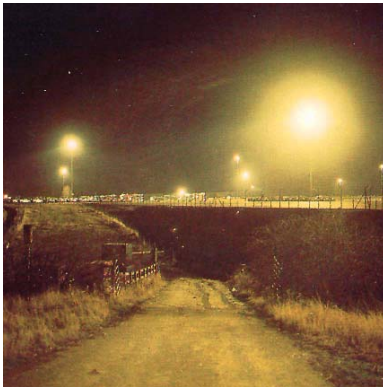
We found one particular cause of light pollution to be large industrial and commercial premises, usually related to transport – freight depots, ferry terminals, industrial estates and so forth. An increasing number of these are aggressively lit by powerful and poorly shielded lights on tall columns, casting glare and skyglow deep into the countryside and far out to sea. The light from Poole ferry terminal, for example, is visible from 30 miles out into the English Channel, even though it is below the horizon at that distance.<sup>13</sup>

S Baines/CFDS image library



Good example of outdoor lighting in large retailers car park, Ulverston

Environmental Resources Management Ltd



Glare from bad car park lighting scheme, Midlands

Several CPRE supporters told us about large out-of-town and edge-of-town developments whose aggressive exterior lighting blights the night sky, such as the IKEA store at Giltbrook in Nottinghamshire and the Barton Business Park, Barton under Needwood, Staffordshire, in the New National Forest, with its Bombardier train works and Argos distribution depot.

In some places, public sector buildings – including schools – are grossly overlit through the night. We heard about farm buildings in the middle of open countryside which now have powerful and intrusive exterior lighting.

### Sports and recreation

Floodlit sports facilities are a rapidly growing source of light pollution, usually near or on the edge of towns and cities, and sometimes in the open countryside. At golf driving ranges much of the light goes upwards and sideways to illuminate the balls in flight. CPRE volunteers have given us many examples of planning applications for floodlit games pitches, golf driving ranges, tennis courts and bowling greens; some that have been accepted and some refused. When constructed, the lights of such facilities can be seen from many miles away, deep in the countryside – either directly or as bright skyglow above the horizon. For instance, one volunteer told us of the Pedham Place golf driving range near Swanley, next to the Kent Downs Area of Outstanding Natural Beauty. From down in the scenic Darent Valley, part of the AONB and one of best rural landscapes close to London, the lights from this range can be seen glaring over the skyline.

### Buildings and monuments

There has been something of a mania, over the past two decades, for floodlighting buildings that are old, distinctive, distinguished or sometimes none of these. The types of buildings

include churches, private homes, hotels, offices and town halls and entire facades and terraces in conservation areas and town centres. There seem to be a variety of motivations – civic and personal pride, the belief that it boosts local tourism and the night time economy and that it makes visitors feel safer and more welcome at night. Often this floodlighting is, quite literally, ‘over-the-top’ – much of the light shines straight up into the sky, never touching the building.

The proposal for a gigantic ‘halo of light’ in the sky over Barnsley, mentioned in the introduction, is one example of this ‘creating a night time spectacle’ tendency taken to extremes. Another is the plan for an enormous, illuminated steel structure, the 160 foot tall Sky Vault, which is intended to act as a gateway to the East Midlands by straddling the M1 or A1 motorway.<sup>14</sup> Tom Hughes, a member of the design team 2HD, confessed: ‘The light pollution issue did not initially occur to us, but we’ve since had several comments and it is one of the things we are going to have to deal with’.

Of particular concern are powerful searchlights – ‘skybeams’ - used to advertise nightclubs in small and medium sized towns. These can be seen from a dozen or more miles away, light up the clouds and – in the case of searchlights – create large quantities of skyglow. When associated with commercial premises, such displays constitute advertising and



The glow from Bath City football ground, Bath

M Tabb/CFDS image library

N S Fox/CFDS image library



A halo of light surrounding a rural church, Warwickshire

**‘There is nothing more beautiful than a darkened church spire silhouetted against a full moon’.**

**CPRE member from Norfolk.**

can be covered by the planning controls which apply to advertising outdoors<sup>15</sup>. We urge local planning authorities to act.

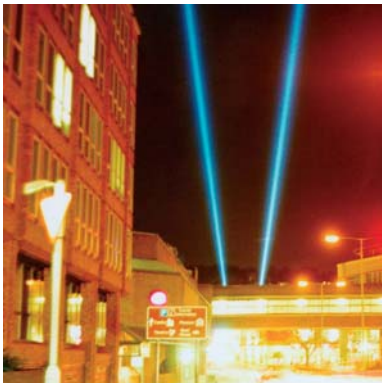
National Lottery money has also funded some questionable church lighting schemes. The Millennium Commission has paid towards 400 church floodlighting projects across England at a cost of £2.2 million.

We are **not** opposed to the illumination of buildings in towns and cities. We think this can make them more attractive and welcoming at night, with all of the social and economic benefits which flow from that. Illumination can enable people to enjoy the beauty and distinctiveness of our finest buildings for longer hours and,

quite literally, in a new light. We are simply arguing for more carefully directed, less wasteful and more subtle illumination.<sup>16</sup> Leeds’ impressive Town Hall provides a good example. One local authority, Colchester, has gone so far as to introduce a Local Plan policy stating that external lighting should ‘not detract from historic buildings’.

Particular care needs to be taken in illuminating churches and other buildings in villages and the countryside. We think the case for floodlighting a church in a rural setting will often be a very weak one. But for those that already are, the hours when they are lit should be restricted. Why should they ever be lit after midnight, for instance?

G Privett/CFDS image library



Night club skybeams, Guildford



Floodlighting often lights more of the night sky than the building

D Galvin/CFDS image library

# The impacts of light pollution – why it matters

**A survey carried out by the Campaign for Dark Skies concluded that ‘90% of people who wish to see the night sky in the UK probably suffer light pollution at least noticeable enough to hinder observation’<sup>17</sup>.**

It has been estimated that on a dark, clear night the average person can see 2,000-3,000 stars in the absence of any light pollution. But most British people who care to look upwards on such a night will actually be able to see a few dozen at most.

Our supporters told us how urban areas cast their skyglow many miles beyond the city limits and deep into the countryside. The glow from Teeside is visible from the moors 20 miles away; that from Bristol and Bath it can be seen from the other side of the Mendip Hills over 20 miles away.

Scientists have compiled a world atlas of ‘artificial night sky brightness’, using the type of satellite data described on pages 6-7, collected during 1996 and 1997<sup>18</sup>. They also mapped the unlit areas covered by the skyglow cast outwards from towns and cities. Knowing how the population was distributed, they devised estimates for what proportion of every nation’s population experienced light pollution levels which made the Milky Way invisible. For the world as a whole, this was 21 per cent, for the European

Union 51 per cent and for the United Kingdom 55 per cent. But it is not just our view of the heavens which is at stake.

