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A RATIONALE FOR THE MANDATORY LIMITATION OF OUTDOOR LIGHTING

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Outdoor lighting at night

- provides a feeling of security
- encourages people to be out and about
- reduces traffic accidents (but not as much as previously thought) and
- turns night into day for sport

It has transformed civilisation.

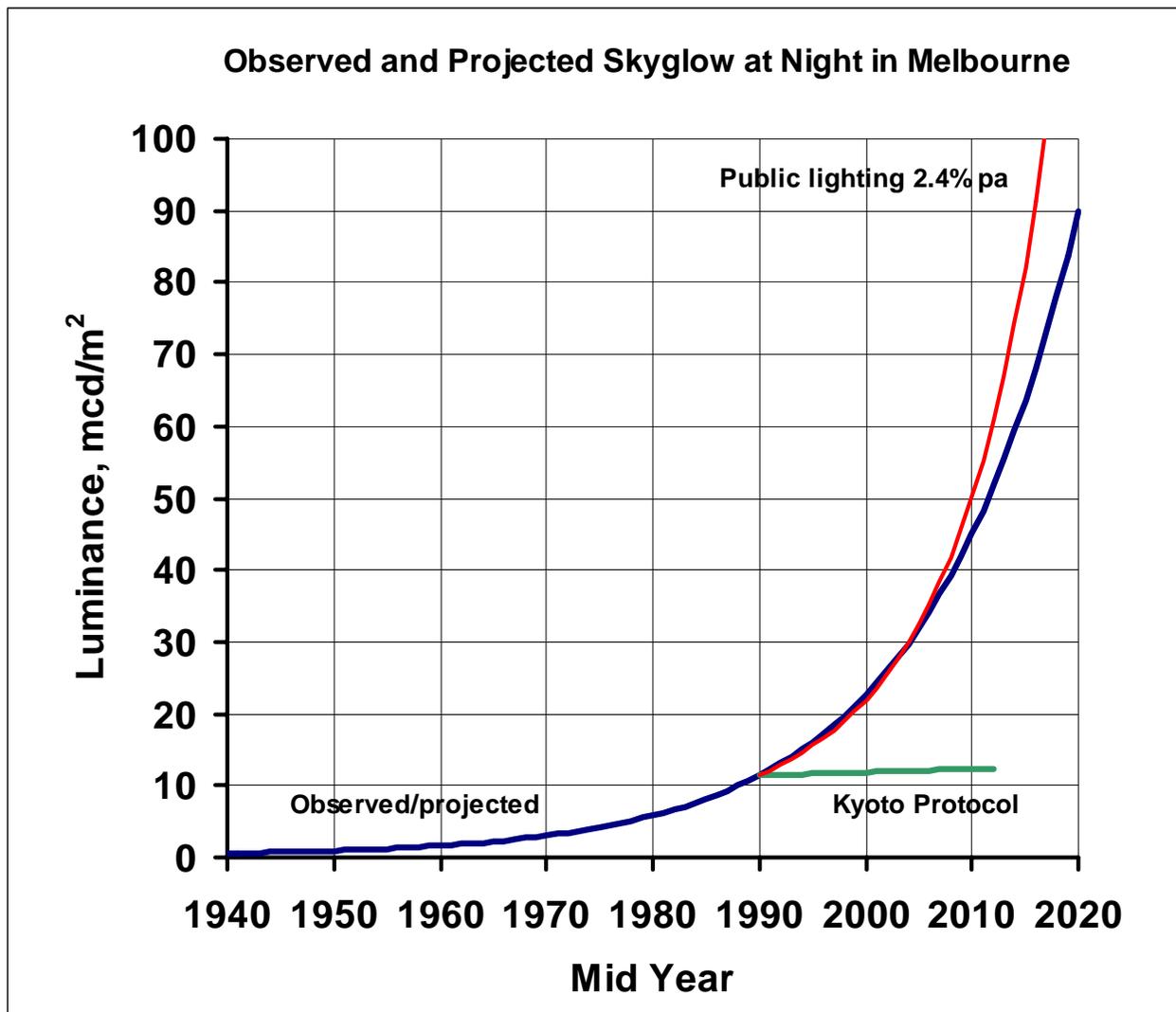
BUT NOW WE HAVE TOO MUCH OF A GOOD THING.

