



THE UNIVERSITY OF  
MELBOURNE

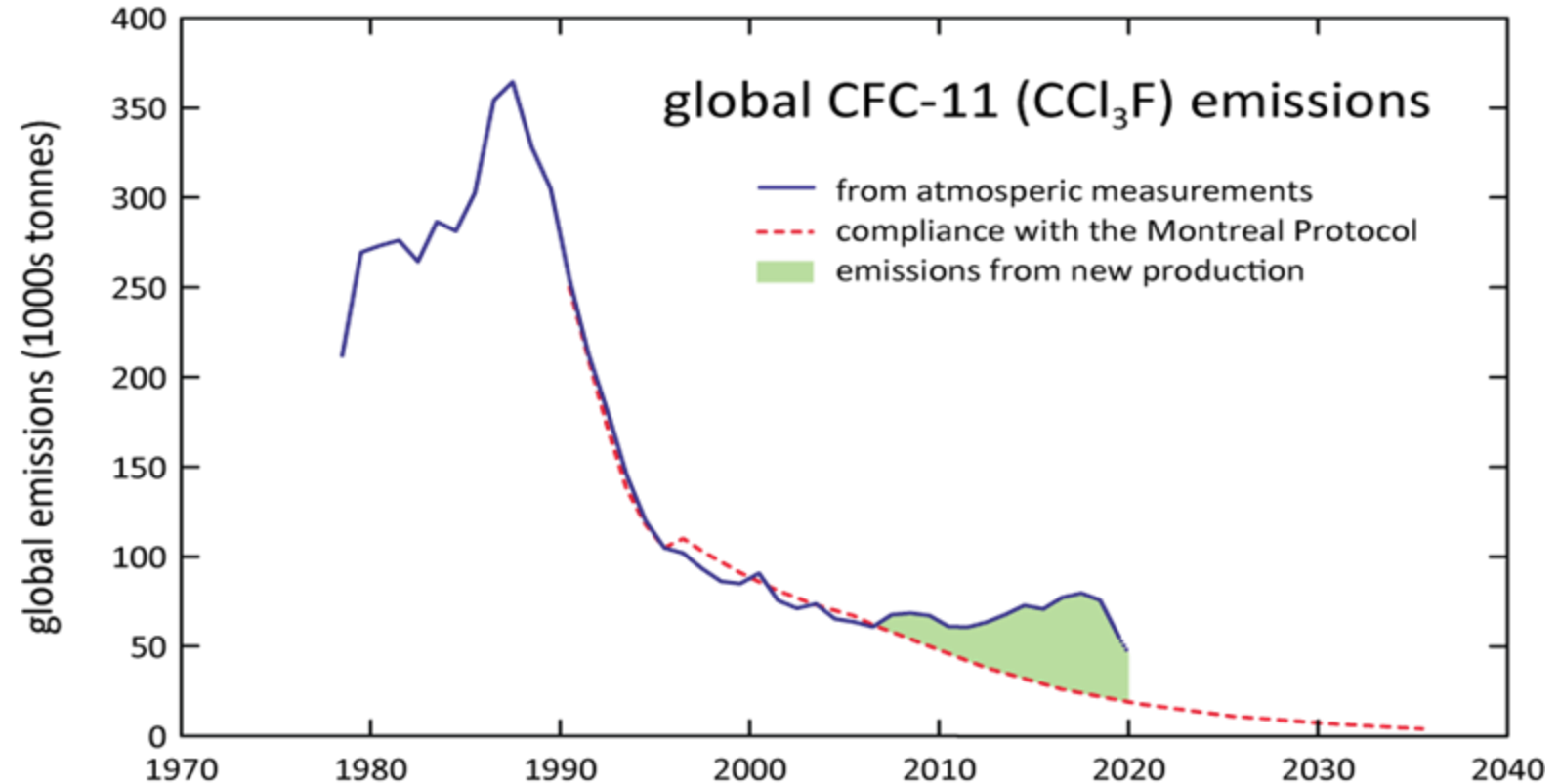
**Taking animals out of  
the spotlight:  
The challenges of  
mitigating light  
pollution**

**Professor Therésa Jones  
Leader of the Urban Light Lab**

I acknowledge the Wurundjeri  
Woi-wurrung and Bunurong  
peoples of the Kulin Nation as the  
Traditional Owners and custodians  
of the unceded land on which I  
work and where the majority of  
my research is conducted. I pay  
my respects to Elders past,  
present and emerging.



# Mitigating pollution – CFCs the gold standard



14 years between basic scientific research (1973) and signed international agreement (1987)