## **Intruding into our homes**

When other people’s bright lights shine into people’s homes at night – in other words, light trespass – this harms their quality of life and can rob them of sleep. The law recognises other kinds of

immediate environmental damage that impacts on people in their homes – loud noises, foul smells and so on – as nuisance. We discuss on page 27 how light pollution can be considered as a nuisance.

The Chartered Institute of Environmental Health has twice surveyed its membership, the environmental health officers (EHOs) working for local



Bright security lights infringe on residential amenity



authorities, to assess people's complaints about light pollution<sup>19</sup>. The most recent of these surveys, carried out in 1996, found that 55 per cent of all complaints received by EHOs related to domestic security lighting with floodlighting of sports facilities coming second at 21 per cent. The number of complaints is still small compared to nuisances like noise but the trend is upwards. Two thirds of the complaints received were considered justifiable.

The Campaign for Dark Skies has been notified of cases where residents have been forced to move into different bedrooms and even move houses to escape their neighbours' thoughtless outdoor lighting<sup>20</sup>. Sometimes requests to turn lights off are ignored, or lead to disputes. In the USA there has been at least one case, to date, of a row between neighbours over domestic security lighting leading to murder<sup>21</sup>.

#### Wasting energy, causing air pollution and climate change

All light pollution is wasted energy; light shining where it is not wanted or needed. And the great majority of that wasted light is made by burning fossil fuels in power stations. From the smoke stacks of these power stations flow air pollutants which cause acid rain and harm human health, as well as the carbon dioxide gas which we know to be gradually building up in the earth's atmosphere, trapping heat, changing climates and raising the sea level.

The Department of Trade and Industry does not have statistics which show how much energy is consumed by, and how much pollution and greenhouse gases can be attributed to, outdoor lighting in Britain. And neither it, nor any other part of Government, has the faintest idea how much of that exterior lighting is wasted in light pollution. We were, however, able to make some rough 'back of the envelope' calculations. We estimated

that each year between 100,000 and 500,000 tonnes of fossil fuels were being burnt to generate the electricity for all types of exterior lighting across the country. If this lighting was cut by just one tenth in order to reduce light pollution – by using less powerful and more efficient, better directed lighting – then Britain's output of carbon dioxide would be cut by several tens of thousands of tonnes a year.

#### Potential impacts on wildlife

Many animal and plant species are known to be sensitive to the changes in day length that come with the passing of the seasons. The changing light cues changes in their own lives concerned with growth and feeding, reproduction and migration. Some bird species use the stars for night time navigation. Some nocturnal species, such as bats, are not adapted for activity in bright light. What impact is the spread of artificial night time lighting having on the natural world?

Sometimes the effect is obvious; for example, when the branches of a deciduous trees next to a street light retain their leaves in winter, or when a song bird sings a mistimed dawn chorus beneath a street lamp.

To date, we have little understanding of the impact of light pollution on flora and fauna in the UK – largely because the

research that might reveal such effects has not been done. It has been hypothesised that artificial lighting may be behind the drastic decline in the UK of the glow worm (a small, flying beetle that glows faintly to attract its mate)<sup>22</sup>. This has not been demonstrated and it is likely that destruction of its grassland habitat has been a factor in its dwindling fortunes. It may be difficult for scientists working in field conditions to disentangle the effects of artificial light on species from other human-caused factors.

**'My next door neighbour installed security lights to his patio. An owl and bats used to come to our garden at night. Now they don't come anymore.'**

**CPRE volunteer from Nottinghamshire.**



Well directed lights illuminate only the intended area

C Baddiley/CPRE Image Library.

# Safety at night

We would not advocate any reductions in light pollution if these would put human lives in danger or reduce people's quality of life.

## Road safety

We accept the evidence that lit roads are, generally, safer than unlit ones.<sup>23</sup> We do not want a reduction in the length of lit roads but we do advocate the replacement of wasteful, light polluting old street and road lights with Full Cut Off lighting (see page 11). The overall length of motorway and A roads that are lit in the open countryside should not continue to grow. We recognise that there may be a few stretches of such road where a strong safety case can be made for an extension of lighting, but we argue that solar-powered LED cats' eyes be considered as an alternative.

## Lights and crime

It is widely believed that street lighting and security lighting reduce crime. In reality, things are less clear cut. The Home Office has previously published studies and reports which find that street lighting has little or no impact on crime<sup>24</sup>. However, the Home Office Crime Prevention Unit's latest systematic review of research into this question looked at 13 separate studies in the USA and UK and concluded that improved lighting did lead to reductions in crime<sup>25</sup>. Whether security lighting at individual households reduces the risks of burglary has not been established, and the same can be said for industrial and commercial premises. Owners and landlords believe that flooding their properties with bright light deters break-ins, but criminals pay as much or more attention to fencing, alarms and the presence of security guards and passers by who could raise the alarm.



Full Cut Off lights illuminate the road without lighting up the night sky – but notice the sky glow from a settlement in the distance.

While lighting may not always reduce the actual risks of crime, it does make people feel less threatened by the crimes they fear most; assault, rape, robbery and burglary. That can be as important as reducing the real risks they are exposed to, since the fear of crime seriously reduces quality of life. We do not advocate dark streets. Rather, we want the lighting used for security to be efficient rather than overpowering and for it to be well shielded, so that it does not add to light pollution.

The Government's Crime Reduction website<sup>26</sup> is highly critical of one of the most popular types of security lights installed by households, the 250 - 500 watt lights triggered by an infra-red detector. It argues that they cast deep shadows, are too glaring, disturb neighbours and may fail to deter crime. Instead it advocates high efficiency compact fluorescent lights which burn from dusk to dawn, consume less than one twentieth the electricity and produce much less light and light pollution.

Some years ago, when I was running the small planetarium at the Royal Observatory in Greenwich, I received a letter from a lady living near Whitstable in Kent. 'Before the war, we used to see so many stars,' she wrote. 'But they're not there anymore. Is it possible that they've faded?'

**Broadcaster and astronomer Heather Couper.**

# How to reduce light pollution

In 2000, the Government published a Rural White Paper<sup>27</sup> which recognised that: ‘Light pollution’ of the night sky is an increasing intrusion into the countryside at night.<sup>28</sup>

The time has come to take the inverted commas away from ‘light pollution’. It is a real and – as our new data show – a rapidly worsening phenomenon. We want Government to decide that light pollution should be prevented from getting any worse, and draw up the policies and indicators needed to achieve this goal.

Satellite data, similar to that used in this report, could provide the basis for indicators of overall light pollution which could then be used to set targets. One obvious target is that the total land area of the UK in the darkest, least light polluted category should not shrink any more. Another target could be that the total areas in the two lightest bands should not increase any further.

In our view, two things are required to check the growth in light pollution. First, there needs to be much **more awareness** of the issue, making more businesses and consumers appreciate that their individual decisions on selling and purchasing exterior lighting have an impact on us all. Rising awareness will change attitudes and, we hope, lead to more **voluntary action** to combat the problem. We hope this report and local campaigning by CPRE and BAA volunteers can contribute to that.

