

The Night Environment

In 1610, Galileo Galilei published a small book describing astronomical observations that he had made of the skies above Padua. His homemade telescopes had less magnifying and resolving power than most beginners' telescopes sold today, yet with them he made astonishing discoveries: that the moon has mountains and other topographical features; that Jupiter is orbited by satellites, which he called planets; and that the Milky Way is made up of individual stars. It may seem strange that this last observation could have surprised anyone, but in Galileo's time people assumed that the Milky Way must be some kind of continuous substance. It truly resembled a streak of spilled liquid—our word “galaxy” comes from the Greek for milk—and it was so bright that it cast shadows on the ground (as did Jupiter and Venus). Today, by contrast, most are unable to see the Milky Way in the sky above the place where they live, and those who can see it are sometimes baffled by its name.

The stars have not become dimmer; rather, the Earth has become vastly brighter, so that celestial objects are harder to see. Air pollution has made the atmosphere less transparent and more reflective, and high levels of terrestrial illumination have washed out the stars overhead—a phenomenon called “sky glow.” Anyone who has flown across the country on a clear night has seen the landscape ablaze with artificial lights, especially in urban areas. Today, a person in a major urban area on a cloudless night would be unable to discern much more than the moon, the brighter planets, and a handful of very bright stars—less than one per cent of what Galileo would have been able to see without a telescope.

More Information

Energy waste implicit in poor lighting techniques

<http://www.affrc.go.jp/satellite/dmsp/dmsp1/isobe/isobe.pdf>
<http://files.harvard.edu/Documents/Announcements/2008/NightSat.pdf>

Whole of life cost savings from energy efficient lighting

http://www.sitelighting.com/brochure/g-e_energy_brochure.pdf
<http://www.eecabusiness.govt.nz/emprove/case-studies/ports-of-auckland.htm>

Ecological impacts

<http://www.urbanwildlands.org/nightlightbiblio.html>
<http://www.urbanwildlands.org/ecanbook.html>
<http://www.lifeshearwaterproject.org/mt/uploads/items/117.pdf>

Human health impacts

<http://data.nextrionet.com/site/idsa/breastcancerstevens.pdf>
<http://www.darkskysociety.org/handouts/pauley.pdf>
<http://msnbcmedia.msn.com/i/msnbc/sections/TVNews/Today%20show/PDF/PV0106LITE.pdf>
<http://www.israelrsa.org.il/meeting/Cancer%20incidence.ppt>

General

<http://data.nextrionet.com/site/idsa/RCEP%20Cosultation%20on%20Artificial%20Light%20in%20the%20Environment.pdf>
www.newyorker.com/reporting/2007/08/20/070820fa_fact_owen

International Leadership

<http://www.iclei.org/index.php?id=publiclighting0>
<http://www.starlight2007.net/pdf/StarlightDeclarationEN.pdf>
<http://www.astronomy2009.org/cornerstone-projects-mainmenu-80/dark-skies-awareness-mainmenu-87.html>
<http://www.darksky.org>

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<http://www.rasnz.org.nz>
<http://www.rasnz.org.nz/darkskies>

Light Pollution

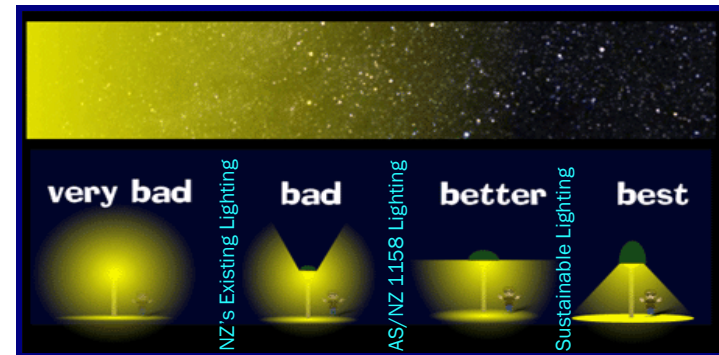
Astronomers world-wide are concerned with the disappearing stars in the night sky due to increasing sky-glow from uncontrolled urban uplight.



Auckland's light pollution from poorly controlled outdoor lighting. Photo by Glen Burgess.

Light pollution is stray light emitted from poorly designed and aimed lighting installations for advertising, business, security and street lighting. While some light is unavoidably reflected upward from illuminated surfaces, much of it spills outside the area meant to be illuminated creating glare, light trespass and skyglow.

