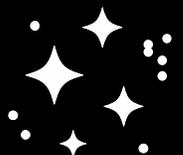
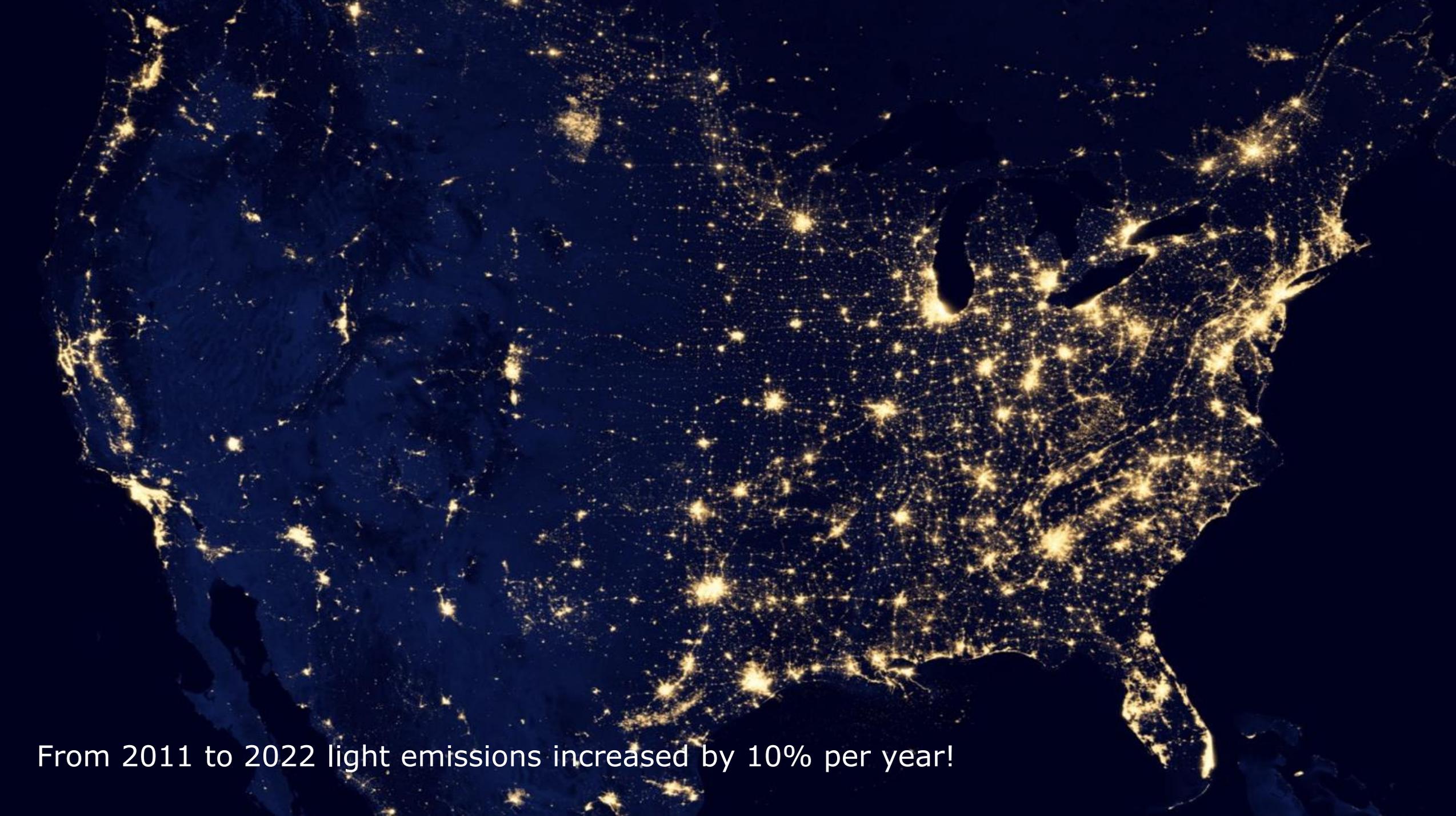