# CFCs unfair advantage – cost neutrality



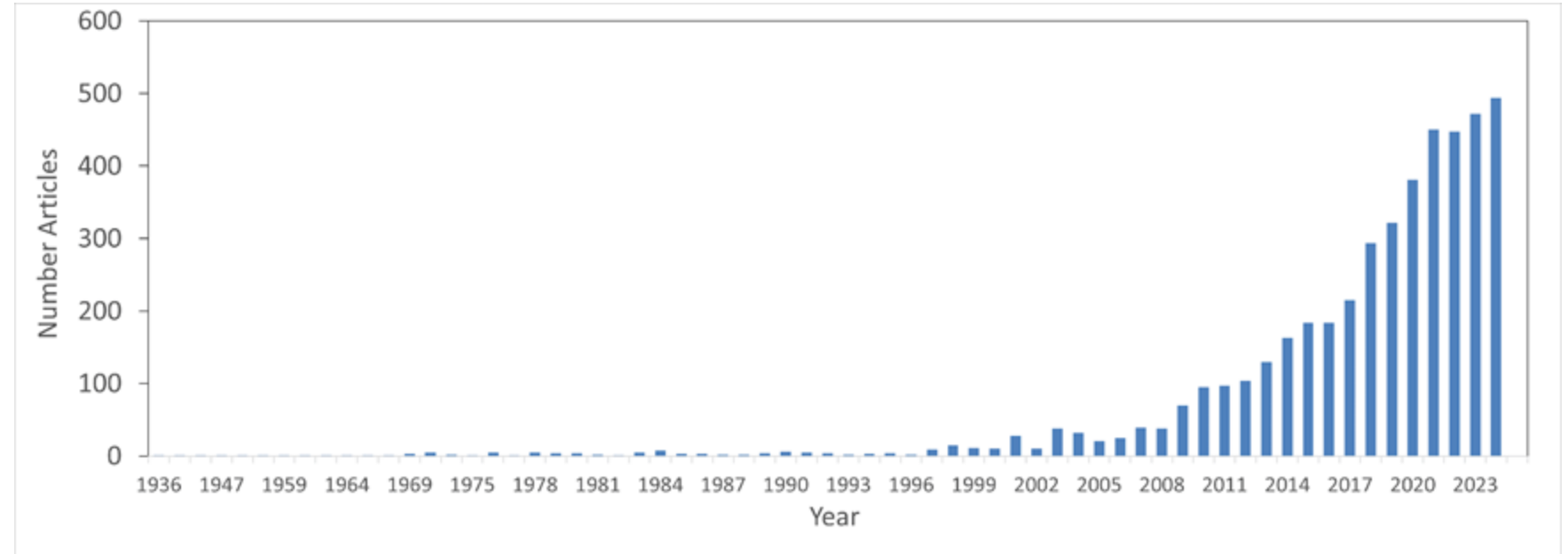
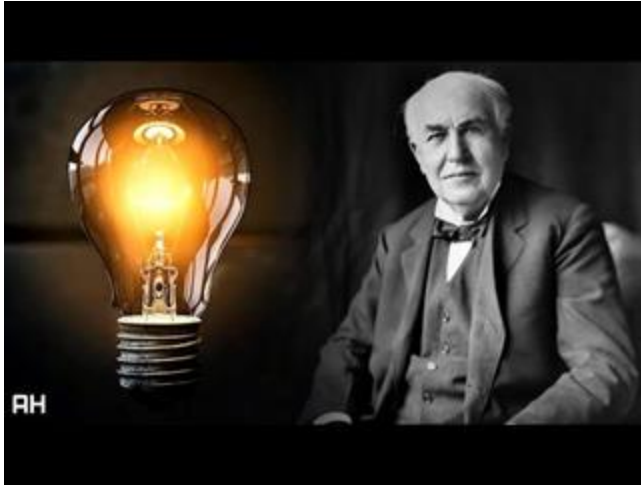
Bigger and  
Better



- Manufacturers/business did not lose \$
- Consumers did not complain
- Laws could be signed with impunity

# Mitigating pollution – Electrical Lighting

- 1879 - Thomas Edison's invention of a practical incandescent light bulb



**140** years since the introduction of the electric light bulb and **>20 years** since the ecological impact of light pollution documented, yet we still have a long way to go to solve the problem

# Let's talk about the science...

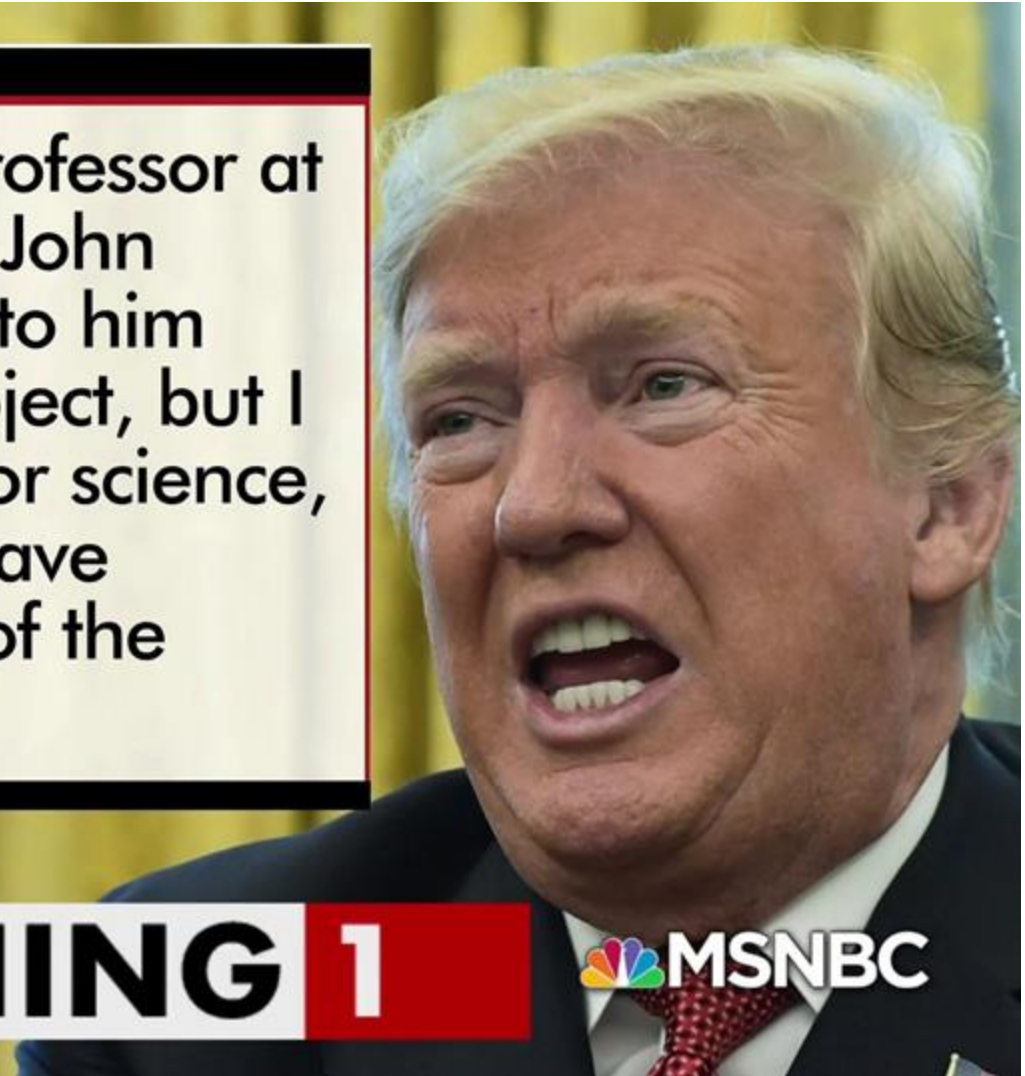
My uncle was a great professor at MIT for many years. Dr. John Trump. And I didn't talk to him about this particular subject, but I have a natural instinct for science, and I will say that you have scientists on both sides of the picture.

