

LIGHT POLLUTION and DARK SKIES PRESERVATION

Hidden in Brightness

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LIGHT POLLUTION

TYPES OF LIGHT POLLUTION

- Skyglow
- Light Trespass
- Glare
- Wasted energy

Skyglow

Wasteful light from artificial sources emitted upward (at horizontal angles and higher) is scattered by aerosols such as clouds and fog or small particulates like pollutants in the atmosphere. This scattering forms a diffuse glow that can be seen from very far away. Skyglow is the most commonly known form of light pollution.



Stars and skyglow over Salzburg, Austria
(Credit: Andreas Max Böckle)



Light trespass

Light trespass is another common problem that can even affect our health.

Unwanted light at night can seep through the windows of houses, causing sleeping disorders due to overexposure to light.

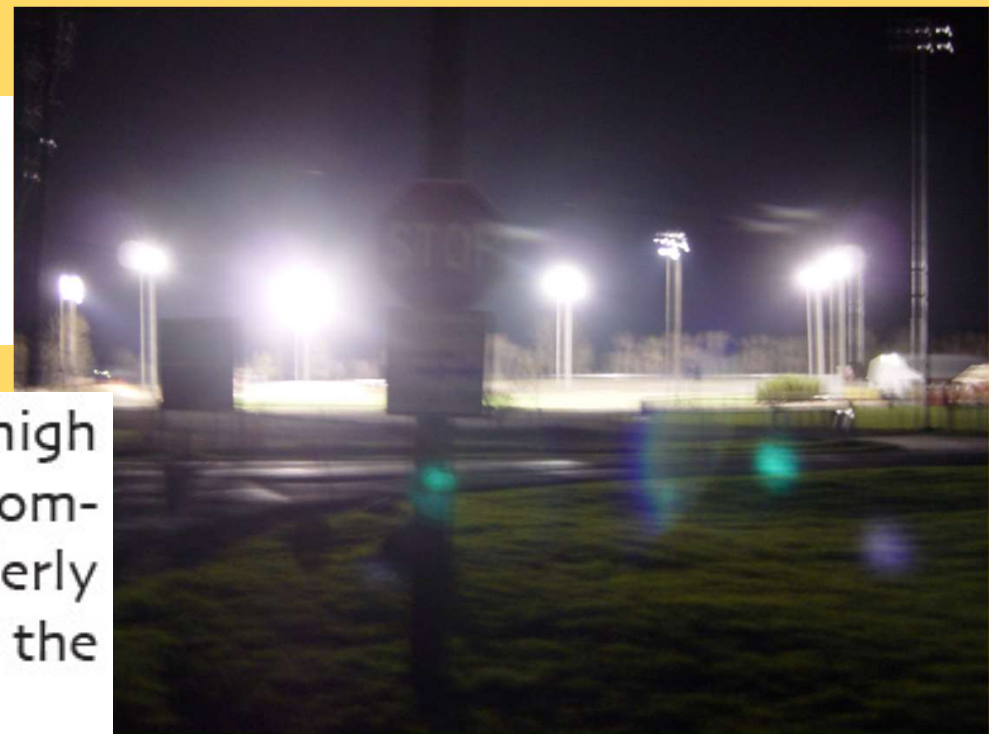


Glare

Glare is too much background light.

Can you see the stop sign?
or read the sign below it?

Excessive brightness at night creates high contrast and decreased visibility, causing discomfort or, in extreme cases, a blinding effect. Elderly people with ageing eyes and cataracts suffer the most.



UPWARD LIGHT IS ALL WASTED AND HARMFUL

SATELLITE VIEW OF EARTH AT NIGHT

Bad Lighting
produces:

- SKYGLOW
- TRESPASS
- GLARE
- WASTED ENERGY



Solution

USE GOOD LIGHTING FIXTURES



VERY BAD



BAD



BETTER



BEST

LED revolution?

