
A new energy culture
sustainability and territories

Light pollution as energy waste

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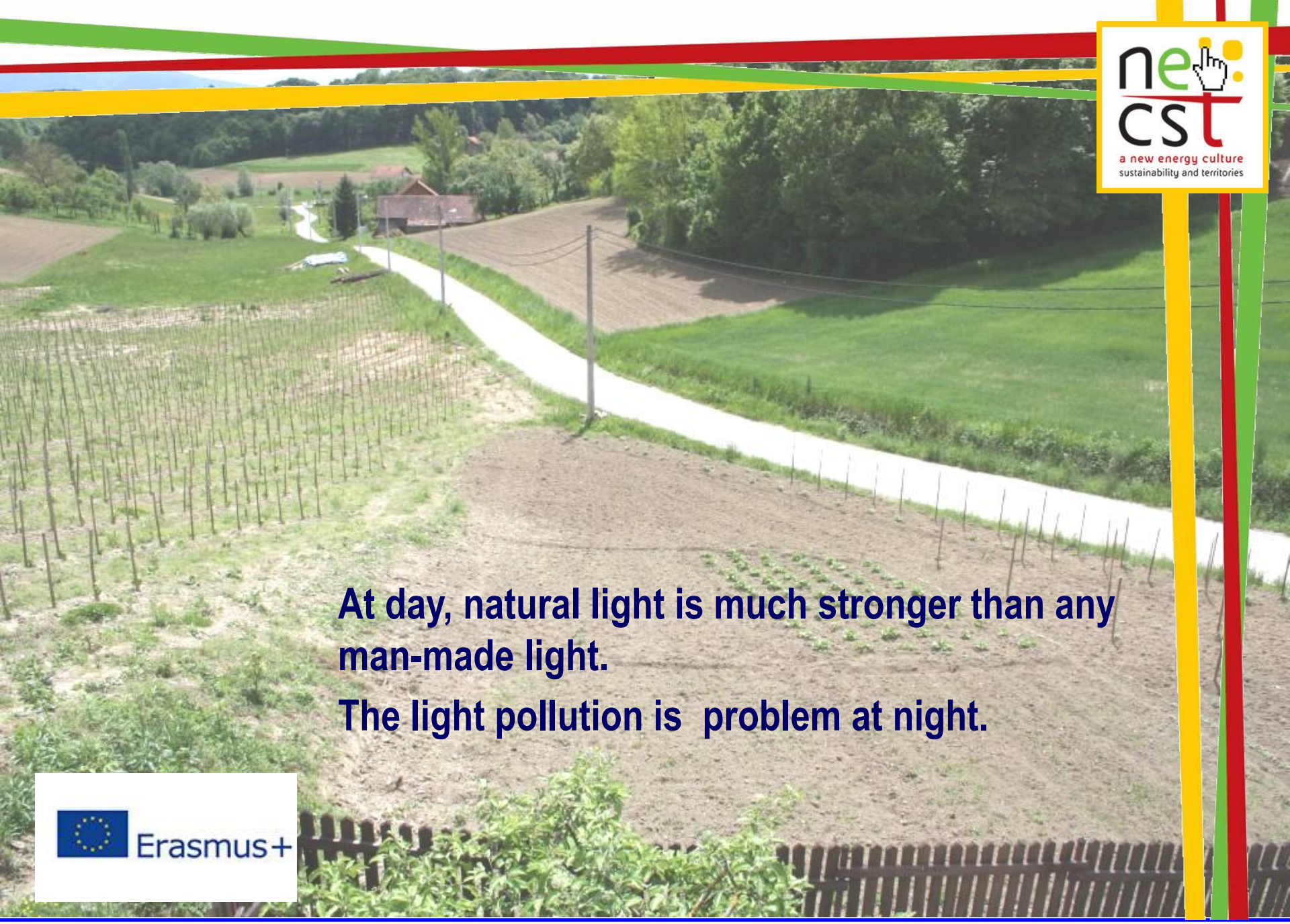
What is this all about?