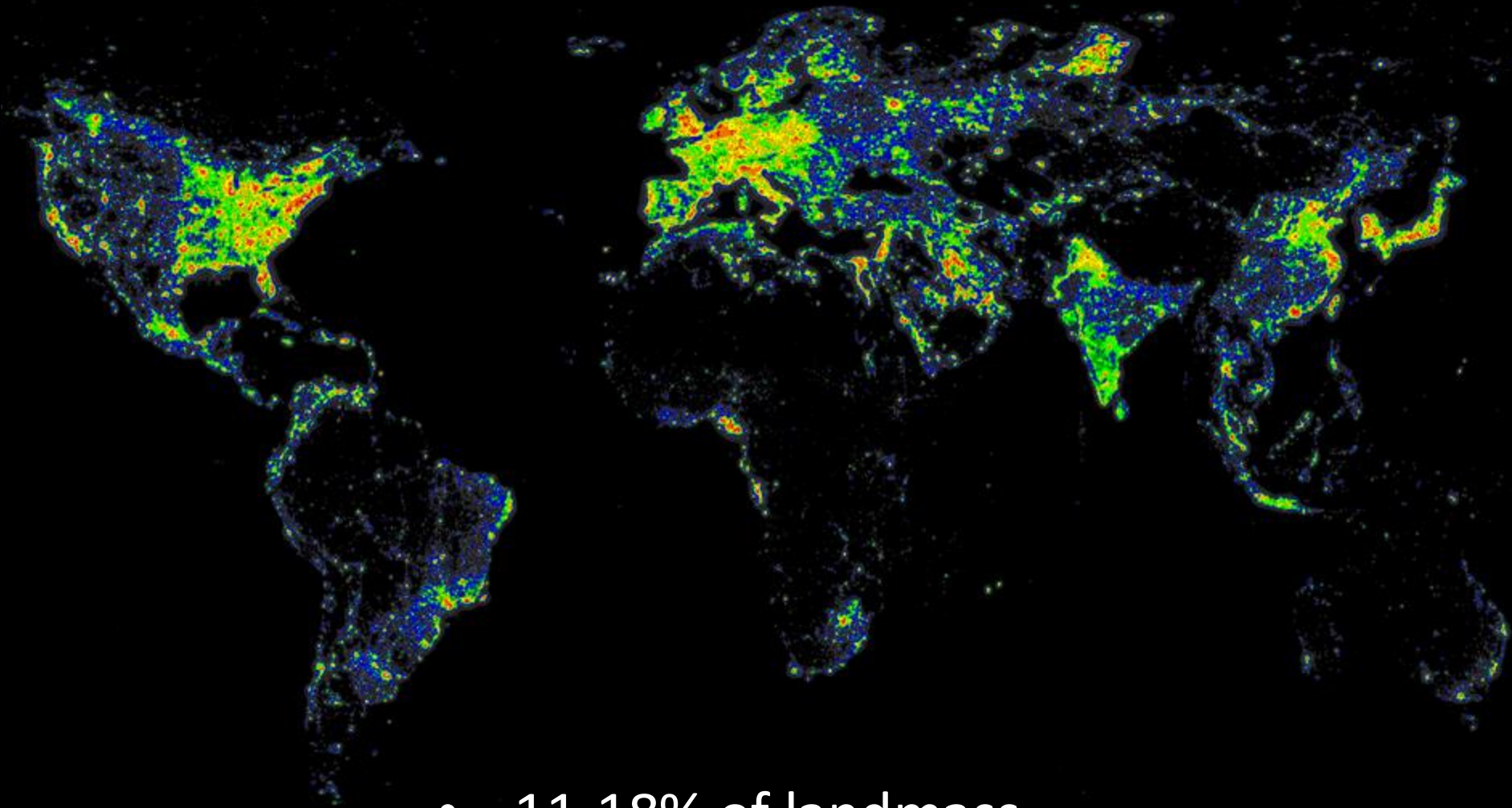
AP INTERVIEW, TUESDAY OCT. 16



**THING 1**

 **MSNBC**





- 11-18% of landmass
- 30% light spill along coastlines
- 6% growth annually

> 28% of vertebrates and 63% of invertebrates are nocturnal

30% of threatened species (inc plants) live in our cities

Light-spill from our cities be seen >50km away





# Artificial light changes the physical properties of the nocturnal environment

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- Increases nocturnal brightness
- Changes the colour of the night
- Masks natural transitions in light