## ***DarkSky Chicago EE Proposal*** ***The Effective Use of Outdoor Lighting for EE***

*An Energy Efficiency plan based on the efficient and effective use of outdoor lighting as outlined by the IES/DarkSky 5 Principles of Responsible Outdoor Lighting. Whereas the adoption of SSL technology and controls has provided energy reduction, in practice, the habits of our uses and applications of light at night is reducing – or even in some cases eliminating – those gains.*



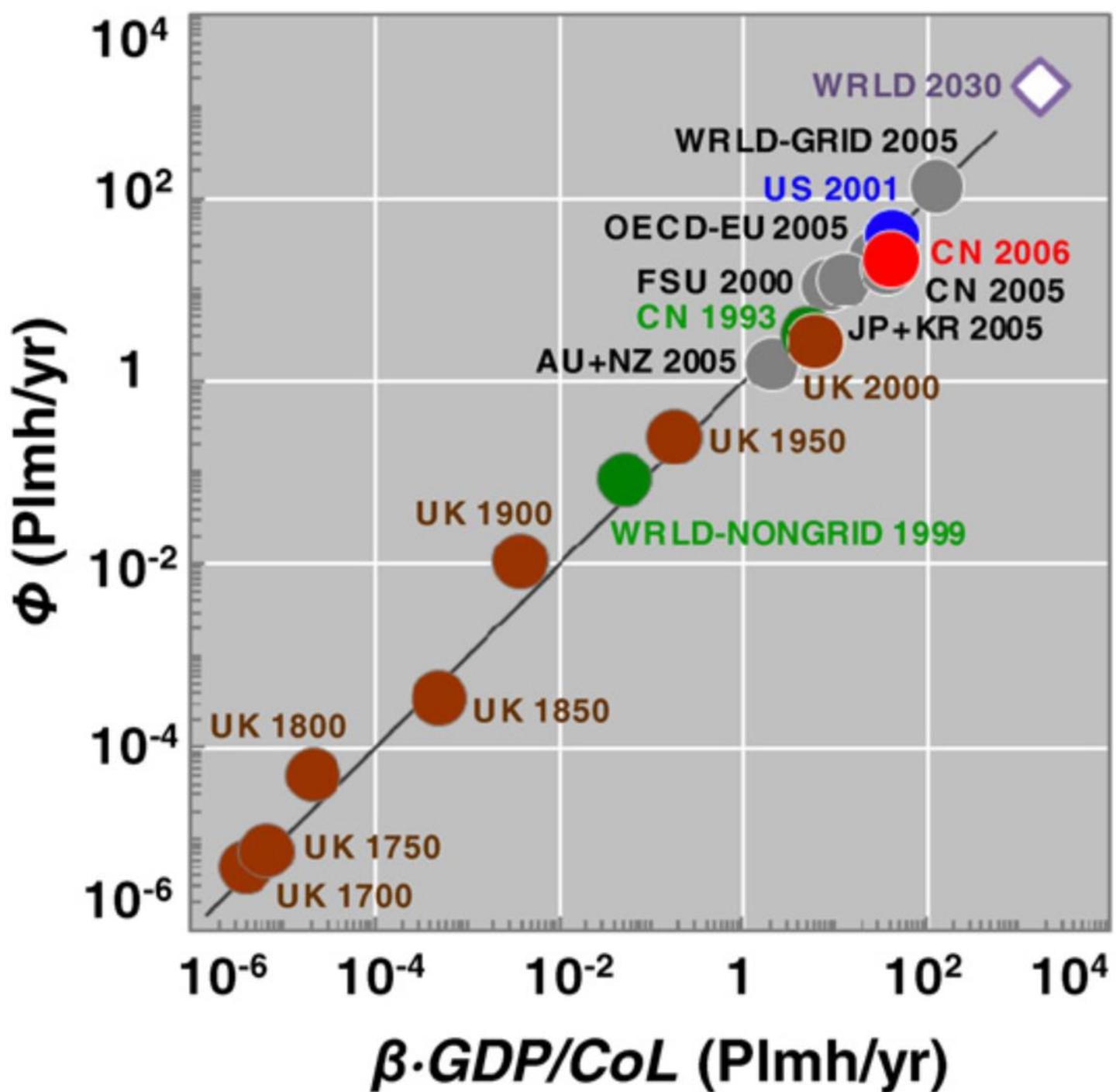
**DarkSky**  
INTERNATIONAL



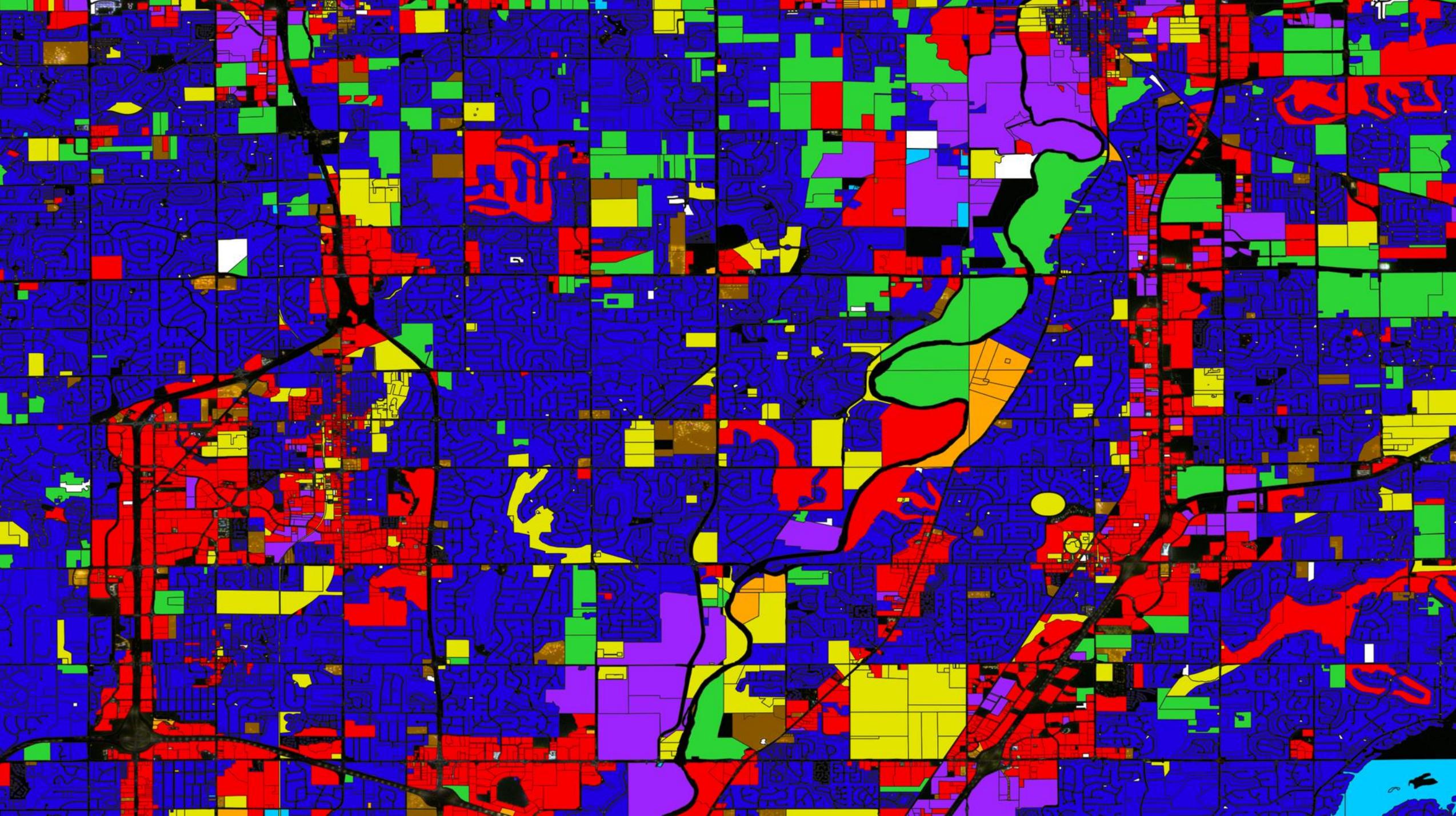
From 2011 to 2022 light emissions increased by 10% per year!