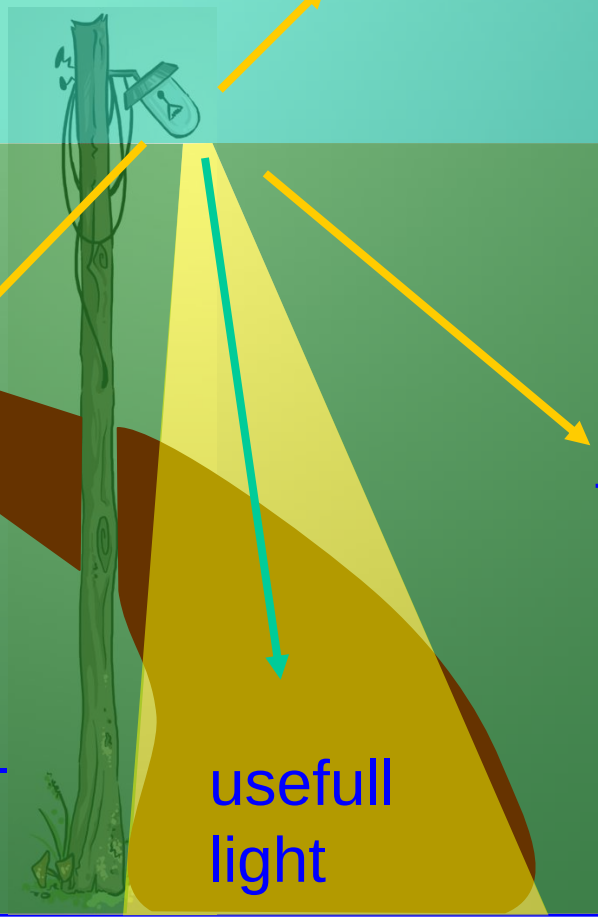
1. Definition of light pollution
2. Sources of light pollution
3. Good lighting versus bad lighting
4. Light is energy
5. Costs of public lighting in Croatia
6. Is the future bright or dark?


At day, natural light is much stronger than any man-made light.
The light pollution is problem at night.


Light pollution is any artificial light that spills into the environment!

A typical situation:

trown away -
brightens the night sky

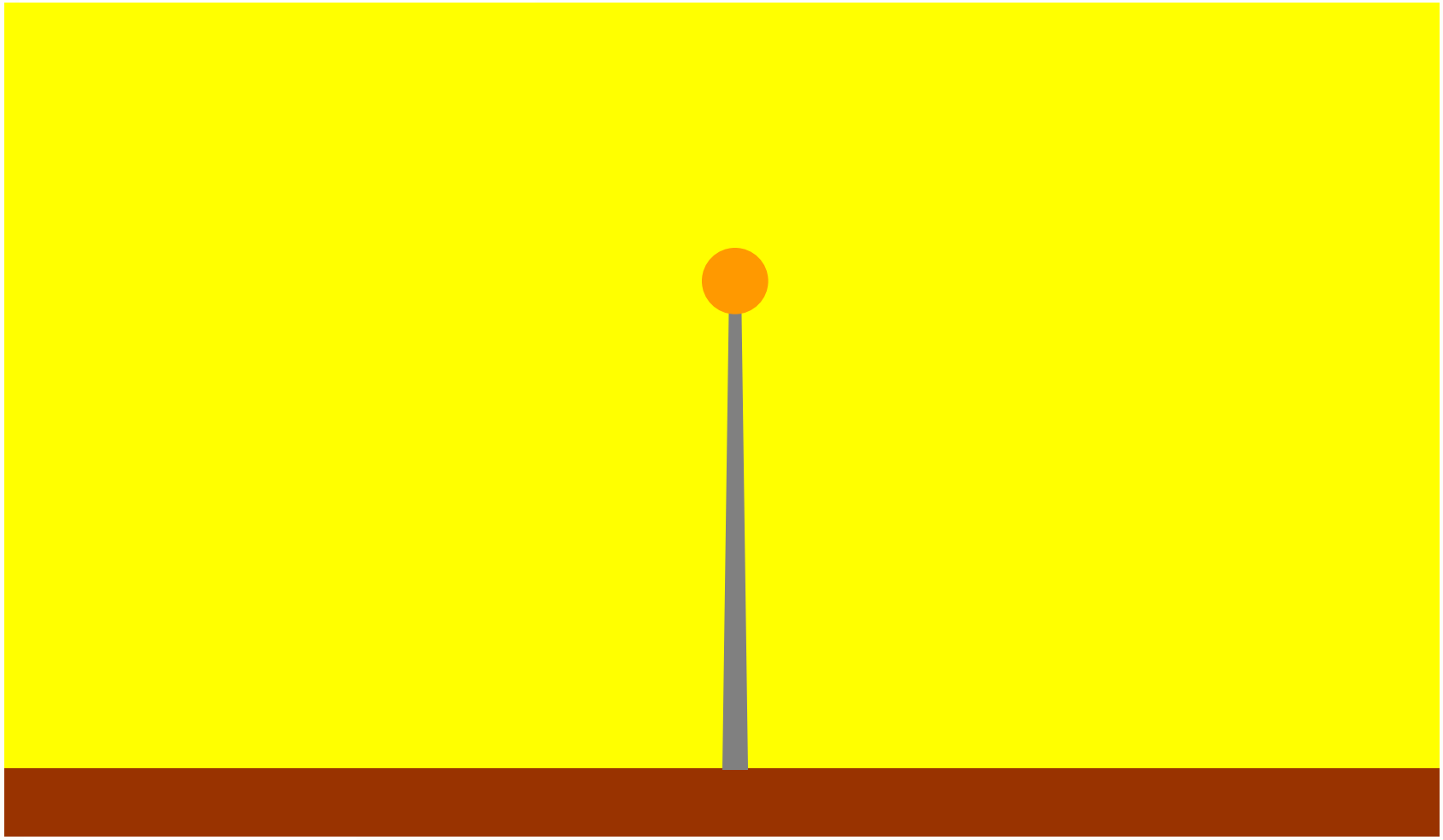


thrown away - impacts the environment

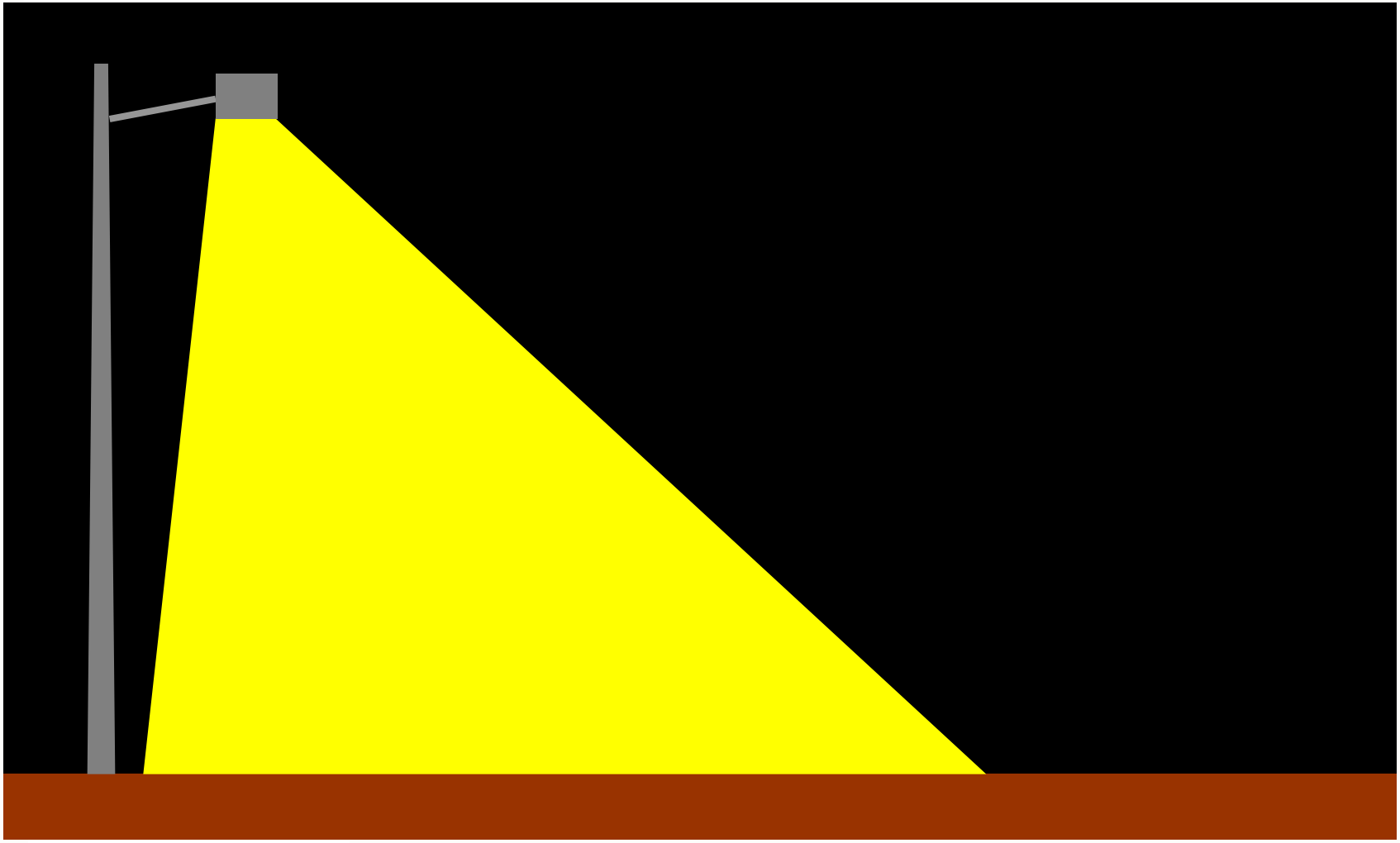