Spectrum of Low Pressure Sodium Lamp



Spectrum of High-Pressure Sodium Lamp

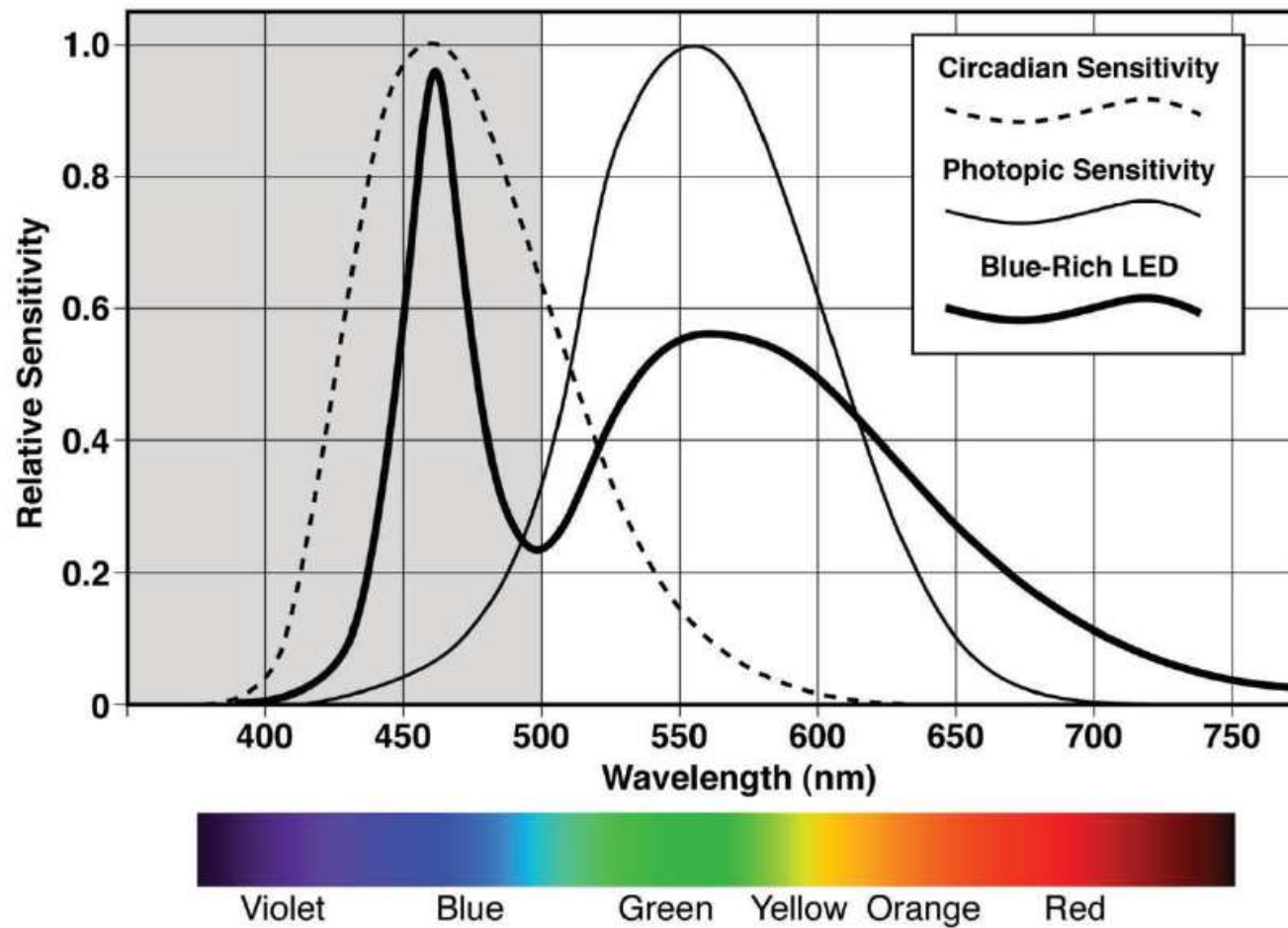


Switch over from sodium lamps to LEDs in Calgary, Canada. (Credit: NASA)

