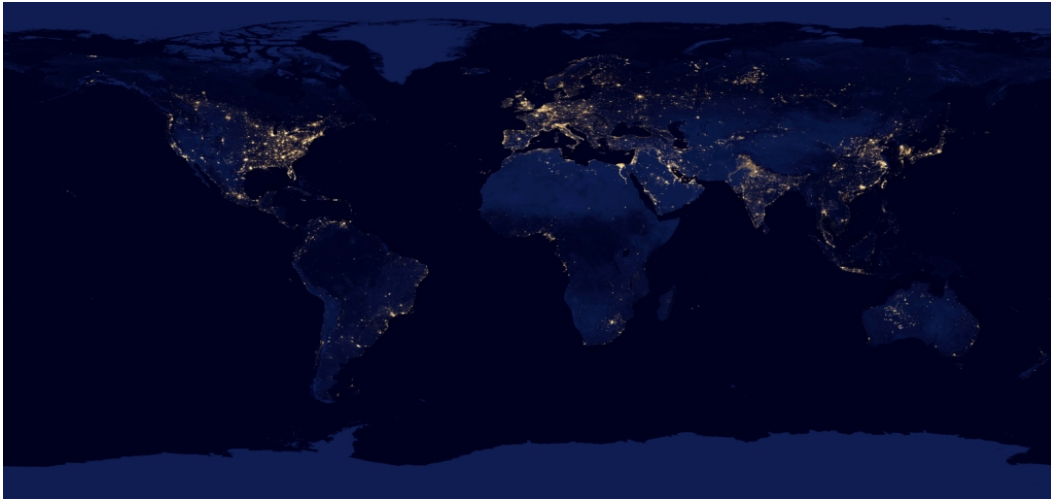


How can we do things differently?

Light Pollution - What is it?

Light pollution is the upward spill of light from street lights, business lighting and house lights, and it is lost into the atmosphere. Fig 1. The image below shows light pollution over the Earth. Credit: NASA, NOAA NGDC, Suomi-NPP, Earth Observatory *Data and Processing: Chris Elvidge and Robert Simmon*



The night sky - beautiful, mysterious and “infinite”.

The band of the Milky Way is made up of numerous twinkling points of light. Over the years the night sky has “disappeared” and its wonders lay hidden behind the glow of light pollution from growing towns and cities. Ballarat still has good views of the Night Sky. Overseas visitors from Germany, Japan, China, England and elsewhere, are amazed at the amount of stars they can see.

Fig 2. The Milky Way. Credit: Mark Justice



Fig 3. Looking North from the Jelbart Dome, Ballarat
13 sec exp. 6 day old Moon. Observatory. Credit:
Saeed Salimpour



Why do we need to do anything about light pollution?

Astronomers depend on a dark sky to study the heavens. Come up to the Observatory and have a look through the spectroscope. It will show you the spectra of some of the light pollution. This man made spectra, interferes with astronomers work.

Fig 4. The image below shows the spectra of a clear Mercury Vapour street light.

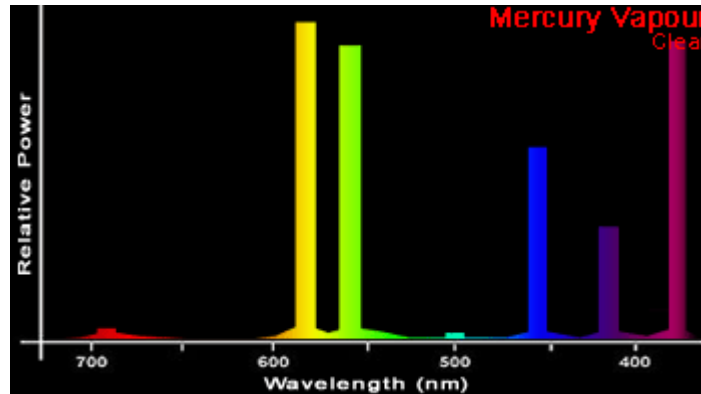


Fig 5. Below is the spectra of our Sun, a G2 spectral type star. The presence of dark lines in the spectrum of sunlight was first detected by a scientist named Fraunhofer, and can be seen in his original 1814 drawing. One of our nearest neighbours, Alpha Centauri is also a G2 type star.