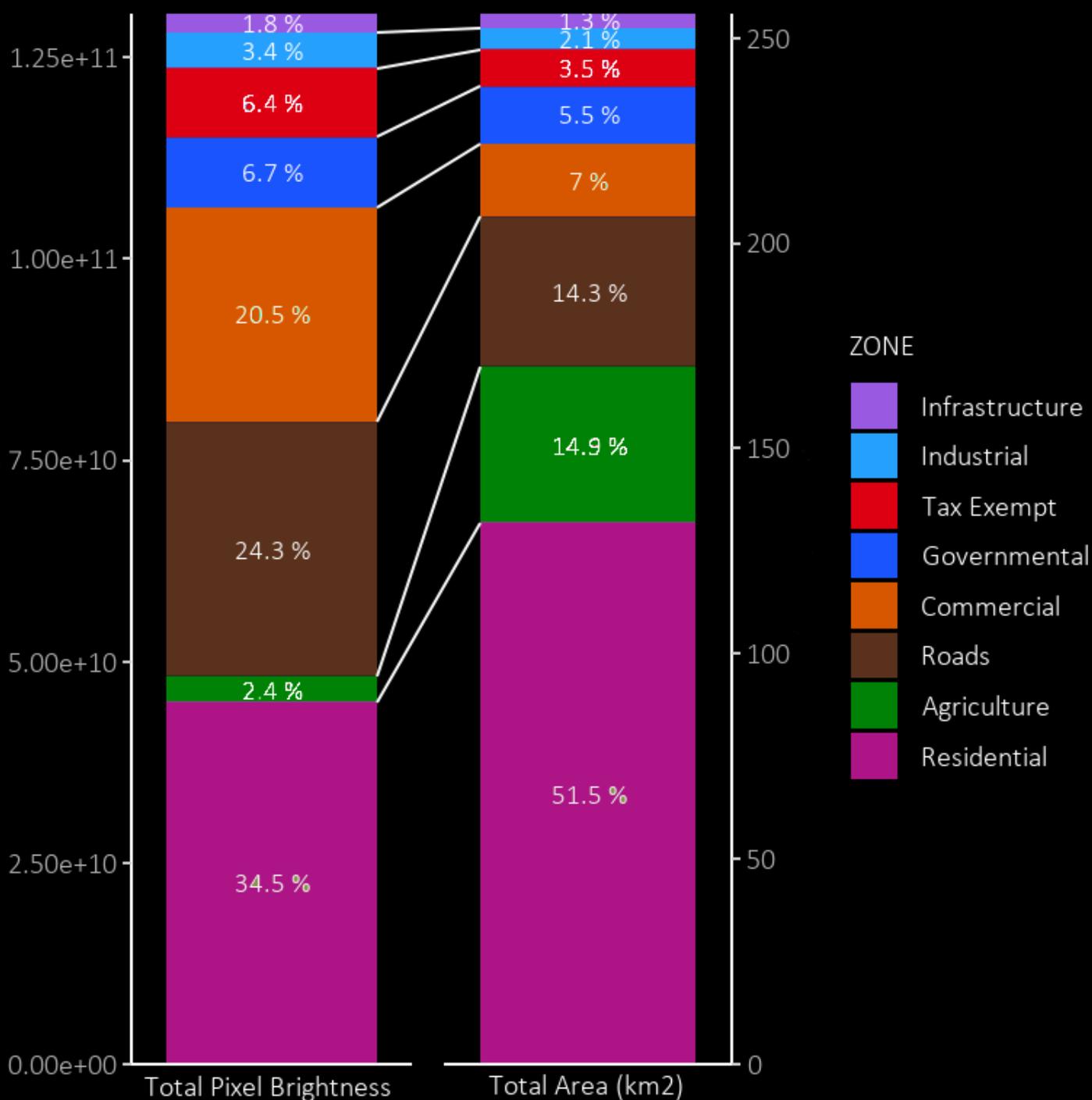
Tsao and Waide found societies spend 0.72% of their GDP on lighting predicted remarkably well despite a span of:

- 3 centuries
- 6 continents
- 5 types of fuel (whale oil to electricity)
- 1.4 orders of magnitude in per capita GDP
- 4.3 orders of magnitude in cost of light
- 5.4 orders of magnitude in per-capita consumption of light









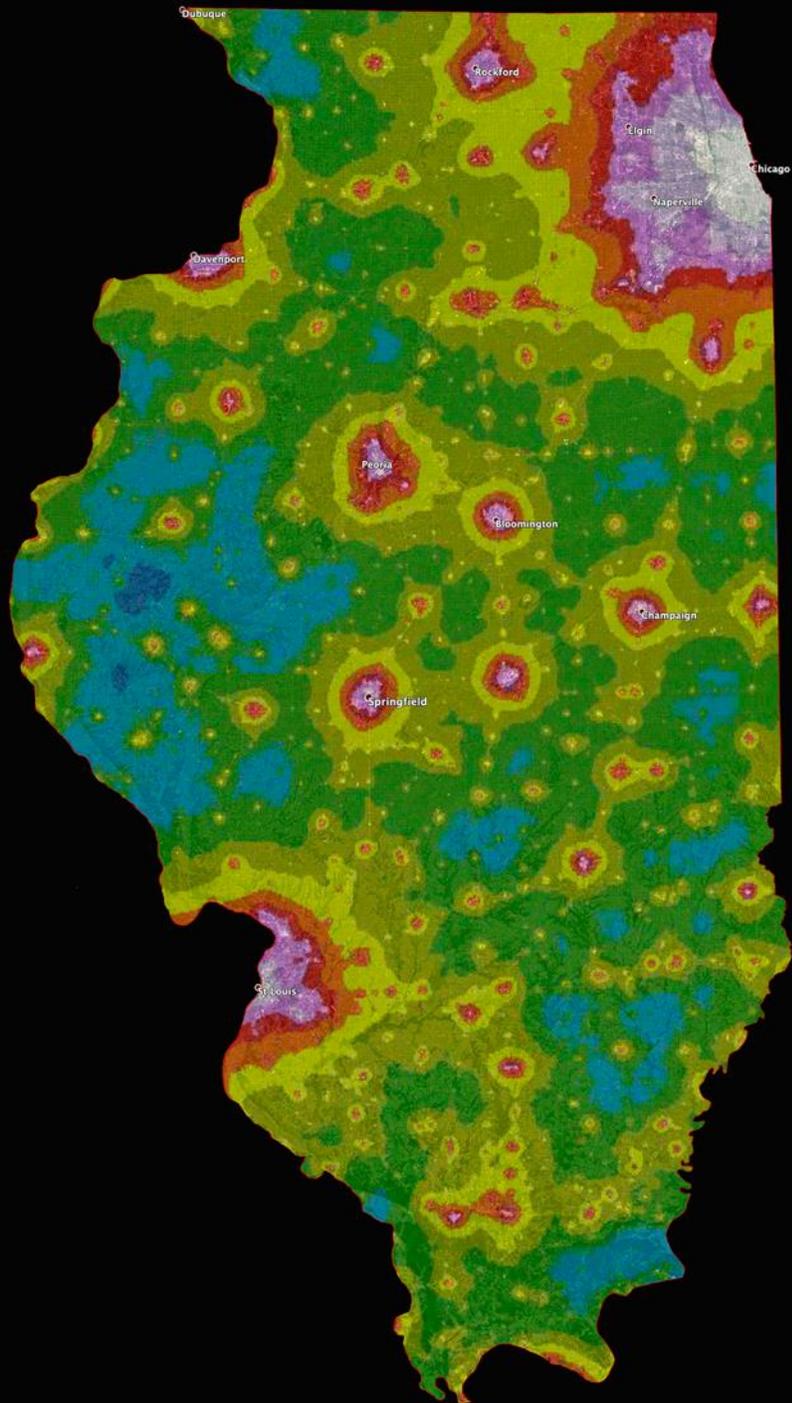
## Highlights:

Commercial property covers 7% of the land sampled but contributes 20.5% of all light emissions

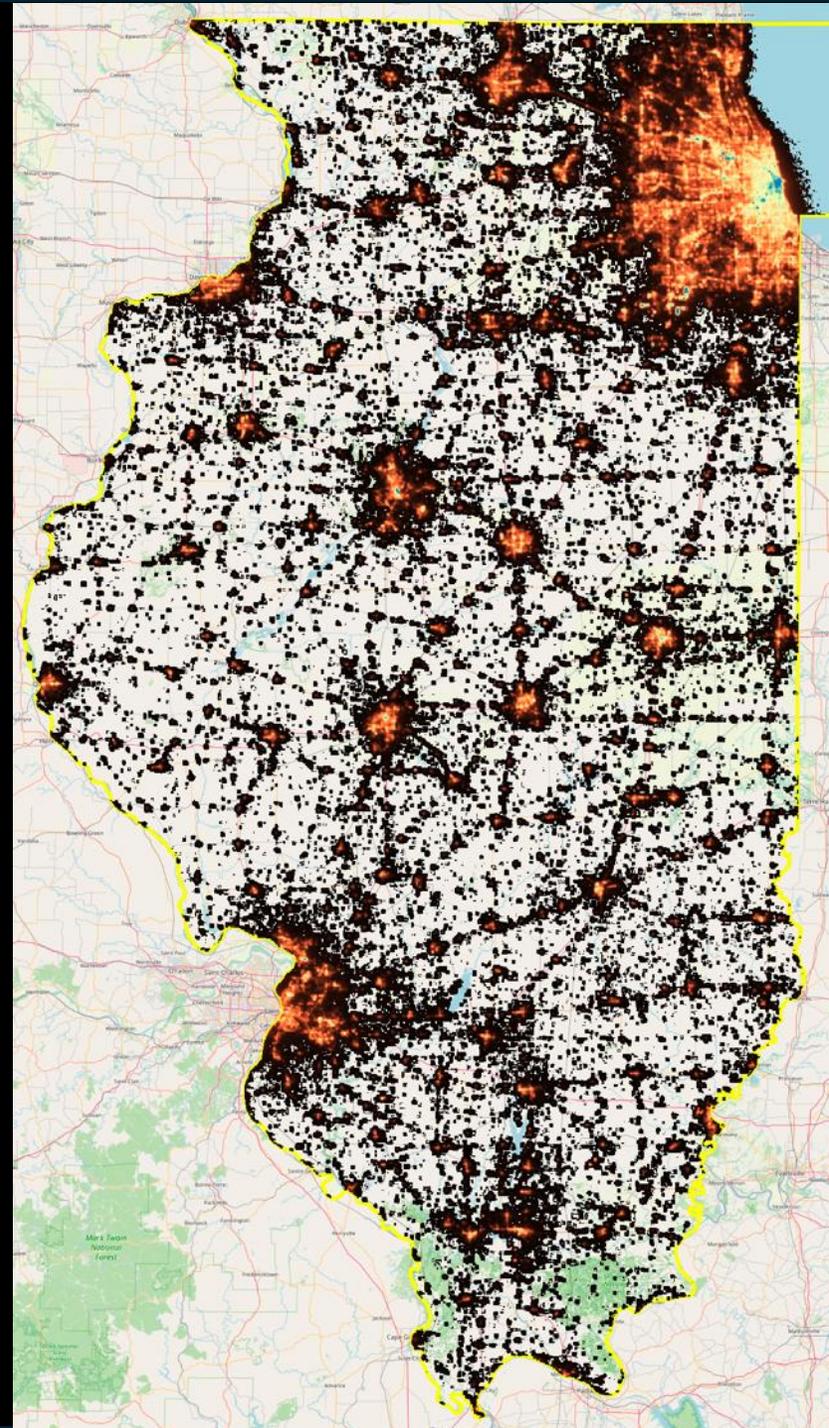
The largest single emitter is Residential land although it composes more than 50% of zoned land