thrown away - impacts the environ-ment

usefull light

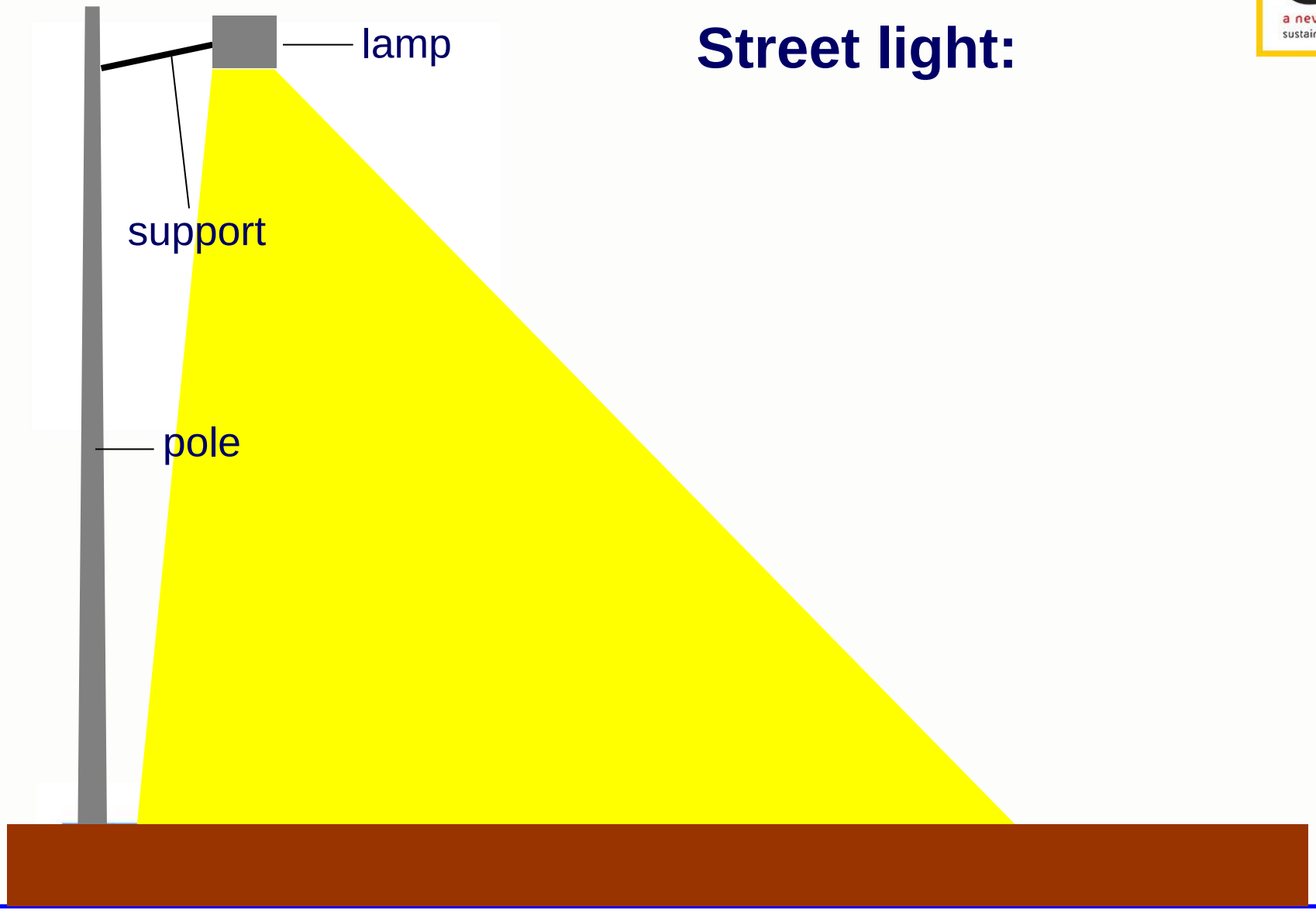
Bad lamp spills light everywhere!