Spectrum of 4100K LED



Understanding the LED spectrum



———— PHOTOTOPIC
Eye Daytime sensitivity

----- CIRCADIAN
Body's Day-Night Cycle

———— LED LIGHT
Blue-rich

LEDs are:
Low cost,
Low energy,
Long lasting

Blue light affects sleep

- Besides RODS and CONES cells in retina of our eyes
- There is a third a **not well known** type of cell – MELANOSPIN
- MELANOSPIN is sensitive to BLUE LIGHT
- Produces the sleep hormone **MELATONIN** at NIGHT when BLUE IS LOW
- Melatonin makes you FEEL TIRED and want to SLEEP
- At DAYTIME **Melatonin is not produced** so as to keep you **AWAKE**

Light pollution and our health

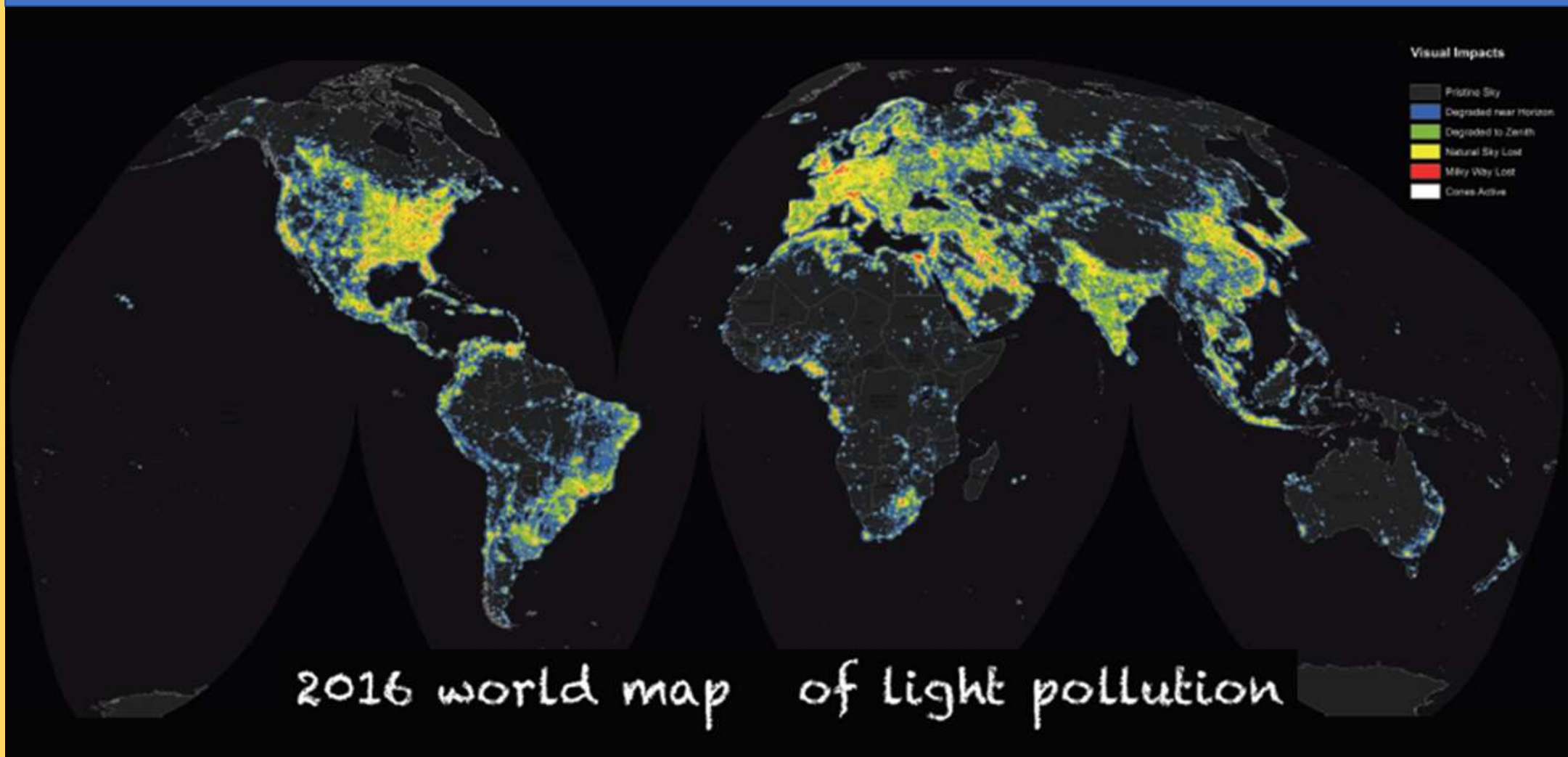
- MELATONIN is an ANTIOXIDANT
- Melatonin REPAIRS the body during sleep
- Regulates CANCER CORRECTING hormones
- LIGHT TRESPASS reduces immunity and increase cancer rates (Americal Medical Association)
- WHITE LED has FIVE TIMES more impact than SODIUM YELLOW lamps