But increased awareness and voluntary action will probably not suffice to stop the problem getting worse. The second



Out of town developments light up the countryside for miles, Peak District

thing that needs to be done is for Government to set up a cross-departmental review involving the Office of the Deputy Prime Minister, the Department of the Environment, Food and Rural Affairs and the Department of Trade and Industry. The outcome of this review would be a series of recommendations for the most cost effective and practical policies for tackling the growth in light pollution as well as the indicators and targets mentioned above.

We give our thoughts on what these policies should be below. But we recognise that whether the problem is addressed through voluntary action or government interventions, at the local or national level, **technical solutions** will play a leading role.

## Technical solutions

If the spread of light pollution is to be halted, then changes in the design and installation of exterior lights will play a leading part. These technical fixes, which

**CZECH IT OUT**

In 2002 the Czech Republic introduced the Protection of the Atmosphere Act, defining light pollution as 'every form of artificial light which is dispersed outside the areas it is dedicated to, particularly if directed above the level of the horizon'<sup>29</sup>. Citizens are now obliged to 'take measures to prevent the occurrence of light pollution in the air' or face a fine. Authorities are now required to use fully shielded lights to control the spread of light, using fittings to prevent light dispersing upwards and sideways. Advertising billboards have to be lit from above, with their lights pointing downwards.

Similar legislation has been adopted at a regional level in other countries.

In Italy the Lombardy Parliament passed a light pollution bill in 2000 which makes it illegal to install new light fixtures emitting light directly above the horizontal, whilst near amateur and professional observatories all unshielded, polluting lighting should be replaced within four years.

In September 2002, the 2nd European Symposium on the Protection of the Night Sky took place in Lucerne, Switzerland. The attendees unanimously requested all European governments and the European Union to take immediate action to control light pollution. These actions, they suggested, should include educational campaigns, new legislation and research.

- Switch off exterior lights when they are not needed – by turning them off when there are no people up and about, or by not having over-sensitive movement detectors.

**Voluntary action by industry, commerce and consumers**

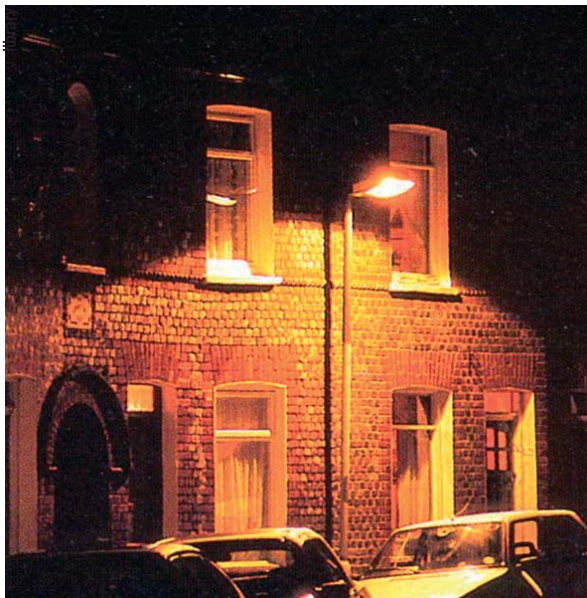
Exterior lighting equipment reaches the people who want it through a complex supply chain, as is the case for many other markets. At one end are the manufacturers of lighting, some of them based overseas. At the other end are consumers – owners or tenants of property, or developers of property. In between them are wholesalers and distributors, retailers, and those who specify and install exterior lighting.

If all the links in this chain were committed to tackling light pollution, the problem would be solved. We note the good work done by the Institution of Lighting Engineers in setting out codes of practice which call for sensitivity in the design, usage and strength of external lighting and which point out the financial and environmental benefits of reduced energy consumption. Many of the firms in the supply chain will be concerned about

are for the most part quite simple, are already widely available<sup>30</sup>. We have no doubt that the lighting industry can come up with more. Essentially, there are three ways of having outside light whilst not causing light pollution

- Ensure all exterior lighting has fixings and shieldings which ensure beams are angled downwards, rather than horizontally or upwards
- Have only the amount of light needed, rather than overlighting as so often happens

J Chapman-Smith/ CIDS image



Full Cut Off lighting spills no beams above the horizontal

R Arbour/ CIDS image library



Badly designed lighting spills light horizontally and upwards

adding to the problem of growing light pollution. Some will even see an opportunity in marketing 'green', low light pollution alternatives.

There is, however, a tendency for most of those in the supply chain to seek to expand the overall market and sell more lighting. Many of the potential purchasers of exterior lights, be they businesses or households, also have a perception that banishing the dark is a good thing and the more light there is, the merrier. This perception, more than anything, may explain why the problem is growing so rapidly (see panel).

**From the website of the Institution of Lighting Engineers:**

Good lighting promotes a feeling of security and well being; bad lighting kills people, places and jobs. By targeting schools and colleges the ILE seeks to show how for relatively little financial outlay, the whole lifestyle of housing estates, town centres and industrial areas can be transformed to have a high profile visible impact on the quality of life for their inhabitants. The ILE has proven that tremendous improvements can be achieved at small cost. The Institution lobbies central and local government to this effect and seeks to raise public awareness particularly among the young about the crucial role of lighting in everyday life.<sup>31</sup>

### Retailers

The shelves of DIY superstores and electrical shops are still dominated by powerful, light-polluting security lights despite more than a decade of campaigning against light pollution. Although the Institution of Lighting Engineers<sup>32</sup> says 150 watt lights are more than adequate for domestic security, retailers continue to offer 500 watt versions.

The Campaign for Dark Skies (CfDS) has commented: 'The simple fact is that nearly all security lights on retailers' shelves have not been designed with a view to trying to restrict their emissions to the premises to be lit. This would involve the addition of shielding, baffles or louvres, and not least the inclusion in their packaging of instructions on sensitive mounting of these devices.'<sup>33</sup>

The CfDS entered into a dialogue with B&Q, one of the UK's largest DIY superstore chains, in 2001. The firm agreed to promote a particular light which was marked as an 'anti-light pollution' model, to promote other lower wattage lights and show lights in catalogues pointing down. Two other chains, Homebase and Focus Do It All, have agreed in writing to review their buying and advertising policies in 2003.

CPRE conducted a small scale survey of three DIY stores in a locality, one from each of these three chains, to see what security light products they sell and how they market them<sup>34</sup>.

**B&Q** offered models with bulbs ranging from 150 watts to 500 watts. The 'anti-light pollution lamp' mentioned above was on special offer and positioned at eye level on the shelf. It has several features (such as a downwards angled head, a hood, and a device which prevents the lamp tipping too far upwards) aimed at minimising the risk of light pollution.