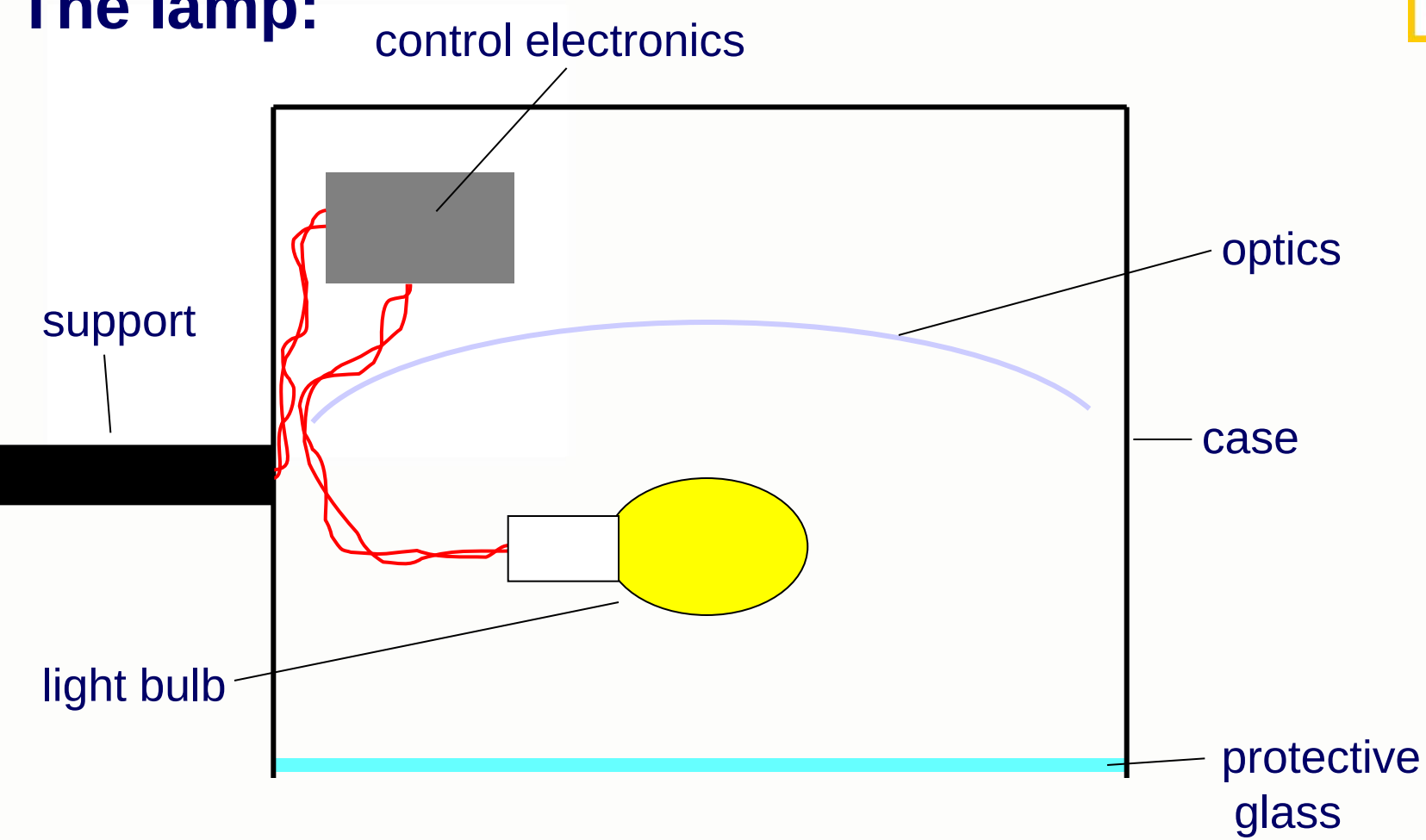
Good lamp sends light where it is needed!



