A Red Zone Dark Sky Park

version 1, 23 September 2016; version 2, 26 September 2016; version 3, 16 November 2016; version 4, 7 December 2016

Mission

To create a dark sky park throughout the Red Zone where lighting is carefully controlled.

Goals

- To demonstrate best practice for outside lighting in the Red Zone.
- To promote star-gazing and an appreciation of the beauty of the night sky.
- To protect flora and especially nocturnal fauna.
- To monitor electricity use and quantify savings.
- To draw attention to the human health hazards of blue light at night

Background

The last decade or more has seen a strongly increasing awareness around the world of the dangers of excessive artificial light at night and the benefits of curtailing unnecessary light, especially light that shines directly into the sky (light pollution), that shines into private windows (light trespass) or that shines directly into our eyes instead of illuminating a scene on the ground (light glare).

In 1988 the International Dark-Sky Association[1] was founded in Tucson Arizona to draw attention to these issues and to promote the maintenance of dark skies and to combat light pollution wherever it occurred. Today IDA has over 5000 members in over 70 countries.

The benefits are much wider than giving stargazers access to the glorious star-studded night sky. The destructive effect of artificial light at night on many species, especially nocturnal species, are known and documented, and the potential electricity cost savings from correctly installed lights have also been recognized from the outset. The harmful effects of light at night on human health are a more recent discovery, as emphasized by a recent report from the American Medical Association.[2] The evidence for light pollution, especially

blue light from LEDs, as a risk for enhanced rates of breast and prostate cancers is well documented in a book by A Haim and B A Portnov[3]. It is now known that blue light at night disrupts our circadian rhythm, leads to changes in the human metabolism of many hormones including melatonin (which is produced only at night in the absence of blue light) with the result of fatigue, stress and loss of alertness and of a sense of well-being. Other hormones such as serotonin are produced only in the morning in the presence of abundant blue light of day as the sun rises, and its lack can cause a loss of energy and vitality leading to depression.

Most cities in the world have become excessively light polluted in the last fifty years, with the result that most urban citizens in the large cities of the northern hemisphere never have the chance to see the Milky Way or to appreciate a pristine unpolluted starry night sky. This is largely because most street lights send much of their light upwards instead of down where it is needed. Between 30 and 40 per cent of the costs of electrical power for street lighting can be saved if street lights only shone down, not up. Moreover, many cities have recently installed blue-emitting light-emitting diode street lights (T_{col} = 4000 K or more), with disastrous consequences for human health and the environment.

A Dark Sky Park in the Red Zone should become an exemplar for the best lighting practices in urban environments, and the hope is that it would be a model copied by other urban places in Christchurch and elsewhere.

An important point to note is that **good lighting practices enhance security and safety at night.** A Dark Sky Park is a safer environment than most urban streets, which generally have poorly designed and poorly installed street lights, causing glare, light trespass and a multitude of human health and environmental issues.

The benefits of being able to view a pristine unpolluted starry night sky are well recognized in the Aoraki Mackenzie International Dark Sky Reserve in the Mackenzie Basin and at Aoraki/Mt Cook National Park. The Red Zone will never be this dark, but it is hoped that 1500 to 2000 stars may be visible on a moonless night, instead of the few hundred we can see at present from Christchurch.

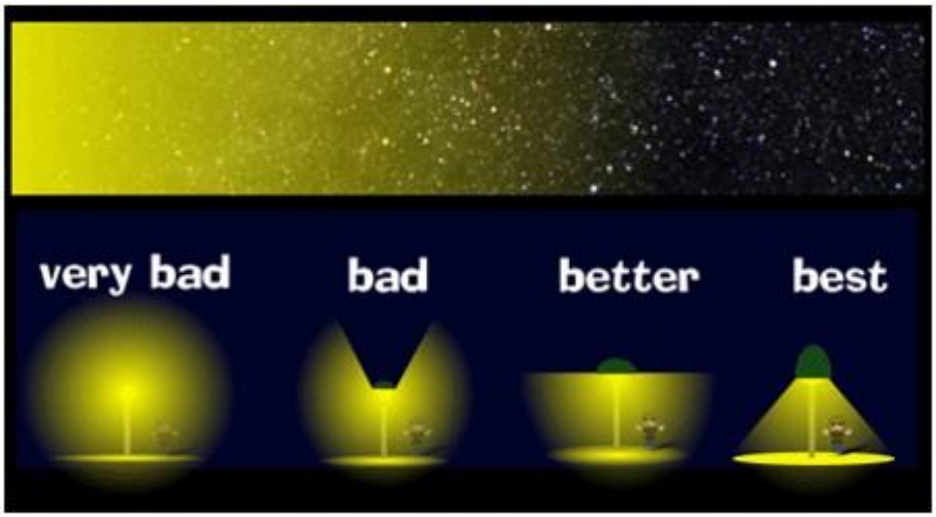
The Christchurch Red Zone Dark Sky Park proposal