The majority of lamps on sale in the **Homebase** store had 500 watt bulbs. Whilst this store did stock a 'Dark Sky Friendly' light, it appeared to have few of the features mentioned in reference to the anti-light pollution lamp above. None of the products were pictured pointing downwards, well below the horizontal, and there were no shields or hoods on any of the high-powered security lights. However, there were information leaflets



Downward pointed domestic security light

Civilization has fallen out of touch with night. With lights, we drive the holiness and the beauty of night back to the forests and the seas; the little villages, the crossroads even, will have none of it. Are modern folk, perhaps, afraid of night? Do they fear the vast serenity, the mystery of infinite space, the austerity of stars?

### *Outermost House, Henry Beeston, 1933.*

inserted in some of the products describing how to install them so as to minimise light pollution.

that not over-sensitive to the point where they flash on and off through the night.

In **Focus Do It All**, the majority of the lamps were 150 watt. Whilst these were not marketed as anti-light pollution, most were pictured pointing down. There was no other in-store information about the issue and there was no attempt to promote the more efficient lamps in preference to the 500 watt variety on the grounds of economy or minimising light pollution.

They will be saving themselves money and cutting pollution in the process.

#### **Local and national government policies against light pollution**

Increased awareness and voluntary action will probably not suffice to stop light pollution from worsening. Government needs to develop policies. Before considering what these might be, we look at action – and inaction – to date.

#### **Consumers**

A growing number of people are blasting their gardens with artificial light because it makes them feel safer or they think their gardens look attractive lit up or they want to show them off. The burgeoning number of ‘garden makeover’ programmes on television has probably contributed to this tendency.

Artificial light is not defined as a pollutant in any UK law. And although the issue is briefly discussed on the Environment Agency’s web site this official environmental protection body has no remit to address light pollution<sup>35</sup>.

It does not have to be this way. Gardens at night can be discreetly, beautifully and securely lit without beaming light into the night sky or onto neighbours’ homes and gardens. Householders can play their part by

- avoiding overlighting
- being careful about where the light goes
- using timers which keep the lights on only when they are needed
- using movement detector switches

Light pollution was, however, mentioned in a variety of government documents covering land use planning policy and rural policy published in the previous decade. The 1995 Rural White Paper<sup>36</sup> said that the intrusiveness of lighting in the countryside should be minimised, but advanced no new policies to achieve this. In 1997 the Countryside Commission and Department of the Environment (DoE) produced a report on the issue, *Lighting in the Countryside: Towards Good Practice*. It states (chapter 10):

'Better use of the planning system to influence lighting proposals; greater awareness of the potential adverse impacts of light amongst developers, manufacturers, retailers and the general public; and improved lighting design and landscape design are among the most important ways of tackling issues of over lighting. The research shows that with the exception of domestic security lighting... most of the lighting that gives rise to problems is associated with new development that does require planning permission. More effective development plan policy and development control practice, therefore, should be able to achieve a great deal.'

This report provides good practice advice for planning officers, drawn from the experience of some planning authorities. Today it is out of print and only available online<sup>37</sup>.

Light pollution is briefly dealt with in three of the Government's Planning Policy Guidance (PPG) notes – PPG 17: *Planning for Open Space, Sport and Recreation*, PPG 23: *Planning and Pollution Control* and PPG 12: *Development Plans*. However, the issue is not mentioned in the overarching PPG1: *General Policy and Principles*, nor in PPG7: *The Countryside – Environmental Quality and Economic and Social Development*. Nor is it discussed in PPG13: *Transport*, despite

the major contribution of street lights to light pollution.

PPG 17<sup>38</sup> calls on planning authorities (local councils) to ensure that local amenity is protected when considering applications for floodlighting on sports grounds. This guidance says impact on the openness of the Green Belt and on the character of the countryside should be key factors in determining the granting of planning permission for new floodlighting. But it is only referring to the visual impact of lighting towers and columns during daylight, not the light they produce at night.

PPG 23<sup>39</sup> says planning authorities can address the issue of light pollution within their development plans. And PPG 12<sup>40</sup> says that light pollution is one of the environmental considerations that development plans should take into account, comprehensively and consistently.

The Government has, then, identified the land use planning system as having a leading role to play in combating light pollution.

#### The land use planning system and lighting

The courts have ruled that artificial light in itself does not constitute development<sup>41</sup>. But the actual lighting equipment, and the structures – such as

towers and poles – to which they are attached, can constitute development. A major new lighting structure – such as a floodlight tower – generally would tend to require planning permission before it was erected. A small security light in someone's garden, or attached to their house, would not.

Anyone planning to attach exterior lights onto or next to an existing building need only apply for planning permission if the lights significantly alter the appearance of the building during daylight! This hurdle is likely to be set higher in conservation areas and for listed buildings, where planners generally have more control over alterations to the appearance of buildings – but the fact remains that the light itself, however bright, requires no planning permission (unless it can be shown to be an advertisement for commercial premises).

The planning system does, however, have power to control exterior lighting associated with new developments for which planning permission is being sought – as opposed to existing developments. Local authority planners are able to set conditions on any exterior lighting proposed as part of a new development, provided they can give reasonable grounds for doing so. A planning authority could impose a curfew for such lighting, or set conditions

C Krappitz/CDS image library



Original (left) and Full Cut Off (right) lighting at a sports ground

B Mizon/CDS image library



Glare from illuminated golf driving range, Iford

which ensure it is kept below a certain level of intensity and prevented from straying onto neighbouring properties. The authority could justify imposing such conditions as part of the grant of planning permission on the grounds, say, that if they were not met the light could harm amenity.

Planners will usually be in a stronger position to set such conditions on new developments if they write policies for limiting light pollution into their local authority's development plans (local, structure and unitary). The Government encourages this approach in PPGs 12 and 23. At its simplest, such a policy would state that the plan sets out to control light pollution and that developers should take this issue into account in any development proposal which included external lighting.

The Institution of Lighting Engineers has recommended that local authorities promote the idea of Environmental Zones in their development plans, to specify the kind of exterior lighting allowable for new development and appropriate curfews<sup>42</sup>. Four such zones are proposed: i) intrinsically dark areas such as National Parks and Areas of Outstanding Natural Beauty; ii) low brightness areas: rural or small village locations; iii) medium brightness areas: small town centres or urban locations; iv) high brightness areas: town and city centres with high levels of night-time activity.

CPRE carried out its own survey to find out the extent to which planning authorities were taking light pollution into account in drawing up their development plans.

#### Survey of planning authorities

We contacted 44 district and unitary (borough) councils in England and five county councils, with all eight English regions represented among this sample.

Four of the five county councils suggested it was not appropriate to include clauses on light pollution in their Structure Plans. Cornwall was the exception. Its structure plan states:

'Development must be compatible with the prudent use of natural and built resources. In particular this should be achieved by...avoiding development likely to lead, directly or indirectly, to the risk of significant levels of pollution or contamination to air, land or water, including noise and light pollution.'<sup>43</sup>

Norfolk County Council, which was not one of the five we surveyed, is liaising with parish councils to set up a zoning scheme along the lines suggested by the Institution of Lighting Engineers (see above).