Melatonin

We all need the dark. Research has shown that our bodies' make melatonin at night, which helps to suppress cancer growth and keeps us healthy.

Melatonin cannot be produced at sufficient levels if there is too much light.

Too much light disturbs the cycles of many insects, birds, reptiles, mammals and amphibians. In fact all life forms are affected in some way by too much light pollution. The survival of turtles is critical in some parts of America. The turtles turn to the light from nearby cities, instead of the reflected moonlight off the ocean which they have used for thousands of years to guide them at night, and so some of the turtles die before they can reach the ocean.

Crime and Light

Some people think that lighting reduces crime. It has been shown that in Regional and Metropolitan Cities, some of the worst areas for crime are well lit. Most burglaries occur on Friday afternoon when people are out getting ready for the weekend. A lot of crime occurs near hotels and venues that serve alcohol and open late into the early hours of the morning. Lighting helps the would be criminal to assess more quickly how to carry out their crime. More lighting does not keep you safe. Safe travel arrangements and security practises keep you safe. Drive to the conditions.

Graffiti areas are often well lit, eg. the corner of Peel and Main Road, Ballarat. One way to reduce graffiti is to build vertical green walls, a simple solution to an extensive problem. Green walls will save energy, money, reduce the temperature of a building, provide a carbon sink and help to clean the air in the city.

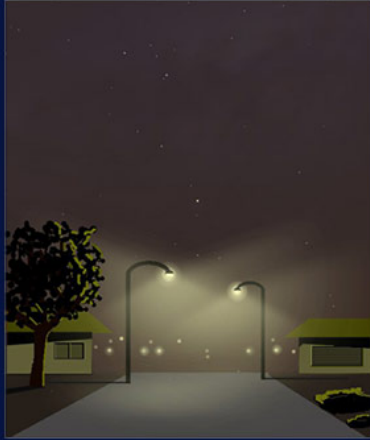
What can we do?

As Ballarat and other areas grow, good planning is required to keep our night sky dark.

We need to preserve our forests and green corridors.

By addressing the growing electricity bill that Councils have, funds can be diverted into other areas for use by the community.

Reducing street lighting in environmentally friendly new developments and refurbishment of old suburbs, such as only placing street lights at intersections, having cut off lamps so that all light is directed downwards, where it is needed and no spill lighting goes up into the atmosphere, residences have their own gate light, which they can use a required, and all unnecessary residential and business lighting to be turned off.



In urban areas with unshielded lights, few stars are visible.

Light escapes up and to the side, diminishing all but the brightest stars and planets.

Glare can encroach on homes, prompting residents to erect shutters.

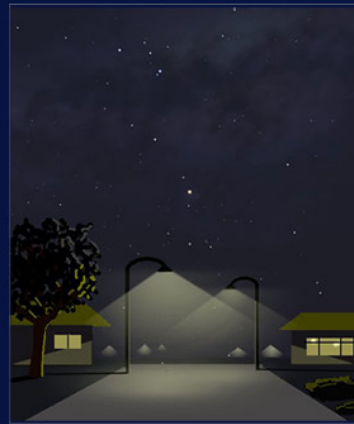
6a.

6. Credit: Martin Lewicki Adelaide Planetarium.

In the 1970's the street lights were turned off at midnight in Ballarat.

France has introduced new local laws to require all businesses to turn off their lights 1 hour after the shops close. There is much that we can do if we want to do it.

6b.



Lamp fixtures that direct light down illuminate the ground while reducing sky glow and glare.

This makes some faint stars visible again. Residents are also less likely to suffer from unwanted light while they sleep.



A dark sky in a rural setting far from any artificial lights reveals the Milky Way and thousands of faint stars.

6c.



Fig 7. This type of light is lower and has a shade to reduce spill lighting, it is located on Jarrah Drive in Alfredton, Victoria. They are only on one side of the street and overall there is reduced light spill and environmental impact.

Save energy & money

By designing our suburban streets so that only intersections are lighted, and having each house responsible for their own gate light, instead of street lights, this could go a very long way to reducing council's growing electricity bills and divert money into other areas where funding is more critical.

Dark Sky Survey

All lighting should have maximum cut off lamps so that light is directed downwards, and no spill lighting escapes into the atmosphere.

Statistics can tell you different information, look carefully at the following two graphs, they are very different. The first graph is more specific in the type of site chosen, whereas the second graph is more general in the locations chosen.