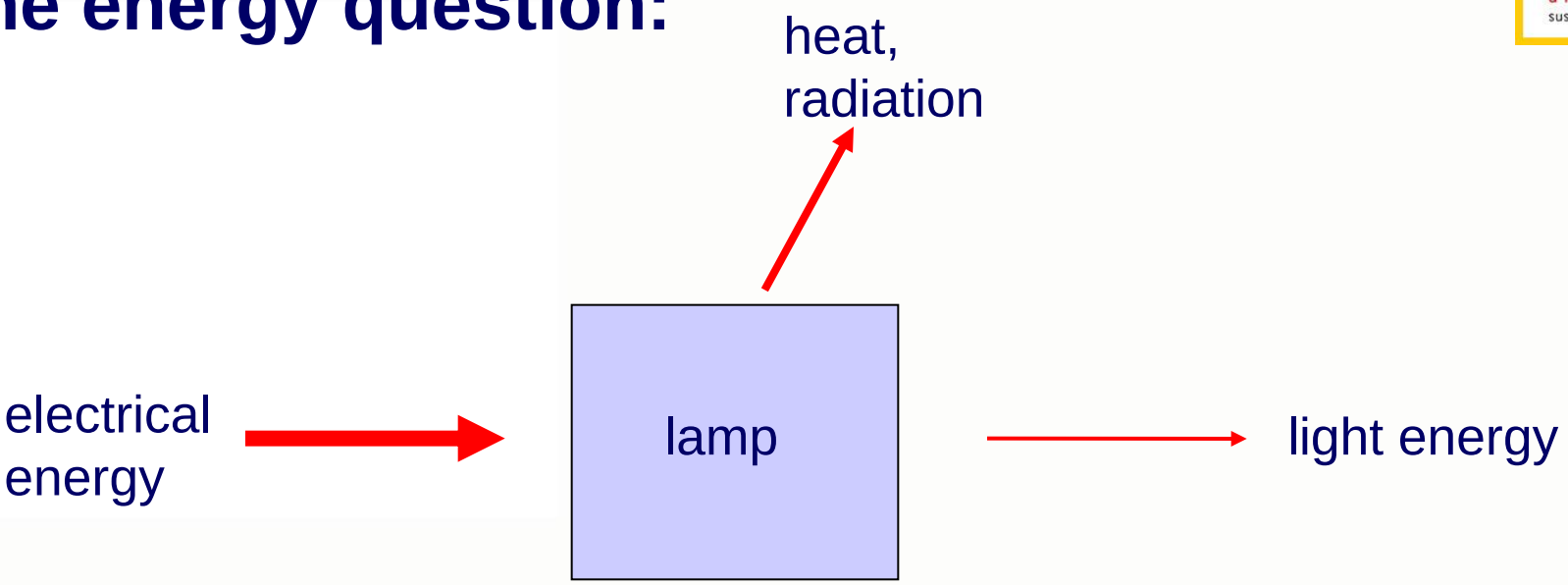
Street light:



The lamp:

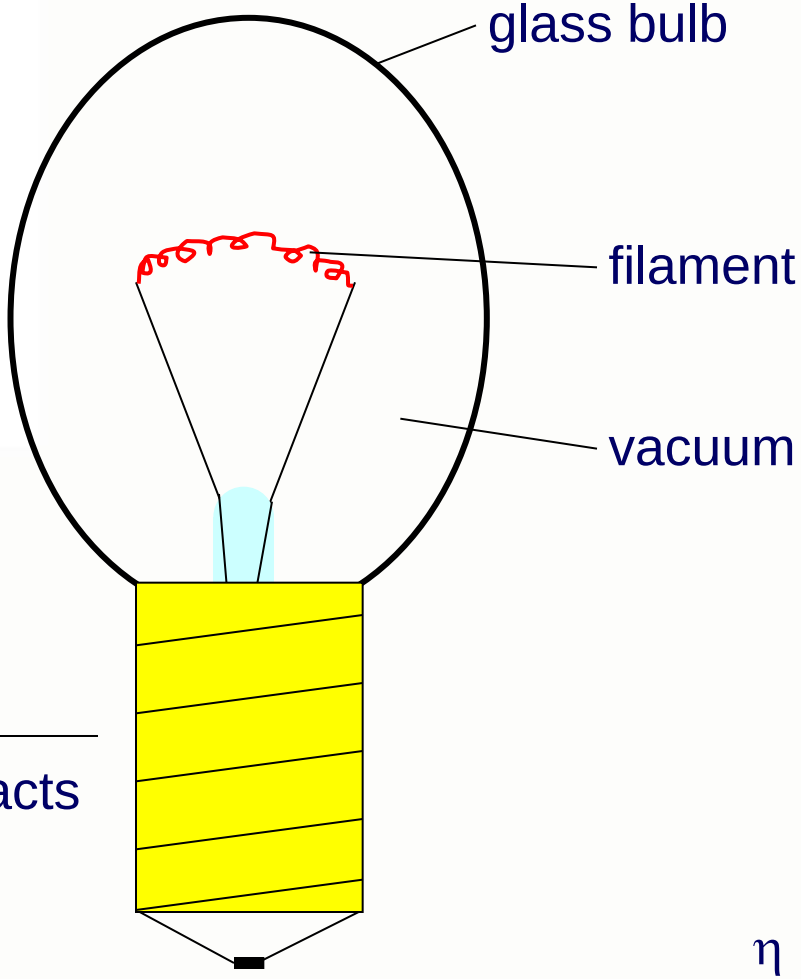

control electronics
optics
support
case
light bulb
protective glass

The energy question:



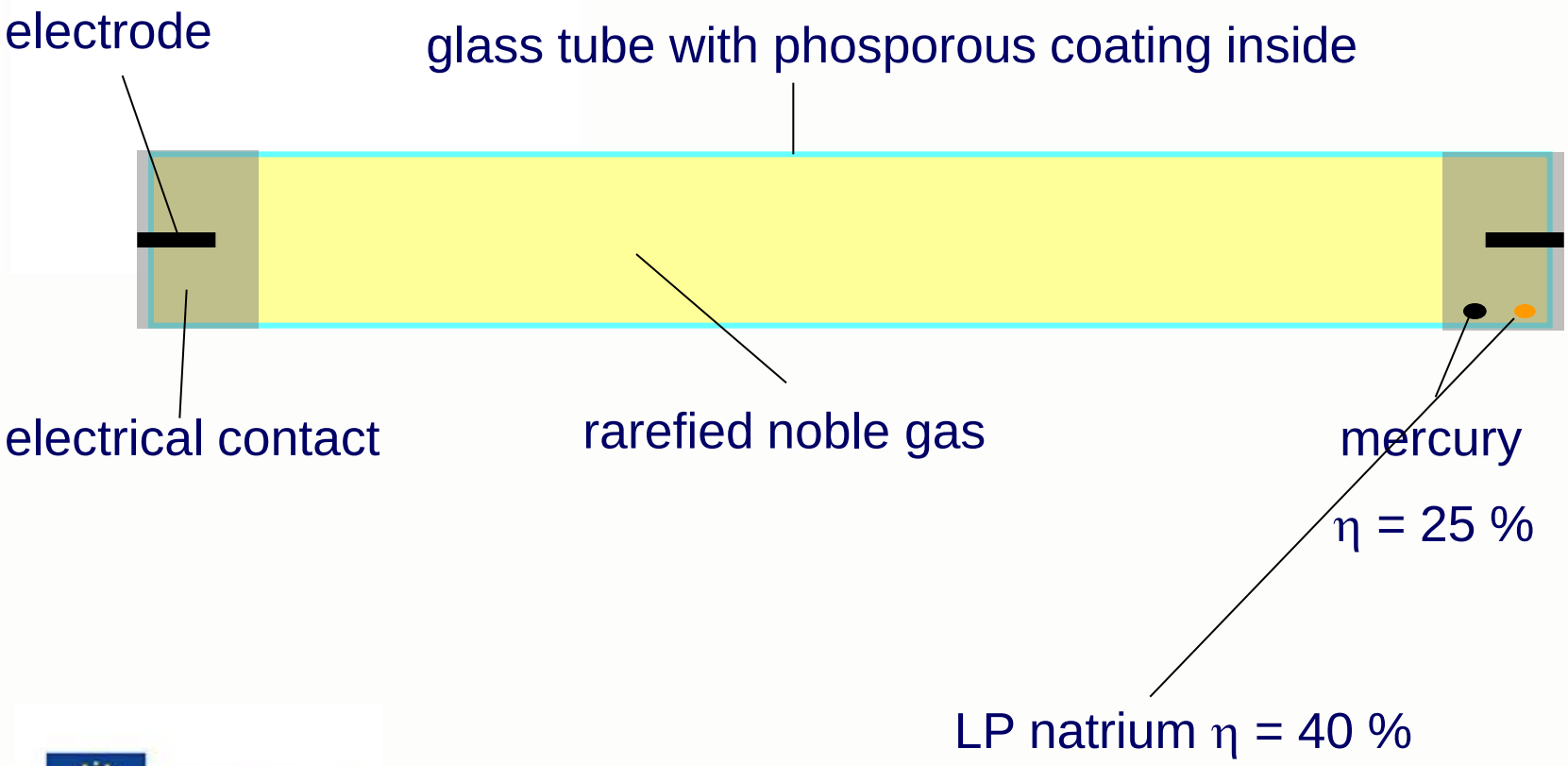
efficiensy (η) = light energy/electrical energy