Roads emit nearly (only?) 1/4 of all observed light

As a ratio of emission-to-area:  
 Commercial land has the highest (2.9:1) while Residential (0.7:1) is the lowest except for Agricultural (0.2:1)



Incentives/Rebates for SSL retrofits and Controls have been helpful, but they miss the root of the largest potential EE gains.



# LIGHT TO PROTECT THE NIGHT

## Five Principles for Responsible Outdoor Lighting

### USEFUL



#### ALL LIGHT SHOULD HAVE A CLEAR PURPOSE

Before installing or replacing a light, determine if light is needed. Consider how the use of light will impact the area, including wildlife and the environment. Consider using reflective paints or self-luminous markers for signs, curbs, and steps to reduce the need for permanently installed outdoor lighting.

### TARGETED



#### LIGHT SHOULD BE DIRECTED ONLY TO WHERE NEEDED

Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.

### LOW LIGHT LEVELS



#### LIGHT SHOULD BE NO BRIGHTER THAN NECESSARY

Use the lowest light level required. Be mindful of surface conditions as some surfaces may reflect more light into the night sky than intended.

### CONTROLLED



#### LIGHT SHOULD BE USED ONLY WHEN IT IS USEFUL

Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.

### COLOR



#### USE WARMER COLOR LIGHTS WHERE POSSIBLE

Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.