What colour shall we use?

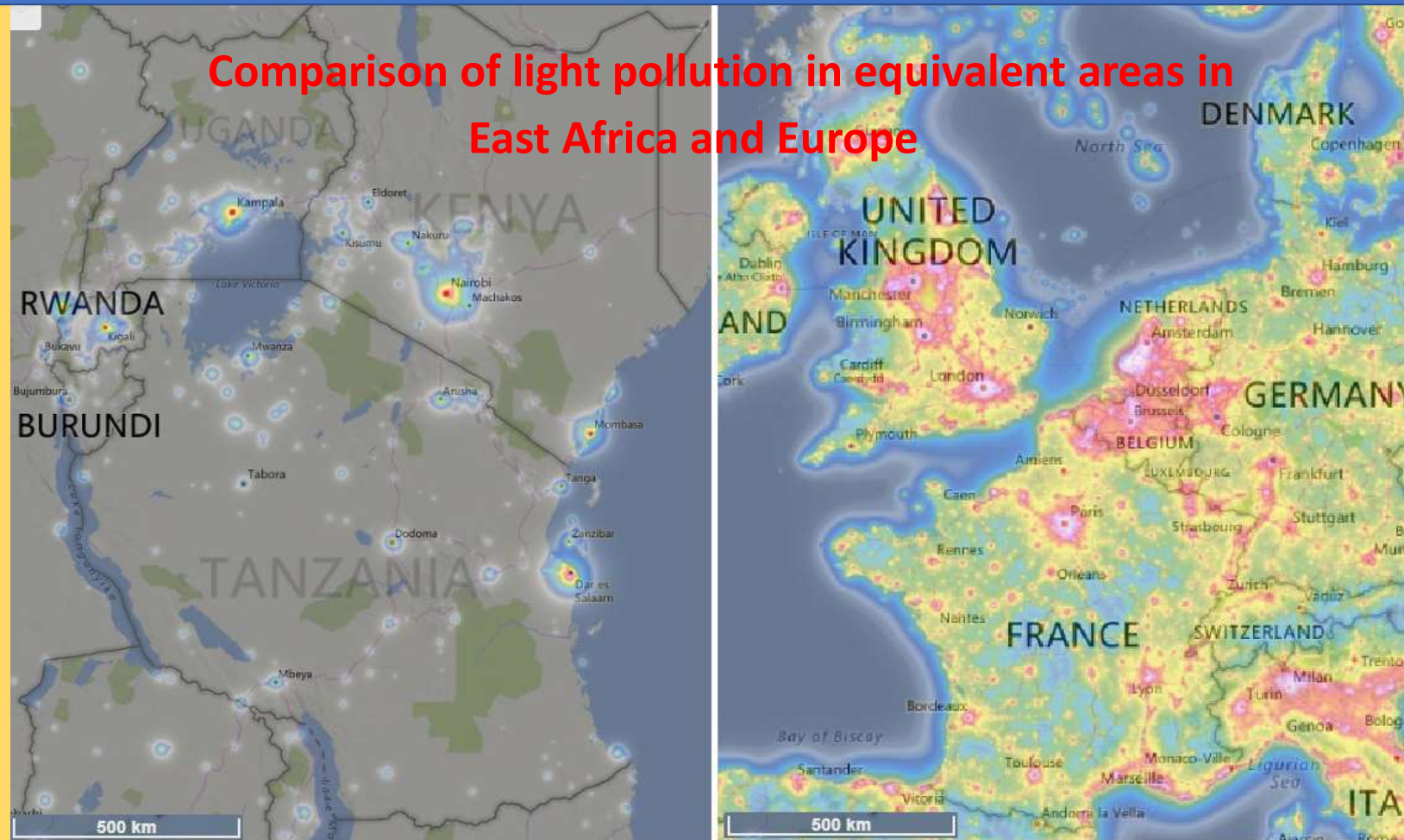


Ecologically responsible and astronomically friendly LEDs

PRESERVATION OF DARK SKIES

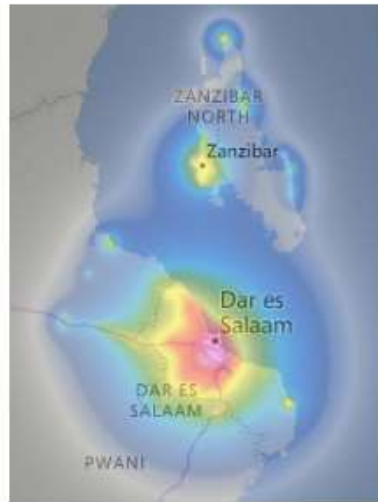


Dark Skies - East Africa v/s Europe



From: <https://www.lightpollutionmap.info/#zoom=6&lat=-608398&lon=4053099&layers=B0FFFFTFFFF>