The Christchurch Red Zone comprises some 450 hectares of land along the Avon River between the Avon Loop (near Fitzgerald Avenue) and the Estuary where residential buildings have been demolished following the 2011 earthquakes. The land is government-owned and mostly deemed unsuitable for rebuilding.

There are many proposals for recreational, educational and sporting facilities to be established on the Red Zone land.

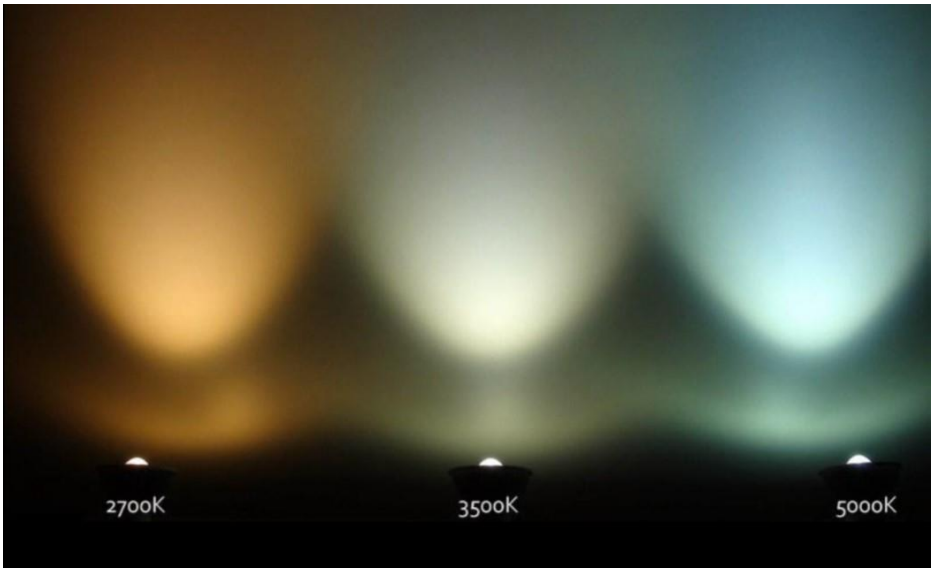
One proposal is for the Red Zone to be planted in native trees and bush with walkways, cycle tracks and picnic places. Our Dark Sky Park proposal is fully compatible with this Greening the Red Zone project.[4] Any public amenities, including paths and picnic places, which require lighting should have lights with the following properties:

- The lights should be full-cut-off, with no light shining at or above the horizontal.
- Only low colour temperature light-emitting diode (LED) lights should be used, with T_{col} = 2700 K or less.
- Lights should be attached to motion sensors so they are off when motion from nearby people is not detected or at reduced illumination levels when traffic densities are low.
- Flood-lighting should be prohibited.
- Light sources should not shine into buildings near the Red Zone.
- Light sources should not be directly visible but only illuminate a scene to provide adequate security at night. Glare destroys dark adaptation and reduces visibility.
- Light bollards should be used wherever possible to illuminate paths, rather than lamp-posts.