USEFUL

1



USEFUL

2



TARGETED

3



LOW LEVELS

4



CONTROLLED

5



COLOR





**TARGETED**

1



USEFUL

2



TARGETED

3



LOW LEVELS

4

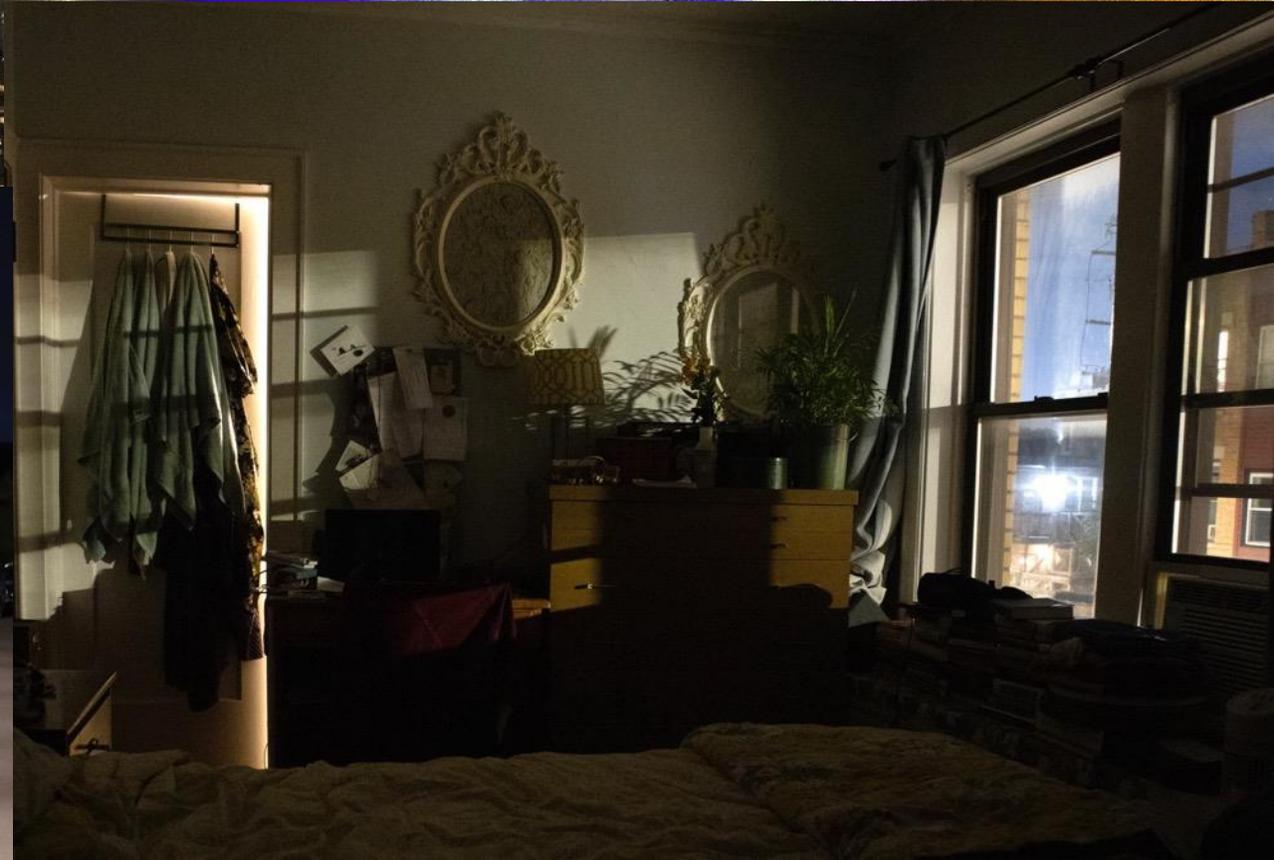


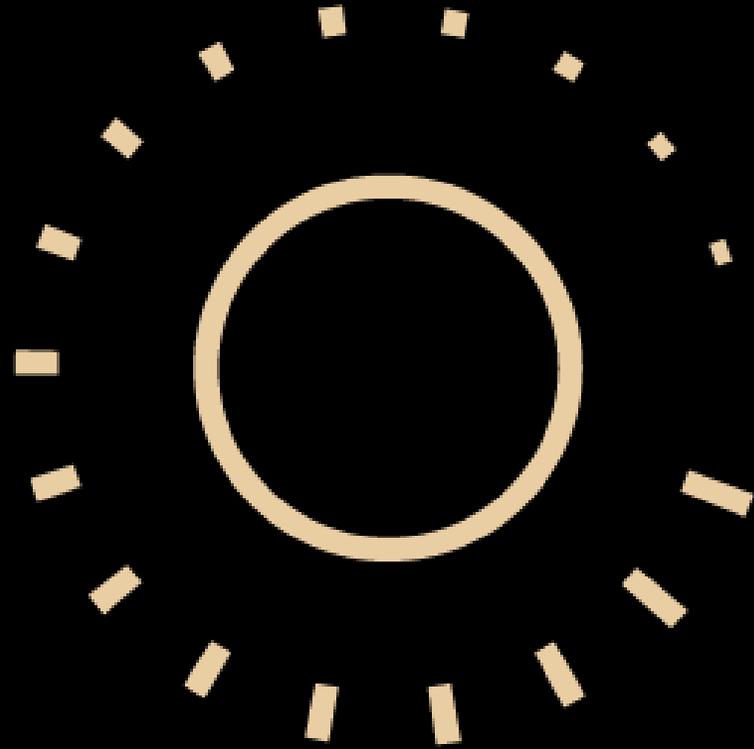
CONTROLLED

5



COLOR





# LOW LEVELS

1



USEFUL

2



TARGETED

3



LOW LEVELS

4



CONTROLLED

5



COLOR













**CONTROLLED**

1



USEFUL

2



TARGETED

3



LOW LEVELS

4



CONTROLLED

5



COLOR





**COLOR**

**1**  **USEFUL**

**2**  **TARGETED**

**3**  **LOW LEVELS**

**4**  **CONTROLLED**

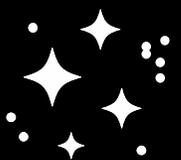
**5**  **COLOR**







Link to References and Studies



**DarkSky**  
INTERNATIONAL