County councils do not decide on the great majority of development proposals (although they are responsible for many road and road lighting schemes in their role as Highways Authorities). However, the structure plans they draw up (often in

association with neighbouring unitary authorities) set a framework for the local plans of the district and unitary authorities as well as influencing the decisions of those authorities on individual planning applications. **There is, then, a strong case for policies on light pollution at structure plan level. If structure plans are abolished, as proposed in the Planning and Compulsory Purchase Bill which was in Parliament at the time this report went to press, we would urge the case for light pollution policies to be included in the proposed new Regional Spatial Strategies.**

Of the district and unitary councils we surveyed, 39 per cent had specific light pollution policies in their local plan and 7 per cent had some coverage of light pollution within other policies (e.g. pollution, sports and recreation). Another 5 per cent said they had included light pollution in the review of their plan, 9 per cent were considering including it in the future and 5 per cent had included guidance on the reduction of light

**Growing up in Karnal, India, some of my precious memories are sleeping under the stars in summers and being awed by the majesty of the night sky. My mother pointed out the Milky Way and some of the constellations; I suspect some times we gazed forever, without blinking for minutes. Something about the night sky causes us all, young and old, to ponder over the very basic questions. We are inspired and motivated.**

**Kalpana Chawla, astronaut who perished when the space shuttle Columbia disintegrated on 1st February, 2003**



pollution, although not as a specific policy. **Thus 35 per cent of these district and unitary councils – more than a third – had no light pollution policies of any kind and no plans to introduce them.**

Of those district and unitary councils which had light pollution policies, one quarter mentioned the threat of light pollution to the intrinsic qualities of the countryside in their plans. But none of them mentioned the benefits of curfews or ‘zoning’ as recommended by the Institution of Lighting Engineers (see above), or prescribed such schemes.

Regionally, planning authorities in the North and the Midlands had the fewest light pollution policies; there were none at all in those North East councils we surveyed. The East of England, South East and South West had the highest frequency of light pollution policies.

We found a number of policies within the local plans that stood out as comprehensive and encompassed innovative ways to ensure that dark skies are preserved.

Harborough District Council, in Leicestershire, has planning guidance specifically for an industrial estate called Magna Park, situated on an elevated plateau in open countryside. This states that all lighting schemes should illuminate only the interior of each plot, that the positioning of lighting columns should take the local landscape into account and, wherever possible, lighting columns should be hidden from external view by landscaping features, that all lighting should be designed to minimise glare and external spillage and conform to BS5489. A clear hierarchy should be established with the minimum lighting around the outer perimeter of the site. Particular care should be taken where this outer perimeter abuts the open countryside.



Security lights illuminate a tree and road

The local plan of the Borough of Allerdale, in Cumbria includes policy EN18 which states :

‘Proposals for development including or likely to require external lighting shall include details of lighting schemes. Such schemes will be expected to

- Be the minimum required to perform the relevant lighting task
- Minimise light spillage and pollution
- Include landscaping/screening measures in edge of town, village and rural areas to screen illuminated areas from view from nearby rural areas
- Avoid dazzle or distraction of drivers on nearby highways.’

The policy further promotes the importance of the Institution of Lighting Engineers’ Guidance Notes and undertakes to consult Environmental Health Officers in assessing development proposals. This council’s enlightened policy acknowledges the growing threat from light pollution to the special qualities, including tranquillity, of the countryside.

Whilst it is encouraging to see some district and unitary councils introducing specific light pollution policies, their local plans can also tackle this problem by including it among other development control policies. For example, the Borough of Macclesfield in Cheshire has Policy DC63, Floodlighting, which states:

‘Proposals for floodlighting of sports facilities will be permitted where

- There is no significant adverse impact on the landscape in terms of the sensitivity of a given area to the introduction of exterior lighting (night time), the effect of lighting on the visual character of the landscape or built environment in terms of siting and the external landform (day time), the effect on historical or wildlife features
- There is no significant adverse impact on the amenity of residents
- The safety of transport users is not adversely affected
- The proposal does not represent an unacceptably adverse intensification of use of the application site.’

In addition, there may be a need to consider the impact on special interest groups such as astronomers. The Borough Council may impose planning conditions to influence the design of lighting installations and to mitigate their impacts.

In Suffolk Coastal District, Supplementary Planning Guidance has been prepared on recreational floodlighting. The Council's approach is

- To resist proposals which would introduce major new lighting sources into rural areas
- To judge urban proposals and those in larger villages in terms of the impact of the lighting columns themselves, residential amenity and the impact on conservation areas
- To resist proposals in smaller villages, unless for a single court or rink;
- To only permit proposals in the countryside in urban fringe locations.'

Regional Planning Guidance (and, we presume, the Regional Spatial Strategies which are proposed to replace it) can also cover light pollution. Following representations made by CPRE at the Public Examination stage, the Regional Planning Guidance for the South West of England published in 2001 directs local

authorities and other agencies, in their plans, policies and proposals to '...take measures to protect the character of the countryside and the environmental features that contribute towards that character, including the minimisation of light pollution.'

### Planning – what more should be done?

Our survey, and the experience of dark skies campaigners from the British Astronomical Association, suggests most planning authorities are aware of light pollution and have begun to introduce development plan policies to control it. Fortunately, many applications for development that would introduce bright floodlighting into the countryside are rejected<sup>44</sup>. But that does not make us confident that the planning system can prevent the further spread of light pollution.

Why? Because a substantial minority of councils have no policies. And for those that do, there remain questions about implementation. Planners may fail to make developers demonstrate compliance with anti-light pollution policies when they consider their planning applications. Or they may fail to set the necessary conditions on external lighting, or fail to take enforcement action when conditions

are not complied with. Planning enforcement action against intrusive lighting may be impossible in the absence of such conditions. Environmental assessments carried out for light pollution at the planning application stage may be deficient, or entirely absent, and the methodology (produced by the developer or the council) unsatisfactory.

Our survey, and Government-commissioned research, both indicate that planning authorities want better guidance on controlling light pollution.<sup>45</sup> The researchers recommend that Government give planning authorities guidance on how to handle planning applications involving floodlighting. Planners should

- Request information on the nature of any illumination proposed, the types of light source, the size of the area to be lit, the location, height and colour of lighting columns, and proposed hours of use
- Consider particularly the environmental effect of introducing major new light sources into areas with no existing background lighting
- Seek to minimise the impact of...light pollution from lighting systems by the use of conditions

But even if Government planning guidance on light pollution is improved – and it should be – the fact remains that the land use planning system has little ability to control new exterior lighting on existing developments. Nor does it have any ability to control new street lighting on new and existing roads (although it could, for instance, set conditions for street lighting on a new housing estate).