Fig 7. Below is a diagram of lighting measurements taken at various darker locations around Ballarat, typically near a park or less lit area. The highest reading is near the corner of Forest and Kirk Streets, Wendouree. The Canadian Forest area is the lowest reading on this graph. This graph shows how important our forests and parks are in preserving the quality of our night sky. The data was collected starting 1 hour after sunset finishing about 3 hours after sunset. This survey is ongoing.

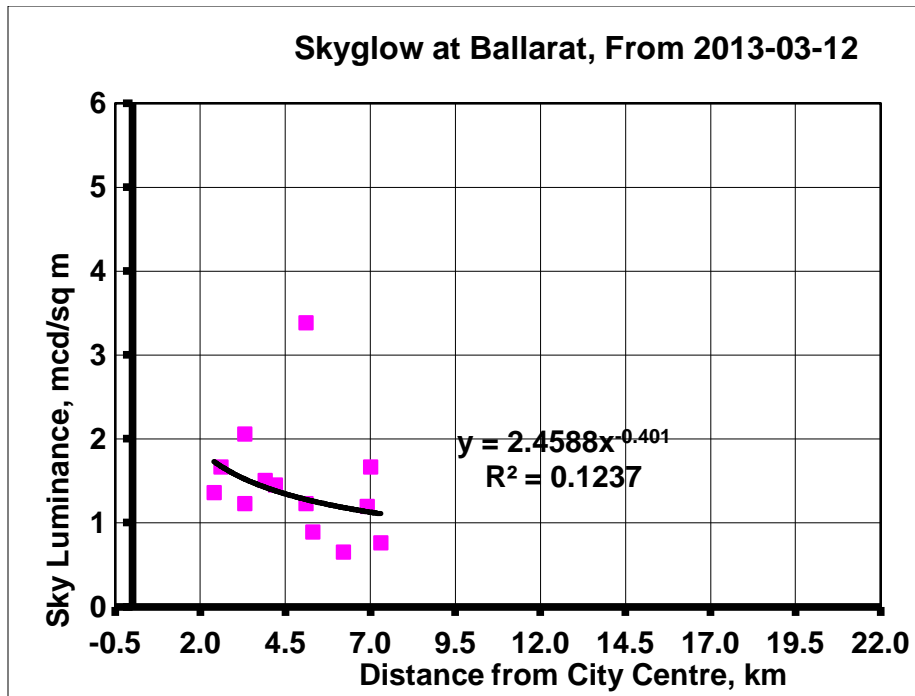
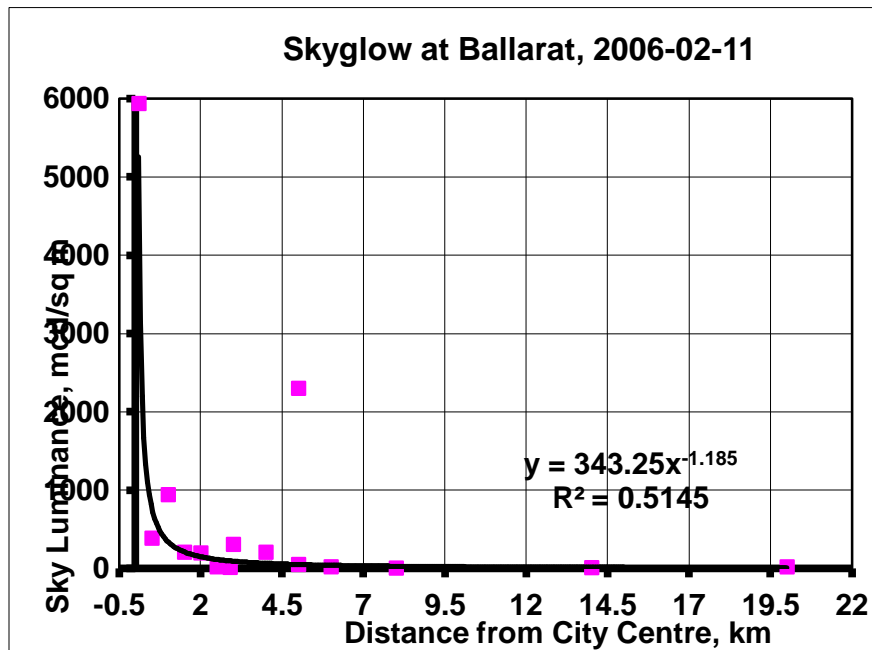


Fig 8. The City Centre required a much higher luminance scale up to 6000 instead of 6. This survey was the first undertaken in 2006. The readings were taken at intersections in the city and then heading across the Whitehorse Ridge towards Buninyong, then onto Clarendon. It is a cross section of very bright intersections to dark areas without lights and on to darker intersections. The data was collected starting just before midnight and finished just after midnight. The outlier at 5km was near the Ambulance Centre at Mt Helen, before the lights had their shades changed to reduce light spill, things can be improved with good communication.