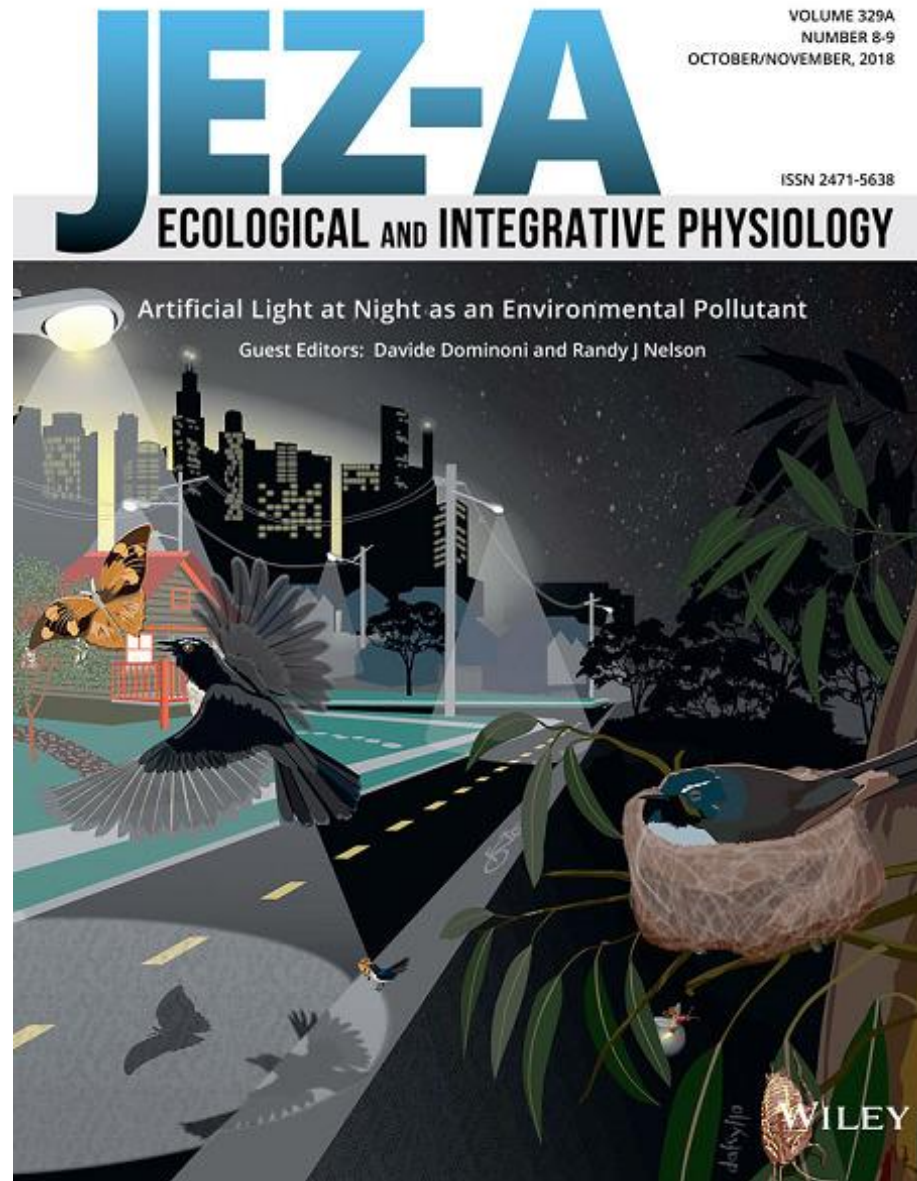


## The things we can see

- Predation risk
- Disrupts movement and activity
- Alters foraging
- Disrupts sleep
- Turns night into dusk (all night)
- Fragments the environment
- Hides the stars

## The things we can't see

- Increased disease
- Altered immunity
- Changes in hormones
- Disrupted microbiome
- Species that have left!