Too much light at night

- **is a rapidly increasing problem**
- **wastes money**
- **adds to greenhouse gas emissions**
- **degrades health**
- **definitely increases crime, and**
- **means too much light pollution**

Light pollution

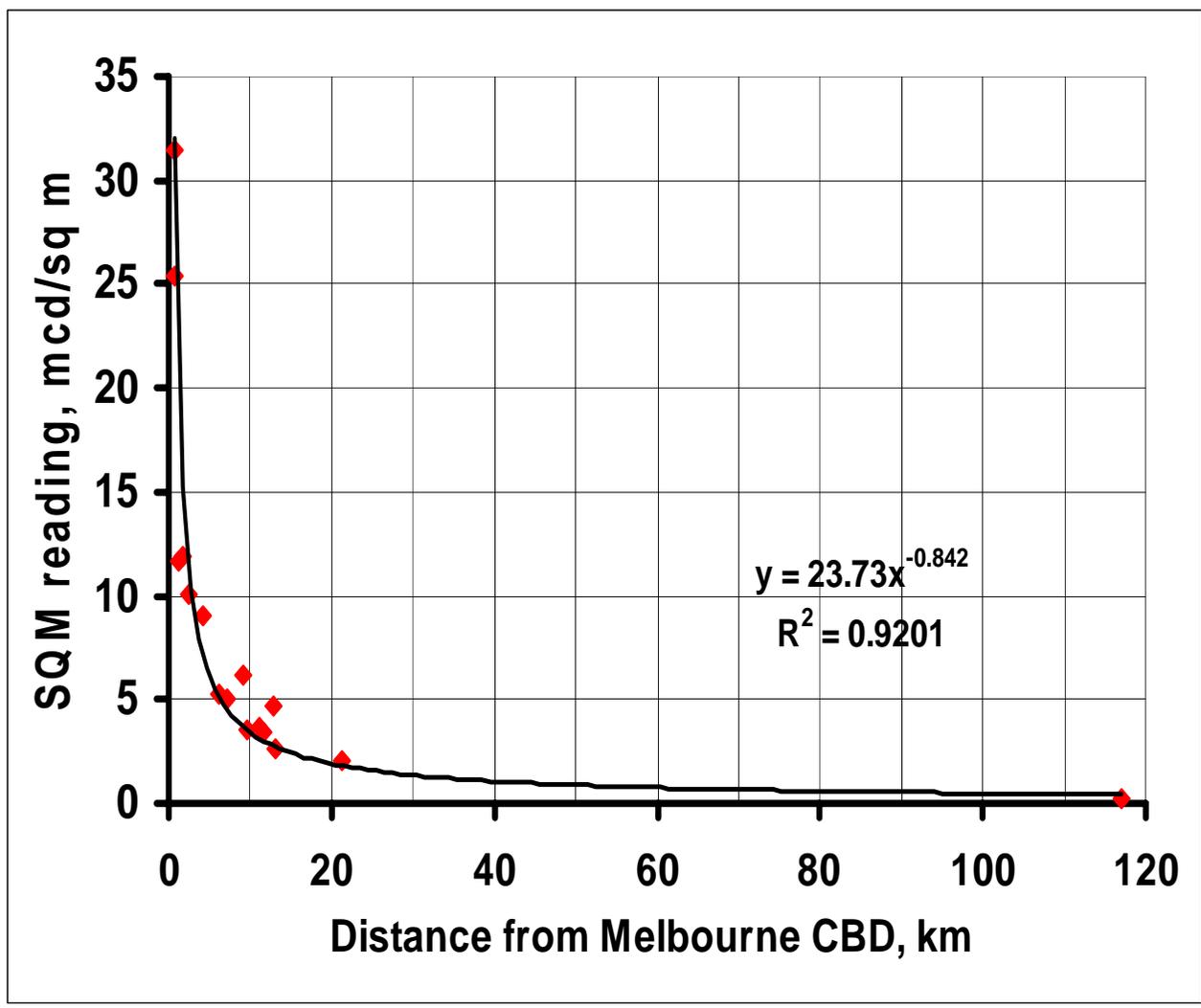
- **is any outdoor artificial light with an adverse effect**
- **is growing rapidly**
- **blots out the night sky**
- **wastes energy and costs money**
- **degrades sleep**
- **increases accidents, and**
- **is worse with bad lighting**



Exponential growth of artificial skyglow has been reported for many countries.