The situation has been summarised thus: 'Environmental protection is the sum of small concerns; this is the essence of sustainable development, which requires



Hazy glow haloes Portsmouth and the M27

**‘The treasures hidden in the heavens are so rich that the human mind shall never be lacking in fresh nourishment.’**

**Johannes Kepler (1571-1630)**

that decisions throughout society are taken with proper regard to their environmental impact. The planning system goes some way to achieving this, but it was never designed to bear the full responsibility for the control of light pollution.<sup>467</sup>

**We propose that Government amends planning law so as to introduce regulations for exterior lighting similar to those that currently cover outdoor advertising<sup>467</sup>** including the designation of areas of special control. This would ensure sensitive areas could be given protection. Consent would be required from the local planning authority before new lighting could be installed. Using the model of the ‘Advertisements’ clause in the Town and Country Planning Act 1990<sup>48</sup> we propose legislation should state that ‘Regulations under this Act shall make provision for restricting or regulating the use of external lighting so far as appears to the Secretary of State to be expedient in the interests of amenity or public safety’. This would also provide for enforcement control, which could include prosecution and fines and give power to local authorities for the removal of unauthorised lights.

The advantages of these new provisions are that

- It would provide a self contained code through regulations for the control of lighting
- It would not depend on the lighting constituting development, requiring planning permission or constituting a nuisance. The nature of lighting requiring specific consent would be defined in the regulations

- If consent is granted it could be made subject to conditions e.g. limiting the hours
- Having a code set out in regulations is more flexible than if set out in primary legislation
- It allows for the designation of areas of special control which would receive extra protection against intrusive lighting
- There is a precedent for this approach in the regime applicable to advertisements.

#### Could people have a legal redress against light pollution?

The law has long recognised something akin to a right to light. If someone builds something which massively curtails the amount of daylight entering your home, you can seek redress through the courts. But when a neighbour causes artificial light to stream into your property through the night there is, at present, no right to dark.

#### Nuisance

Light pollution could be better controlled if it were legally defined as a Statutory Nuisance, which builds on the common law concept of nuisance. Statutory Nuisance is defined in public health legislation, which empowers local authority environmental health officers to take action against categories of nuisance such as smoke and fumes, dust, smells and noise, working through the criminal courts. An attempt was made to have floodlighting and security lighting included as a type of Statutory Nuisance during the passage of the Bill which became the Environmental Protection Act 1990, but this failed.

It is conceivable that light pollution could be capable of constituting a statutory nuisance under the first, general category set out in the Act: ‘any premises in such a state as to be prejudicial to health or a nuisance’. But since Parliament’s decision was that light pollution should not be included as a statutory nuisance in the legislation, most legal opinion holds that any prosecution on these grounds would fail.

People whose lives are being harmed by light pollution could take action in the civil courts against whoever is responsible for their suffering, on the basis that the light amounts to a private nuisance. Private nuisance arises from a substantial interference with an individual’s use and enjoyment of her or his property. A judge could order the individual or firm responsible for the light to remove it, or take some other action that gives relief to the plaintiff. In reality, however, such legal actions are very rare because the ‘upfront’ costs for the plaintiff will usually be high and the prospects of success highly uncertain.



Obtrusive floodlight illuminates neighbouring premises, Peak District

Light pollution might also, in theory, be dealt with as a 'public nuisance', meaning one which materially affects the comfort and convenience of a large group of people. A public nuisance is a criminal offence and the action may be brought by the Attorney General or a local authority. We know of no such action ever taken regarding light pollution, nor are any in prospect.

To sum up, Environmental Health Officers and individual complainants either lack knowledge of the legal options against light pollution on nuisance grounds or, quite reasonably, they have little confidence that the law can deal with the issue effectively – notwithstanding the occasional, rare successful case<sup>49</sup>.

However, the Government was – at the time of writing this report – considering the option of introducing legal controls on light pollution. It opened its consultation on this issue with two documents focussed mainly on issues of improving the quality of life and the environment in towns and cities, both launched at the Government's Urban Summit in late 2002.

One of these consultation papers, *Living Places – Cleaner, Safer, Greener*, suggests the possibility of 'creating new powers for local authorities to deal with the detrimental effects of light pollution'<sup>50</sup>. It acknowledges that 'noise, air and light pollution affect the physical and psychological well-being of residents'<sup>51</sup>. Its sister publication *Living Places – Power, Rights and Responsibilities*<sup>52</sup> reviews the legislative framework for providing and maintaining clean and safe public spaces. So far as light pollution is concerned, the report offers the following 'options for discussion'.

(a) New regulations for positioning of external lighting (other than street lights) and the power for local authorities to serve statutory nuisance abatement notices on owners/occupiers of

## Winter Stars

I went out at night alone;  
The young blood flowing beyond the sea  
Seemed to have drenched my spirit's wings.  
I bore my sorrow heavily.  
But when I lifted up my head  
From shadows shaken on the snow,  
I saw Orion in the east  
Burn steadily as long ago.  
From windows in my father's house,  
Dreaming my dreams on winter nights,  
I watched Orion as a girl  
Above another city's lights.  
Years go, dreams go, and youth goes too,  
The world's heart breaks beneath its wars,  
All things are changed, save in the east  
The faithful beauty of the stars.

Sara Teasdale, 1884-1933

land/property with contravening lighting, along with an additional power to intervene as a last resort to take remedial action and recover costs. Local authorities would be under a duty to use these powers when necessary and there would be mechanisms in place for individuals and community groups to seek redress.

(b) Voluntary agreements at neighbourhood level facilitated by local authority through partnership arrangements (e.g. Local Strategic Partnerships and sub-groups) and a code of practice for positioning of external lighting.

Voluntary agreements would, we fear, have little impact on the rapid growth in light pollution, so we would favour the first of these options in the absence of

changes in planning law as described above. It would give local authorities a specified power to deal with nuisance lighting in much the same way as other nuisance issues, such as noise and dust.

## Building Regulations

The Building Regulations have been drawn up under the Building Act 1984, and are periodically revised, to ensure that new and refurbished buildings meet minimum environmental, health and safety standards. They now cover standards of internal lighting within some types of building. The Government should consider whether the Building Regulations should now be widened to cover the exterior lighting of buildings, setting standards which ensured that light pollution was minimised while lighting 'fit for purpose' could be achieved.

# Conclusion – suggested actions

There's not enough awareness about light pollution and no policies currently in place capable of halting its rapid growth. It's not recognised in law as a pollutant or a nuisance. We propose the following action.

## We can all:

- Ensure we don't waste light outside our homes: angle outdoor lights downwards; use minimum wattage bulbs; fit hoods or shields to minimise light spill; ensure they are switched on only when needed.
- Approach neighbours – be they households or businesses – with overly bright security lights and politely ask them to angle them downwards, or shield them, or fit a passive infra red sensor or a lower wattage bulb. Give them a copy of *Night blight!*, our leaflet available from CPRE Publications.
- Contact local MPs, urging them to press the Government to act. Send them a copy of our leaflet.
- Lobby your local council. Contact officers and councillors responsible for highways and land use planning, make them aware of light pollution in their area (our satellite data is a starting point) and urge them to implement the measures and policies set out in this report. Send them a copy of our leaflet.
- Contact local DIY stores or their headquarters and ask them to stock security lights which minimise light pollution.