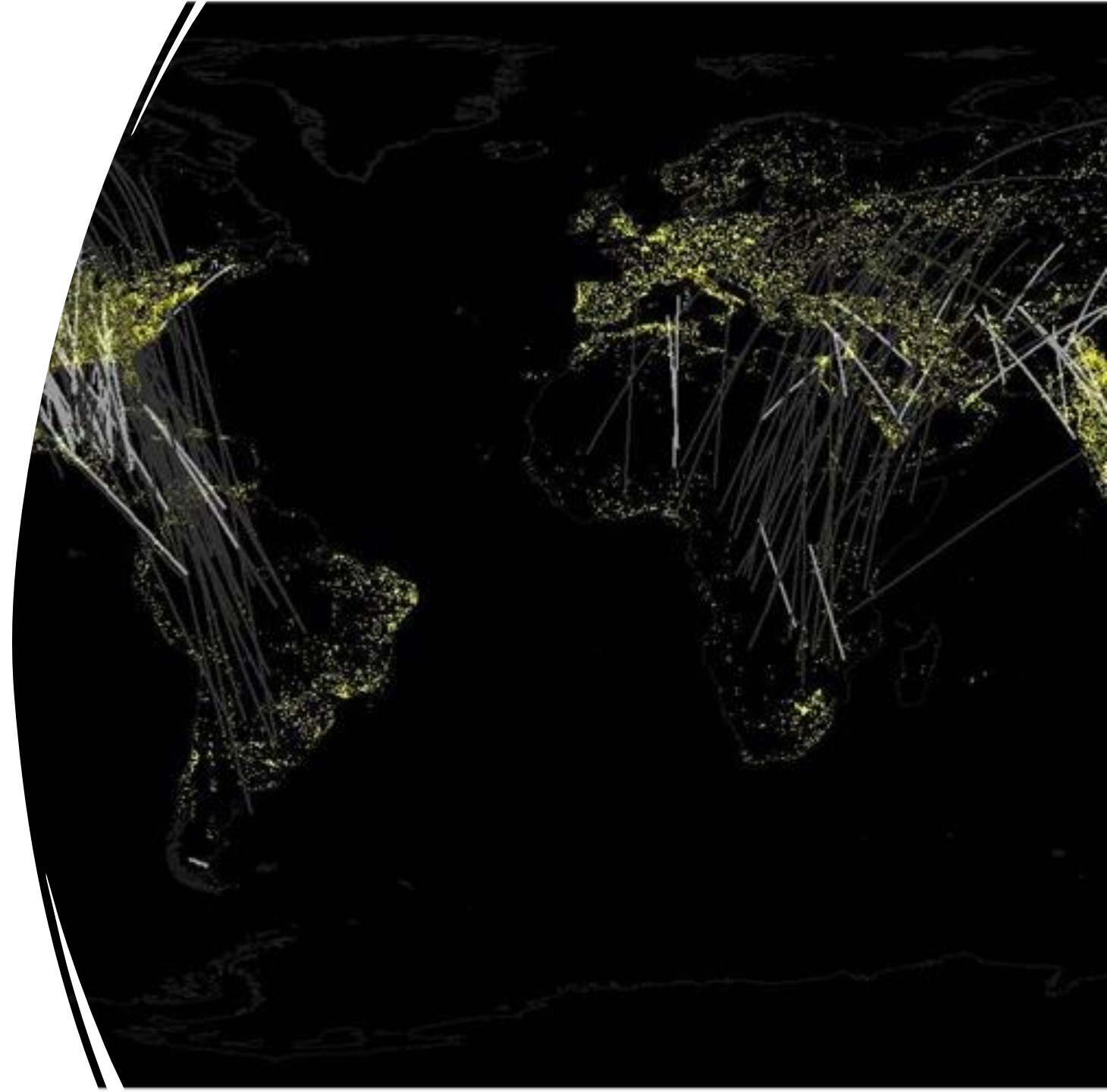


Our knowledge  
of aquatic  
environments is  
relatively poor

The science is  
good but not  
many people are  
studying them

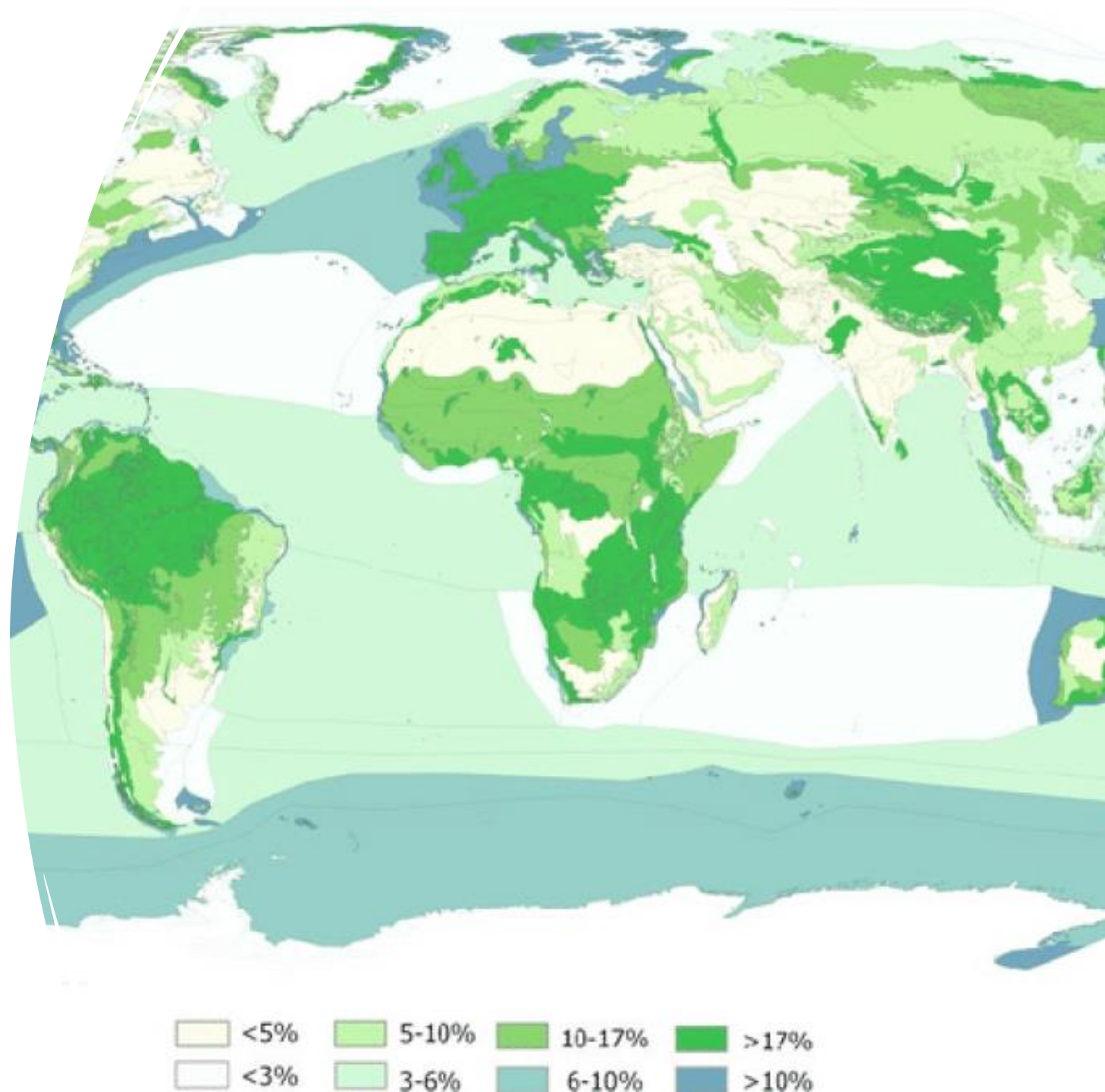
# Light Pollution Changes Nocturnal Migration Pathways