Light pollution in our cities



DAR ES SALAAM

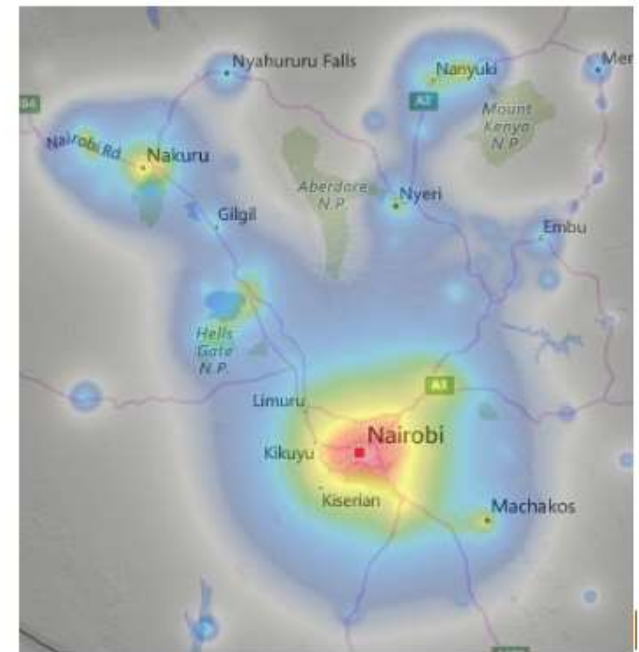


KAMPALA



MOMBASA

**Extensive Light Pollution
around major East African cities**

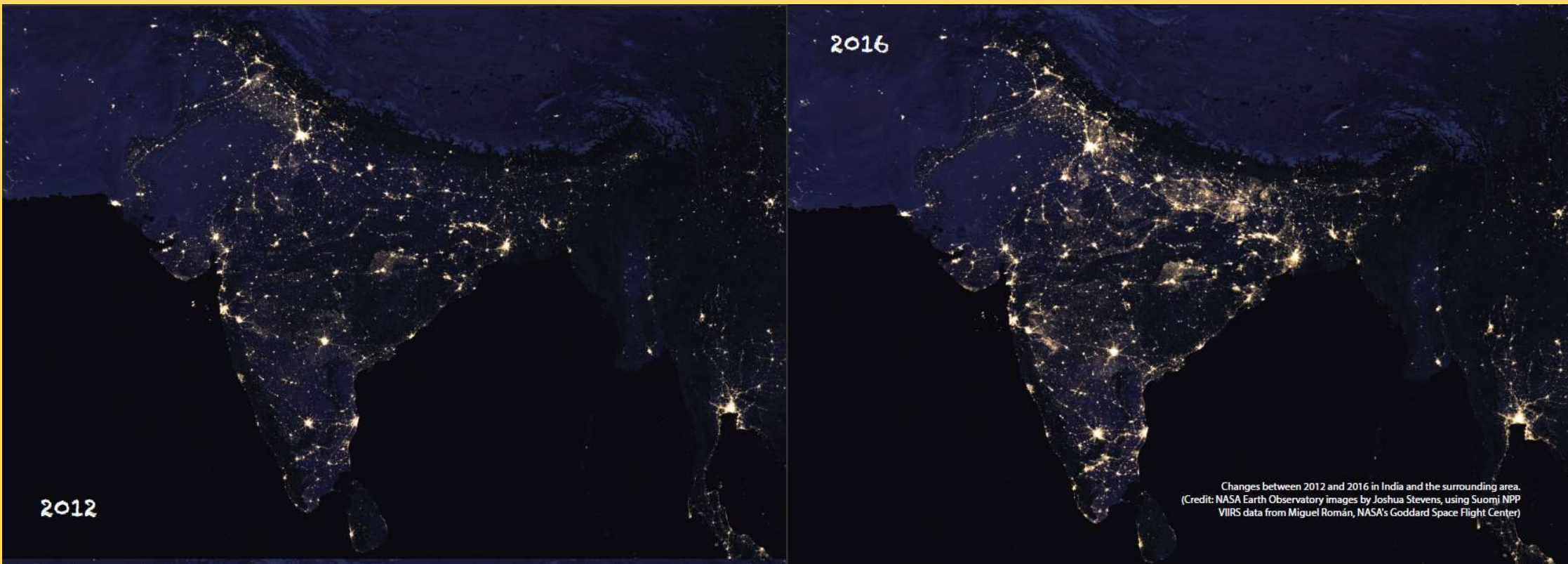


NAIROBI

From: <https://www.lightpollutionmap.info/#zoom=6&lat=-608398&lon=4053099&layers=B0FFFFTFFFFF>

LEDs make light pollution worse

- Our world brightened by 9.1% from 2012 to 2016
- White LEDs easily scatter and create a higher light pollution



Astronomy and Light Pollution

Without dark skies, astronomers are unable to receive the faint signals of light from distant objects in outer space.

Dark skies are also an important part of the cultural and natural heritage of all

Many astronomical observatories are built in remote locations in an effort to escape the light of cities and towns.

Even these observatories are threatened by light pollution.

The International Astronomical Union and the safeguarding of dark skies

to raise the profile of recent advancements in

our understanding of light pollution,

in particular the use of LEDs,

to support the astronomy community

increase public awareness of light pollution research.

How can we effectively reduce the impacts of light pollution?

REDUCE THE NUMBER OF LIGHTS

USE ONLY WHERE REALLY NEEDED



EFFECTIVENESS 10X

USE AMBER
LIGHTS INSTEAD
OF WHITE LIGHTS



EFFECTIVENESS 5X-12X

REDUCE LAMP
POWER



EFFECTIVENESS 2X-4X

PLACE LAMPS
WHERE LIGHT CAN
BE BLOCKED
BY TREES AND
OBSTACLES



EFFECTIVENESS 2X

RESTRICT
LIGHTS GOING
UPWARDS



EFFECTIVENESS
CITY **2X** COUNTRYSIDE **5X**

PUBLIC ACTION

Lighting ordinances are an important tool to protect these sites from light pollution.

Stars, Pleiades and Venus together with the world's largest telescopes
– Keck Observatory and Subaru Telescope on Hawaii's mountaintop.
(Credit: Dr. Hideaki Fujiwara - Subaru Telescope, NAOJ)





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