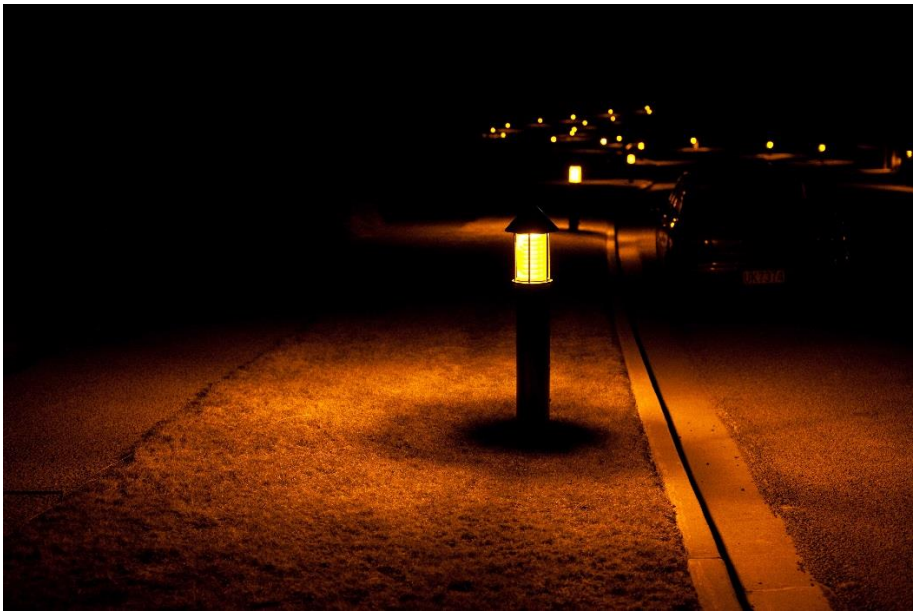


Good lighting shines down where it is needed for security, not up into the sky where it is wasted and prevents star gazing

It is anticipated that these requirements will be compatible with many of the proposals for the Christchurch Red Zone, especially those with a recreational, environmental or educational theme. They may not be compatible with some proposals if flood-lighting of sporting facilities is deemed an essential element of a proposal.



Good lighting uses lamps with a warm yellow or orange colour,
as specified by a low colour temperature



Light bollards such as this one at Lake Tekapo are ideal for a Dark Sky Park or Reserve. Note that the light shines on the ground where it is needed and not directly into our eyes. The light colour is yellow or orange, which has less impact on human health, on the environment and on our ability to see the stars.

If the above lighting guidelines are adopted, this would meet the requirements of a Dark Sky Park, which would probably qualify for accreditation by the International Dark Sky Association.

We wish to make presentations to Regenerate Christchurch and other relevant authorities who will determine the future development and uses of the Christchurch Red Zone.

Compatibility with other Red Zone proposals

It is likely that the proposal for the Red Zone Dark Sky Park is compatible with many other proposals for the Christchurch Red Zone. Many of the proposals have an environmental and ecological focus, such as Greening the Red Zone, the Avon-Otakaro Forest Park and the Waitakiri Eco-Sanctuary. A Dark Sky Park should fit comfortably with these projects. Others have an emphasis on recreation, education and sustainability (e.g. Eastern Cycle and Walkway Network; Christchurch City Farm; the Food Resilience Network; the Mahinga Kai project; the Otakaro Arts Trail). The Red Zone Dark Sky Park committee wishes to reach out to all other proposals and ascertain how we can work together and give advice on good lighting practices.

The points to note are:

- The Red Zone Dark Sky Park is a low cost proposal, inexpensive to implement and there are cost savings (relative to traditional lamp posts and security lights) to operate the lighting through power savings.
- A Dark Sky Park doesn't mean no lighting, it means good lighting.
- Good lighting enhances security at night.
- A Dark Sky Park naturally complements many other proposals. It is not a stand-alone project, but an add-on project that could complement many other excellent proposals.

The Red Zone Dark Sky Park committee

A committee has been established in September 2016 to advance the proposal for the Red Zone Dark Sky Park. The committee comprises the following members:

- Professor John Hearnshaw, University of Canterbury, chair, emeritus professor of astronomy, chair Aoraki Mackenzie International Dark Sky Reserve
- The Hon Margaret Austin CNZM, former Board member of the Aoraki Mackenzie International Dark Sky Reserve
- Steve Butler, Dark Sky Group, Royal Astronomical Society of NZ, Invercargill. IDA member, Board member of the Aoraki Mackenzie International Dark Sky Reserve
- Kevin Cawley, Christchurch, lighting designer
- Dr Peter Tait, Lincoln University, environmental economist

The Red Zone Dark Sky Park committee is an auxiliary committee of Greening the Red Zone. We seek to form an association with other Red Zone proposals with which a dark sky park would be compatible.

John Hearnshaw

Christchurch

[1] http://darksky.org/
[2] http://www.ama-assn.org/ama/pub/news/news/2016/2016-06-14-community-guidance-street-lighting.page, 14 June 2016
[3] A Haim and B A Portnov, Light Pollution as a New Risk Factor for Human Breast and Prostate Cancers, Springer, Dordrecht Heidelberg New York London, 2013. ISBN 978-94-007-6219-0.
[4] http://www.greeningtheredzone.nz/