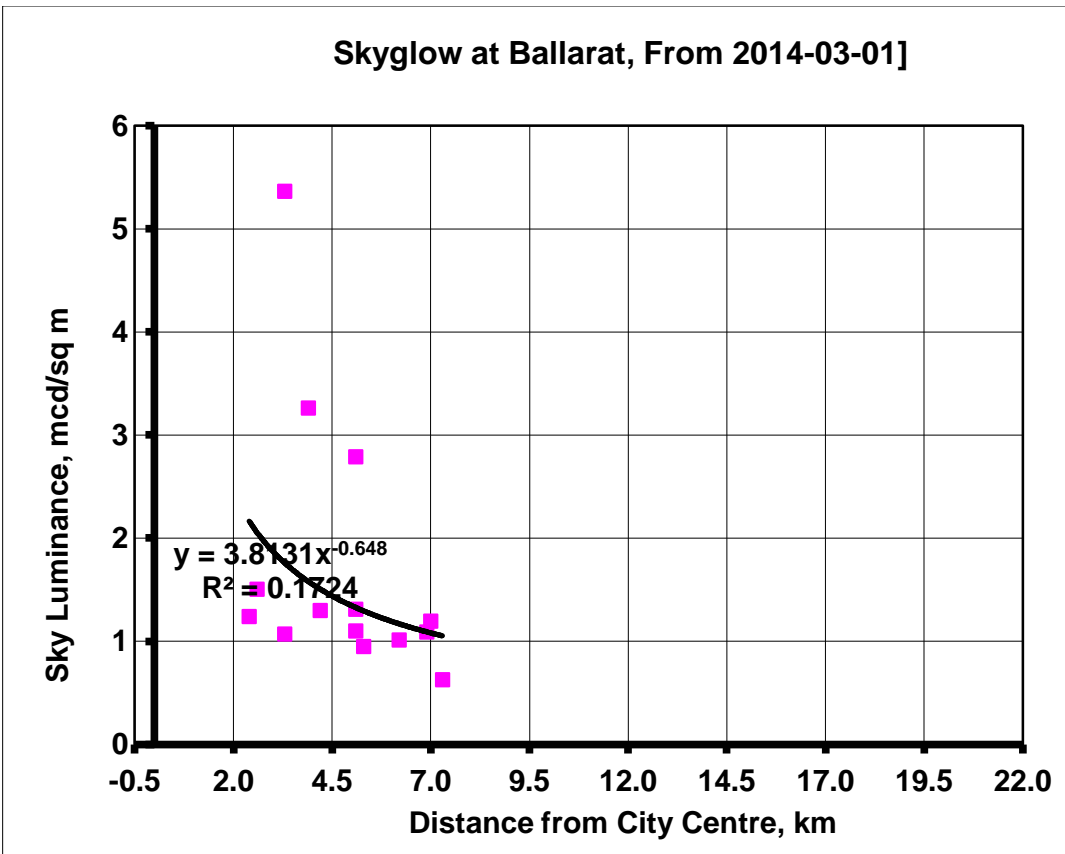


Fig. 9.