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# Light Pollution affects globally protected areas

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Gaston et al 2015  
Guette et al 2018

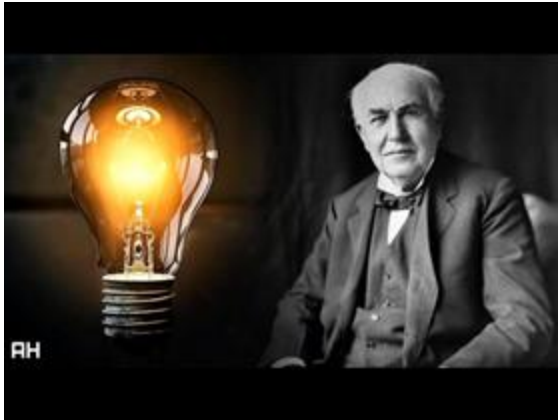
# Light Pollution Implicated in Biodiversity Declines

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Knopp et al 2017  
Owens et al 2020  
Bucher et al 2023



# Lighting's disadvantage – Lots of costs



Three  
options  
to  
replace



Lower intensity  
(zero as starting point)



Different colour  
(blue-reduced)



Shift timing  
(dark refugia during night or  
sensitive periods of lifecycle)

- All options costly in some context
- Consumers do notice
- Laws cannot be signed with impunity
- The science tells us only one will actually *solve* the problem

# More Actual Science – Apparently, we can't just go with our gut!



Lower intensity  
(zero as starting point)

Illuminance lower than that of a full moon can affect the behavioural and physiological responses of individual species as well as communities and ecological networks. (*2023 Philosophical Transactions 378:1892*)



Different colour  
(blue-reduced)

Life on earth has evolved to optimize fitness everywhere - different species and potentially individuals respond in different ways to wavelengths of light (even blue). No single colour shift will be good for all. (*Aulsebrook et al 2020*)



Shift timing  
(dark refugia during night)

Sensored lighting is optimal, but what part of the night should you keep dark? When lights turn on, they can startle and might make it actually worse. (*Sordello et al 2022*)

# Mitigation Measures Must Balance Human Conflict







## More lighting alone does not create safer cities. Look at what research with young women tells us

May 28, 2019 3:54pm AEST

Bright light does not necessarily make a space feel safer, as seen here where there's a sharp drop-off into dark shadows at the edge of the path. [grobxart/Shutterstock](#)

- Email
- Twitter
- Facebook
- LinkedIn
- Print

31

2.7k

[I] walk this route to the train station. I often get cat-called whilst walking to the train. It's also very poorly lit at night. (Female, age 27)

In 2019, [The Australia We Want](#) report noted that at least half of Australian women do not feel safe walking alone at night. This is unsurprising given the [prevalence of sexual harassment](#) and gender violence women manage when

### Author



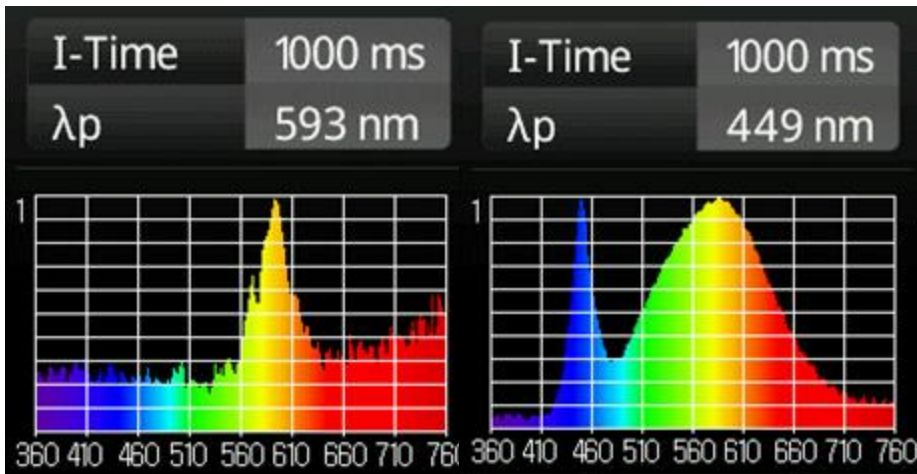
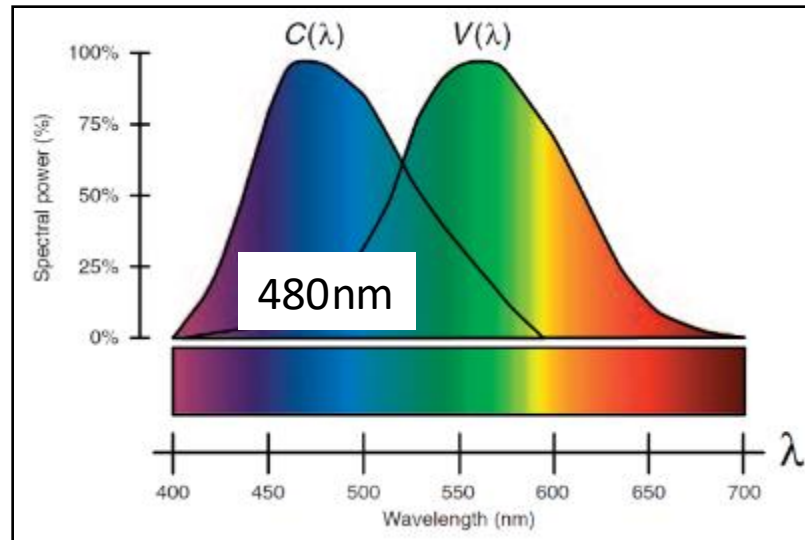
**Nicole Kalms**

Director, XYX Lab, and Associate F of Art, Design and Architecture, Mo

### Disclosure statement

Nicole Kalms is the Director of the Monash Uni  
This research is a collaboration between Plan I

# Global Shift to LED Street Lighting



Could our own biases be influencing our choices and decisions?