## DIY superstores and other retailers should:

- Withdraw the more powerful, 300 to 500 watt security floodlights from

their shelves – there's no need for these anti-social, environmentally-unfriendly products to be sold in the mass market. We suggest a maximum of 150 watts, in line with the Institution of Lighting Engineers' recommendation.

- Ensure information is available on installation methods that minimise light pollution – in signage next to the product on the shelves as well as in the packaging.

## Property developers, owners of commercial premises, lighting manufacturers, specifiers and installers should:

- Recognise that light pollution is everybody's problem, including their's, and take the issue properly into account whenever exterior lighting is considered.

## The Highways Agency, which is responsible for construction and maintenance of trunk roads and motorways, should:

- Set a target date for replacing all existing road lighting with low light pollution, 'Full Cut Off' lighting which cuts out light going upwards.
- Bring forward the replacement of lighting at the most overlit junctions in both urban and rural areas and consider whether more rural stretches of its network currently lit with

conventional road lighting could have solar-powered LED (light emitting diodes) studs (rather like cat's eyes) installed instead.

- Consult communities affected by any necessary new road lighting schemes about its impact and how this may be minimised.
- Encourage more innovative approaches to lighting large, harshly lit areas like junctions. For example, one tall downward angled light may create less light pollution than several smaller lights.

## Local Authorities light the rest of the road network and also have an important influence as planning authorities. They should:

- Introduce a policy to control light pollution into their planning policies. This should include:
  - insisting on light pollution assessment at the planning stage of new developments. Badly designed or over lit schemes should be sent back to the applicant for modification;
  - setting limits on light pollution, including curfews, according to the remoteness, darkness or other special qualities of the area. There should be a strong presumption against any powerful and intrusive exterior lighting schemes in or on the edge of open countryside.

- Ensure the environmental statements required for major development schemes address light pollution.
- Set targets for replacing all their street and road lights with less light polluting types. Consider using solar powered LED studs (see above) instead of street lighting on rural roads. Local authorities should address these issues in their Local Transport Plan.
- Ensure consultation takes place with local residents when installing any new road lighting.
- Consider reducing the number of road and street lights in over-lit areas as part of any replacement programme.

#### Government should:

- Develop indicators of light pollution and then set targets to prevent the problem getting worse. Light pollution – or its absence – could be one of the Indicators of Countryside Quality which the Government has said it intends to develop.<sup>53</sup> Satellite data such as that featured here could provide the basis for such indicators.
- Set up a cross-departmental group charged with drawing up the most cost effective and practical policies for halting the growth in light pollution. Options include 1) defining light pollution as a Statutory Nuisance and drawing up the regulations which would enable local authority Environmental Health Officers to deal with it; 2) introducing new regulations through land use planning legislation to allow planning authorities to control exterior

lighting, for example by defining areas of special control over exterior lighting (we propose the Outdoors Advertising Regulations as a model); 3) amending Building Regulations to cover external lighting of buildings.

- Ensure the Government's proposed Planning Policy Statements<sup>54</sup> will address light pollution and acknowledge the importance of dark landscapes to countryside quality and character;
- Ensure policies of all Government departments and the policies and operations of public agencies take account of the need to tackle light pollution – including the Highways Agency and bodies such as the Millennium Commission and the sports councils for National Lottery-funded projects.
- Ensure highways authorities develop policies to minimise light pollution associated with road and street lights in the next revision of Full Local Transport Plans.

We propose that the Government should promote a public debate on the idea of a voluntary 'national switch off' for part of a night when there is a spectacular event in the heavens, such as a comet appearing at its brightest or a meteor shower. If all exterior lights were switched off between prearranged and extensively publicised hours, the nation could come together to gaze at the night sky. This is an exciting but controversial proposal, and it would need to be extensively debated. The switch-off could be cancelled if most of the country was covered in cloud on the night!

It isn't too late to turn the tide. Light pollution may still be getting worse, but as more and more people become aware of what we are losing so the momentum for change will grow. The battle is only beginning and one day, later in this new century, our children and our children's children may thank us for bringing back the Milky Way.