It can be reduced by reducing outdoor lighting and by better lighting practices.

Exponential growth of outdoor lighting is unsustainable. Large reductions are necessary.



Graphs like this are not hard to do with a Sky Quality Meter.

Similar plots for other places will assist action against light pollution.

The city centre peak indicates that lighting use is wildly out of control, very wasteful and unhealthy.

WHERE DOES SKYGLOW COME FROM?

Oba, Kawakami, Iwata et al. (2005) Sky glow caused by light from office buildings. *Journal of Light and Visual Environment*, 29(1), 19-24.

Direct upward waste light in central Tokyo comes from three roughly equal sources: upward spill from lighting, illuminated billboards, and light escape from windows.

From city centre lighting example by Clark

Total outdoor light flux is about 1.7 times the output from street and path lighting.

35% of total light flux ends up in the sky.

Without reducing street and path illumination, 80% of this waste is avoidable by three roughly equal contributions:

- eliminating upward spill from street and path lighting**
- removing all sign lighting and floodlighting, and**
- blocking light escape from windows.**

IDA STRATEGY

Much IDA effort to date has gone into trying to reduce upward spill and glare from outdoor luminaires, moderating overuse of lighting and developing a model lighting ordinance.

Less effort has gone into reduction of numbers, size and brightness of illuminated billboards, and little into stopping the escape of internal light from windows.

Most of these campaigns would produce one-time-only improvements even if they were fully successful. But artificial skyglow is generally increasing exponentially fast enough to overcome all such gains in a decade or two at most, after which all-night artificial twilight will be inevitable unless the expansion of outdoor lighting is reversed. Little IDA effort has gone into this highest priority of all.

OUTDOOR LIGHTING AND CRIME

Darkness certainly increases fear of crime.

Existing field trials of lighting for crime prevention are invalid because of systematic bias and reliance on non-independent data (Marchant 2004-2007).

Statistically significant positive correlations exist between government data for city waste light and city crime rates. Lighting blackouts always result in reductions in crime, indicating the causal direction of the correlation (Clark 2002, 2003).

(IDA policy has been to avoid mention of this work in any IDA publication or website.)

ADVERSE EFFECTS OF LIGHT AT NIGHT

Recent Literature

Sleep loss and sleep disturbance

- Increased risk of traffic and industrial accidents - eg 16 of 29 injured drivers had prior sleep problems
- Less than 1.5 lux of blue light kept truck simulator drivers alert all night, therefore maximum stray light in bedrooms needs to be even dimmer

Sleep deprivation increases appetite

May 2006 issue of *Cancer Causes and Control* - 9 papers on light at night and breast and other cancers. Avoid exposure to bright light at night, eg sports lighting, shopping malls, overlit railway stations.

Lighting Zones should be abandoned.

OUTDOOR LIGHTING & GREENHOUSE GAS EMISSIONS

UN IPCC Report *Climate Change 2007*

- **over two thousand scientists**
- **global anthropogenic greenhouse gas emissions must be reduced to 40 % or less by 2050, raising equity issues**

Worst per capita polluters, USA and Australia, still refuse to ratify Kyoto Protocol and advocate ‘aspirational’ emissions targets

Outdoor lighting has been growing much faster than GhGs, therefore much larger cuts are required in lighting.

CONCLUSIONS

Laws are required to reduce outdoor lighting drastically. Non-essential uses should cease. The retention of existing lights must be justified.

Every new light must be offset by the removal of several others.

Present allowable lighting spill and waste is intolerable and must be reduced greatly.

Lighting Zones should be abandoned quickly to help minimise adverse effects of light on sleep, health, safety, security and visibility of the night sky.