Does it matter?

# Minimising and Mitigating Impact: Challenges

## Lighting Standards

- Focus on human vision and safe movement
- Little attention to ecological effects
- Few maximum limits

## Responsibility for lighting is diffuse

- Lighting sits across many areas of local government
- Input from consultants, developers, suppliers
- Need for clear guidance across organisations

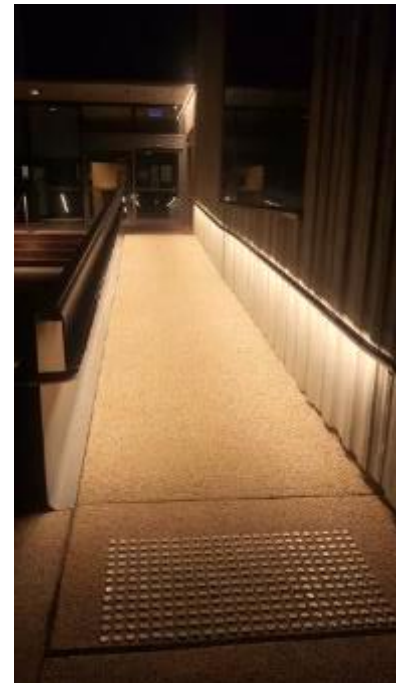


# Minimising and Mitigating Impact: Opportunities

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## Lighting Standards

- Existing scope for improved lighting
- Existing carve-outs for ecologically sensitive areas
- New amendments are marginally improved





Australian Government  
Department of the Environment and Energy



Department of Biodiversity,  
Conservation and Attractions

Light Pollution Guidelines

## National Light Pollution Guidelines for Wildlife

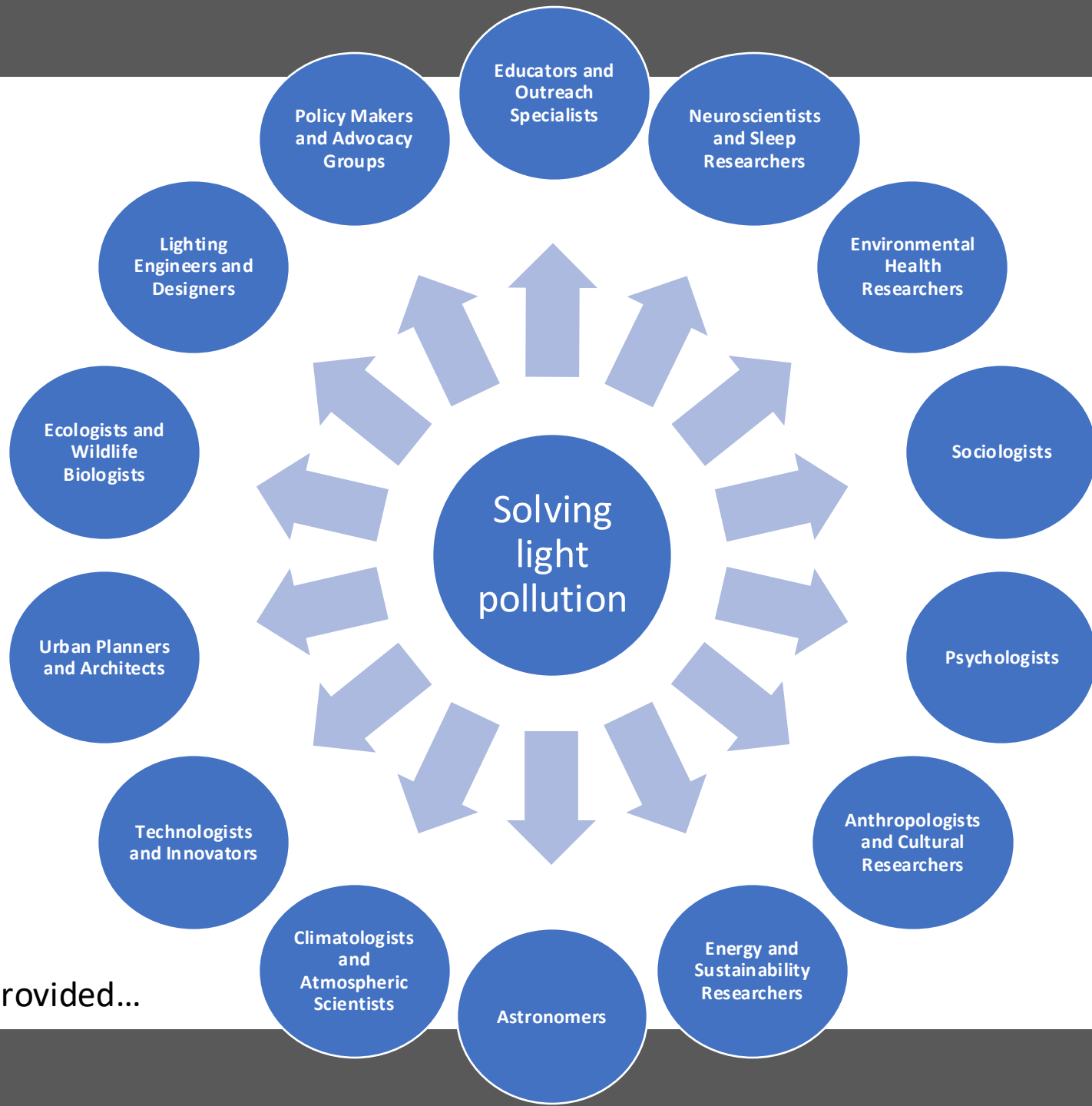
*Including marine turtles, seabirds and migratory  
shorebirds*

January 2020

Version 1.0







This is what ChatGPT provided...