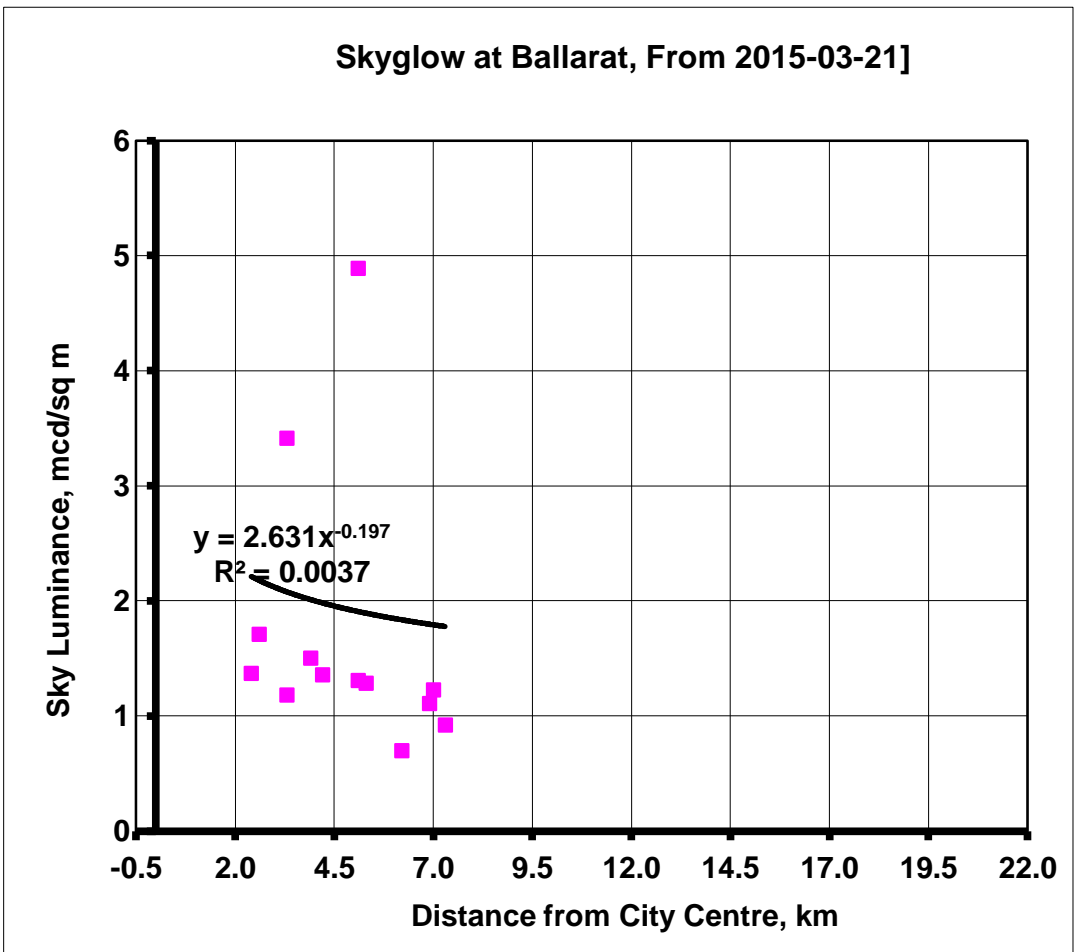


Fig. 10.

This survey Fig 10 completed in 2015 from Fig 9 completed in 2014 shows a very slight increase overall in the sky luminence. Ballarat has a continuing expansion of housing development and suburb growth which has required a more global approach to City of Ballarat requirements for Developers, when considering which lighting to install.