The Milky Way

## Endnotes

- <sup>1</sup> The quotation comes from a letter from the painter to his brother Theo, commenting on what was to become one of his most famous paintings, *Starry Night*. From the *Collected Correspondence*, 1853-90, Bullfinch Press (2000).
- <sup>2</sup> Orange predominates at present but will not necessarily do so in the future as white Ceramic Metal Discharge and High Pressure Sodium street lights – which cast a pink, rather than orange, glow – replace the orange glare of low pressure sodium street lights.
- <sup>3</sup> The data came from the U.S. Air Force Defence Meteorological Satellite Program Operational Linescan System. The 1992-93 data came from DMSP satellite F-10. The 2000 data came from DMSP F-15.
- <sup>4</sup> Personal communication by C D Elvidge, NOAA National Geophysical Data Center, Boulder, Colorado, USA.
- <sup>5</sup> Ibid.
- <sup>6</sup> See [www.cpre.org.uk](http://www.cpre.org.uk), and visit the 'our views' section for information on *Tranquil Area* maps.
- <sup>7</sup> The first figure is from Institution of Lighting Engineers (ILE), *Protecting a Vital Asset*, October 2000. The second is an unpublished 2002 Department for Transport estimate based on returns from highway authorities; it excludes lights in car parks.
- <sup>8</sup> Institution of Lighting Engineers (ILE), *Guidance Notes for the Reduction of Light Pollution*, 1994.
- <sup>9</sup> Highways Agency, Department standard TD30/87.
- <sup>10</sup> *Transport 2010: The Ten Year Plan*, DETR, 2000.
- <sup>11</sup> AMA Research, *The UK Lighting Market Report*, 2002.
- <sup>12</sup> Mizon, B, *Light Pollution: responses and remedies*, Springer, 2001. p 30
- <sup>13</sup> Communication from Bob Mizon, UK Co-ordinator, British Astronomical Association Campaign for Dark Skies.
- <sup>14</sup> See [www.2hd.co.uk](http://www.2hd.co.uk)
- <sup>15</sup> In 1999 a Planning Inspector ruled that two 7,000 watt searchlights shining into the night sky from a night club in Guildford, Surrey were advertisements, therefore needed local planning authority consent, did not have it and should therefore be switched off. Her decision followed a public inquiry. She described the beams as 'an alien presence' in the sky when seen from surrounding countryside.
- <sup>16</sup> See, for instance, Royal Fine Art Commission, *Lighting our Darkness*, 1994.
- <sup>17</sup> Mizon, B, *Light Pollution: responses and remedies*, Springer, 2001, p. 32
- <sup>18</sup> Cinzano, P, Falchi, F, Elvidge, C D, *The first World Atlas of the artificial night sky brightness*, *Mon.Not.R.Astron.Soc.* 328, 689-707, 2001.
- <sup>19</sup> See [www.ciehq.org/about/policy/papers/light.htm](http://www.ciehq.org/about/policy/papers/light.htm)
- <sup>20</sup> Mizon, B, *Light Pollution: responses and remedies*, Springer, 2001, p. 52
- <sup>21</sup> *Washington Post*, Thursday 31 October 2002, p. B04
- <sup>22</sup> See [www.glowworms.org.uk](http://www.glowworms.org.uk)
- <sup>23</sup> Murray, I J, Plainis, S, Chauhan, K, Charman, W N, *Road traffic accidents: the impact of lighting*, *The Lighting Journal*, 63 (3), pp. 42-46, 1998.
- <sup>24</sup> *The influence of street lighting on crime and fear of crime*, Home Office Crime Prevention Paper No. 28, Stephen Atkins, Sohail Husain and Angele Storey (1991) and *The effect of better street lighting on crime and the fear of crime*, Malcolm Ramsey, Crime Prevention Unit Paper No.29, 1991.
- <sup>25</sup> *Effects of improved street lighting on crime: a systematic review*, David Farrington and Brandon Welsh, Home Office Research Study 251, 2002.
- <sup>26</sup> <http://www.crimereduction.gov.uk/burglary45.htm>
- <sup>27</sup> *Our countryside: the future – a fair deal for rural England*, The Stationary Office, 2000
- <sup>28</sup> Chapter 9, 9.4.4, Ibid.
- <sup>29</sup> See [www.astro.cz/darksky/](http://www.astro.cz/darksky/)
- <sup>30</sup> The Institution of Lighting Engineers (ILE), *Guidance Notes for the Reduction of Light Pollution*, 1994.
- <sup>31</sup> See [www.ile.org.uk](http://www.ile.org.uk)
- <sup>32</sup> The Institution of Lighting Engineers (ILE), *Guidance Notes for the Reduction of Light Pollution*, 1994.
- <sup>33</sup> Mizon, B, *Light Pollution: responses and remedies*, Springer, 2001, p. 49
- <sup>34</sup> In this survey we did not include ornamental garden lighting or lights less than 75 watts.
- <sup>35</sup> See [www.environment-agency.gov.uk/yourenv/eff/pollution/](http://www.environment-agency.gov.uk/yourenv/eff/pollution/)
- <sup>36</sup> *Rural England: A Nation Committed to a Living Countryside*, MAFF and DoE, HMSO, 1995.
- <sup>37</sup> See [www.planning.odpm.gov.uk/litc](http://www.planning.odpm.gov.uk/litc)
- <sup>38</sup> PPG 17: *Planning for Open Space, Sport and Recreation*, ODPM, 2002, para 19.
- <sup>39</sup> PPG 23: *Planning and Pollution Control*, ODPM, 1994, para 2.18.
- <sup>40</sup> PPG 12: *Development Plans*, ODPM, 1999, para 4.4.
- <sup>41</sup> PQ Hansards, 19 September 2002, column 286W. Also see Jewkes, P, *Light Pollution: a review of the law in Journal of Planning and Environmental Law*, January 1998, p. 12.
- <sup>42</sup> The Institution of Lighting Engineers (ILE), *Guidance Notes for the Reduction of Light Pollution*, 1994, p. 3.
- <sup>43</sup> Cornwall Structure Plan, Policy 4: *Use of Resources*
- <sup>44</sup> Research commissioned by ODPM found, for instance, that 42 per cent of proposals for golf driving ranges were approved by local authorities and only 18 per cent of appeals were upheld. *The Effectiveness of Planning Policy Guidance on Sport and Recreation*, ODPM, 2001.
- <sup>45</sup> Ibid.
- <sup>46</sup> Jewkes, P, *Light Pollution: a review of the law in Journal of Planning and Environmental Law*, January 1998, p. 22.
- <sup>47</sup> The Control of Advertisement Regulations 1992.
- <sup>48</sup> Part III, Section 220.
- <sup>49</sup> For a useful review see Jewkes, P, *Light Pollution: a review of the law in Journal of Planning and Environmental Law*, January 1998.
- <sup>50</sup> *Living Places – Cleaner, Safer, Greener*, ODPM, 2002, p. 56
- <sup>51</sup> *Living Places – Cleaner, Safer, Greener*, ODPM, 2002, p. 12
- <sup>52</sup> *Living Places – Powers, Rights and Responsibilities*, Department for the Environment, Food and Rural Affairs, 2002.
- <sup>53</sup> *Our countryside: the future – a fair deal for rural England*, MAFF, DETR, TSO, 14.4.2, p. 166, 2000.
- <sup>54</sup> The Government intends Planning Policy Statements to replace the current Planning Policy Guidance Notes. The intention is set out in the Planning and Compulsory Purchase Bill which was making its way through the Houses of Parliament when this report was completed.

## Suggested reading

*Lighting in the Countryside: towards good practice*, ODPM, 1997  
[www.planning.odpm.gov.uk/litc/](http://www.planning.odpm.gov.uk/litc/)

*Road lighting and the Environment*, DOT, 1993

*ILE Guidance Notes for the Reduction of Light Pollution*, Institute of Lighting Engineers, 2000

*Light Pollution. Responses and Remedies*, Mizon, B, Springer Verlag, 2001

*Lighting our Darkness*, Royal Fine Art Commission, 1994

## Websites to visit

CPRE: [www.cpre.org.uk](http://www.cpre.org.uk)

Campaign for Dark Skies: [www.dark-skies.org](http://www.dark-skies.org)

Institution of Lighting Engineers: [www.ile.org.uk](http://www.ile.org.uk)

International Dark-Sky Association: [www.darksky.org/](http://www.darksky.org/)

The British Astronomical Association is the UK's largest astronomical body, with some 3,000 members. Its Campaign for Dark Skies, which has 119 local officers across the UK, has worked since 1989 against light pollution. The simple aim of the campaign is: 'The right amount of light, and only where needed'.

#### **Campaign for Dark Skies**

38 The Vineries, Colehill, Wimborne, Dorset BH21 2PX

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

The Campaign to Protect Rural England promotes the beauty, tranquillity and diversity of rural England by encouraging the sustainable use of land and other natural resources in town and country. We promote positive solutions for the long-term future of the countryside and to ensure change values its natural and built environment. Our Patron is Her Majesty The Queen. We have 59,000 supporters, a branch in every county, nine regional groups, over 200 local groups and a national office in central London. Membership is open to all. Formed in 1926, CPRE is a powerful combination of effective local action and strong national campaigning. Our President is Sir Max Hastings.

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