## Eliminate

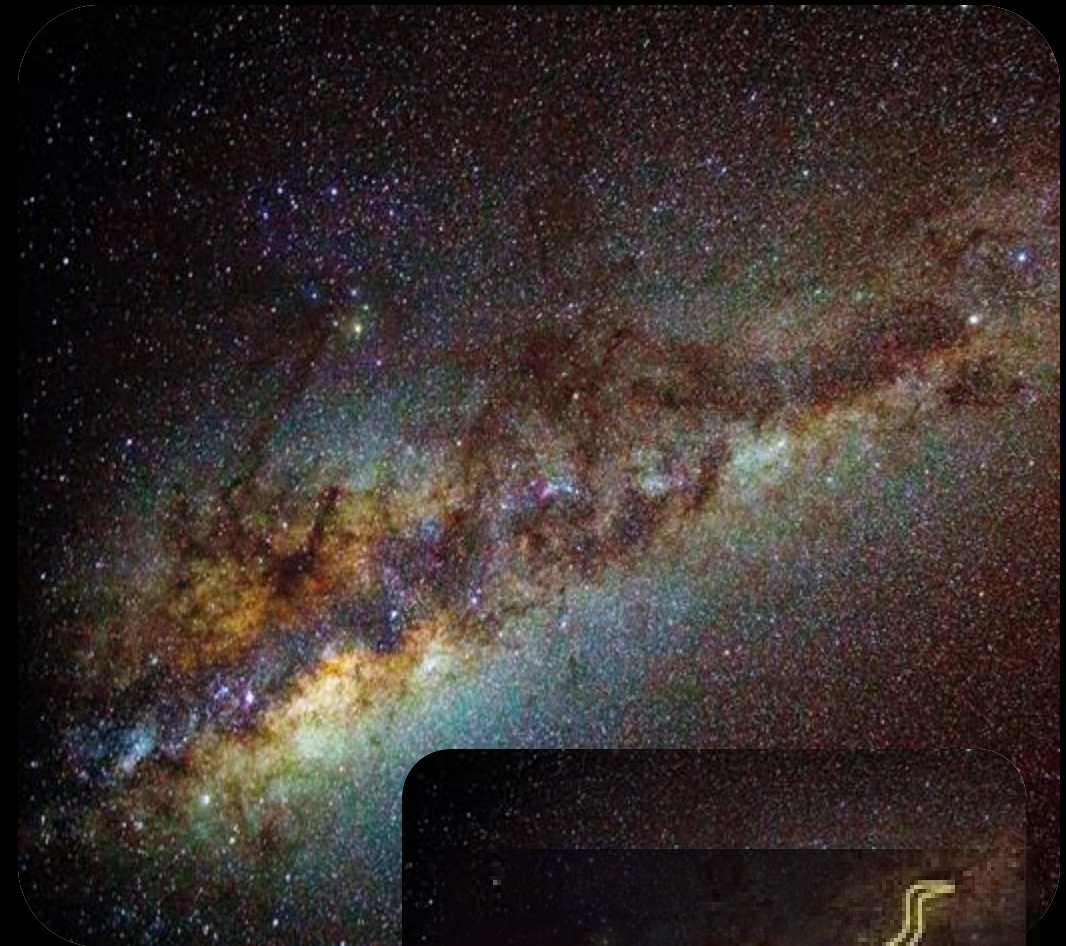
- Turn off the lights (when/ where we can)

## Mitigate

- Shield lights (reduces spill and glare)
- Make sure they face down
- Change timing/colour/intensity

## Understand

- Assessment is critical but knowledge of who you need to convince and their priorities is critical





# Urban Light Lab

## Postdocs

- **Dr Kathryn McNamara**
- **Dr Gareth Hopkins**
- **Dr Marty Lockett**

## Students (PhD)

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- **Ashleigh Anderson**
- **Lucy McLay**
- **Joanne Durrant**
- **Marty Lockett**
- **Nik Willmott**
- **Anne Aulsebrook**
- **Ashton Dickerson**

## Students (Masters)

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- **Michael Botha**
- **Maddie Brown**
- **Joanne Durrant**
- **Nick Fitzgerald**
- **Chris Freelance**
- **Alexander Francis**
- **Shion Kim**
- **Maddie Nam**
- **Rebecca Rasmussen**
- **Nathan Vu**

## Academic Collaborators

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- **Prof Steven Swearer**
- **Dr Emily Fobert**
- **Prof Mark Elgar**
- **Prof Kevin Gaston**
- **A/Prof John Lesku**
- **Prof Raoul Mulder**
- **A/Prof Mariana Pinto**
- **Prof Marcel Visser**

## Industry and Government Collaborators

- **WE-EF**
- **City of Salisbury**
- **Boroondara Council**
- **Cardinia Shire**
- **City of Melbourne**
- **City of Monash**
- **Department of Transport (Vic Roads)**
- **Knox City Council**
- **Victoria State Government**
- **Whitehorse City Council**
- **Yarra Ranges Council**



**Australian Government**  
**Australian Research Council**