This stray light, and the energy generated to produce it, is wasted. It unnecessarily contributes to greenhouse gas emissions, and wastes money.

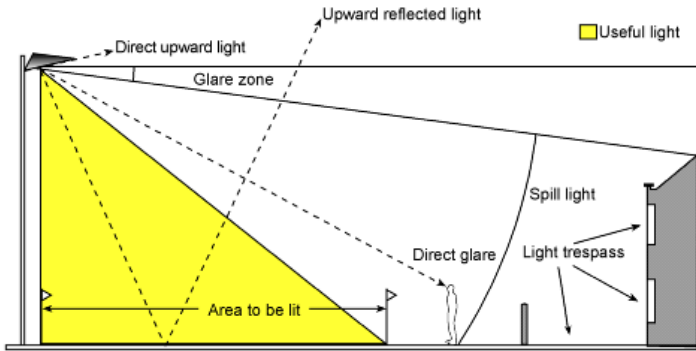


There is room for improvement
in
New Zealand's out door lighting.

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The Problem



Glare

Glare can be thought of as objectionable brightness. It can be disabling or discomforting. There are several kinds of glare, the worst of which is **disability glare**, because it causes a loss of visibility from stray light being scattered within the eye. **Discomfort glare** is the sensation of annoyance or even pain induced by overly bright sources. Discomfort and even disability glare can be caused by streetlights, parking lot lights, floodlights, signs, sports field lighting, and decorative and landscape lights.

Sky Glow

Sky glow occurs from both natural and human-made sources. Electric lighting increases nights sky brightness and is the human-made source of sky glow. Light that is either emitted directly upward by luminaires or reflected from the ground is scattered by dust and gas molecules in the atmosphere, producing a luminous background. It has the effect of reducing one's ability to view the stars.

Light Trespass

Light trespass occurs when spill light is cast where it is not wanted. An example of light trespass is when light from a streetlight or floodlight enters a window and illuminates an indoor area. Proper aiming of the floodlight and shielding would significantly reduce the light trespass.

Light Pollution

Light Pollution is any adverse effect of artificial light, including sky glow, glare, light trespass, light clutter, decreased visibility at night, and energy waste.

The Solution

Outdoor Lighting 101

The emphasis should be on the quality of light rather than the quantity, with more emphasis on directional control of lumens resulting in greater protection of natural amenity values.

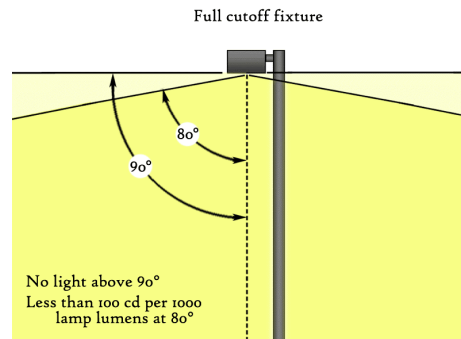
Reducing energy use and greenhouse gases from public lighting

Current public lighting in New Zealand, particularly for minor roads and streets, uses large amounts of energy and financial resources, while typically failing to provide high quality lighting. It is possible to improve lighting quality while reducing energy use and greenhouse gas emissions and lowering costs.

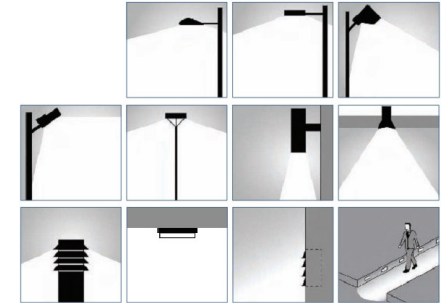
New Zealand has committed to reducing its growth in greenhouse gas emissions, and public lighting offers many cost-effective opportunities for contributing to this effort. Local Territorial Authorities, which are being encouraged by the Central Government to reduce their greenhouse gas emissions, need to pay particular attention to public lighting because it is the single largest source, typically accounting for 30 to 50% of their greenhouse gas emissions. Local governments and other customers would benefit from lowering their expenditure on public lighting and from reducing their risk of litigation through use of higher quality lighting.

How to achieve Sustainable Lighting

One of the most effective ways to achieve sustainable lighting is to direct light to the area where it is required, and by limiting waste lighting, reduce the energy required for the task. Light trespass, glare and light pollution are also prevented. Full cutoff fixtures are the only solution that achieves all these benefits.



The Good



The Bad



The Ugly



Waste light from poorly controlled harbour lighting. Photo by Stephen Voss.

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