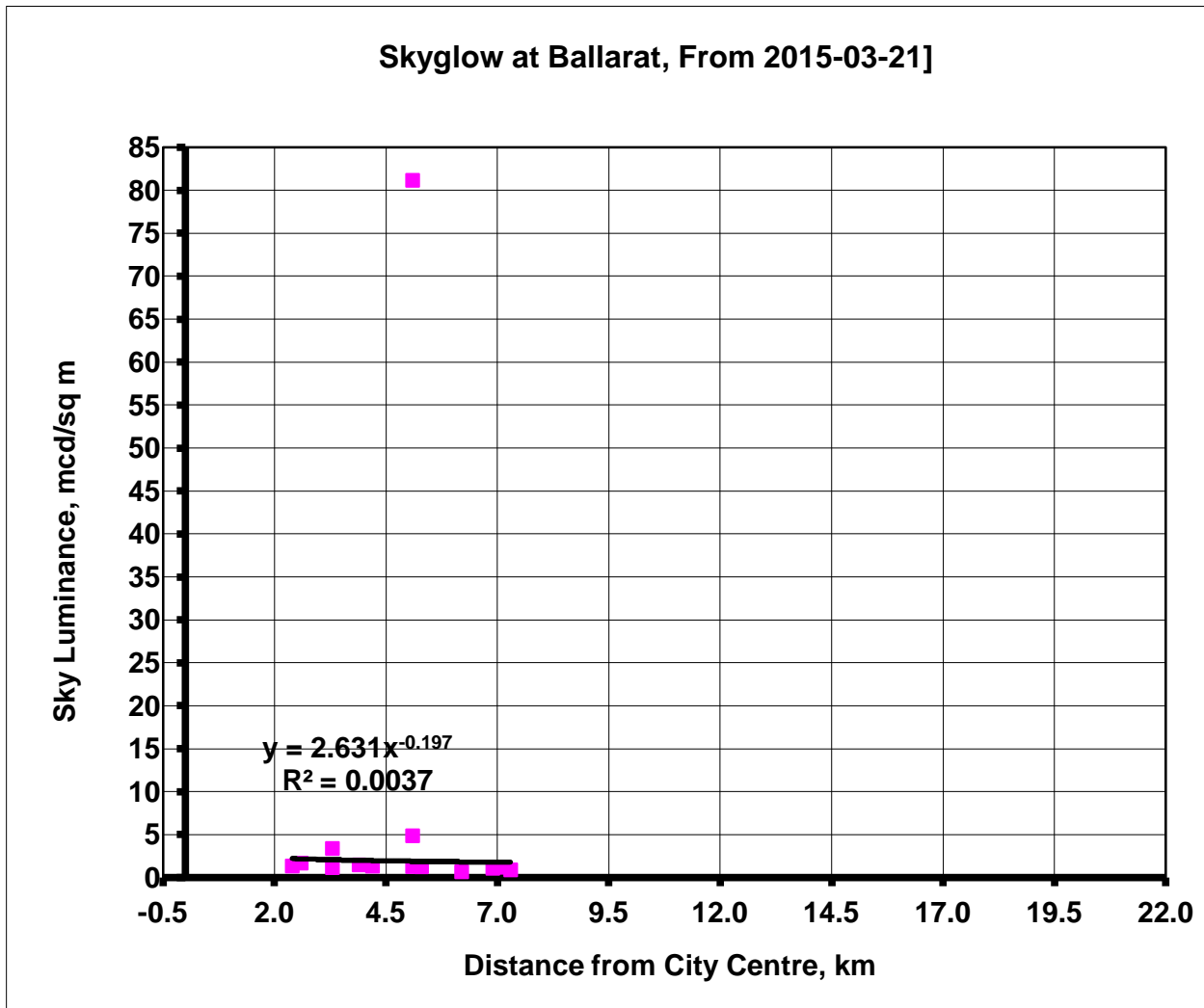


Fig. 11

Fig. 11 shows an outlier which could not be accommodated on the scale of 6 for Sky Luminence. A scale of 85 was required. This light has recently been turned on and it is located on the corner of Napier and Learmonth Roads, Alfredton. This road has been heavily used for decades as it connects the business hub located on Latrobe Street with Ring Road. A recent housing development nearby has coincided with a very high arterial road light installed and the point where the previous reading was taken was much darker. This shows how lighting can quickly change the light reading in a particular position.

The Australian Standards for Outdoor lighting are a guide. Councils can make decisions that are more in tune with the 21st century and our growing environmental awareness.

Fig. 12 A recent precedent in The Honeysuckles – 90 Mile Beach, Gippsland, Victoria (photo taken 2003) Area ~ 1.25 square kilometres

Permanent Population ~ 40 (approx.)

Holiday Resident Population ~ 80 to 140 (Peak Times – 4 to 6 weeks)

Has seen the light poles which have existed for 40 years with no lights, continue to have no lights as the whole community has petitioned not to have them installed. The situation now is that a petition would be required to reverse this. The community has resisted a number of changes that were suggested so that the environment has as little disturbance as possible. This shows that communities can address environmental and amenity issues with positive results.



The Warrumbungle Shire Council in NSW has addressed the need to keep the sky dark for the Australian Astronomical Observatory at Siding Springs.

We need to create environmentally friendly urban developments. We owe this to ourselves, our children and future generations. If you live out in the country, there is little street lighting and the skies are dark.

Turn off all unnecessary lighting and enjoy the night !

Further Information is available at the Ballarat Observatory. E: bas@cbl.com.au P : 03 5332 7526 Judith Bailey 2013 Updated 2015