Tungsten light bulb:

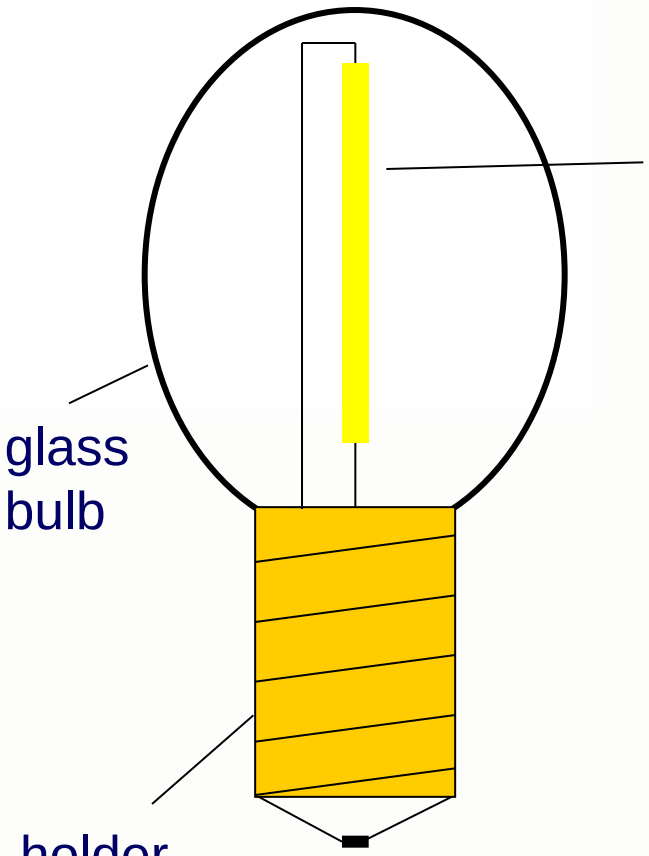


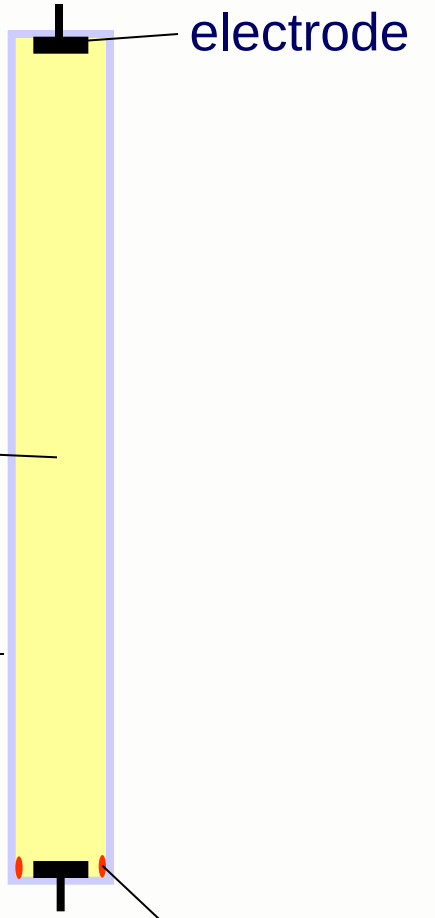
$\eta = 2 - 4\ \%$

Fluorescent tube:



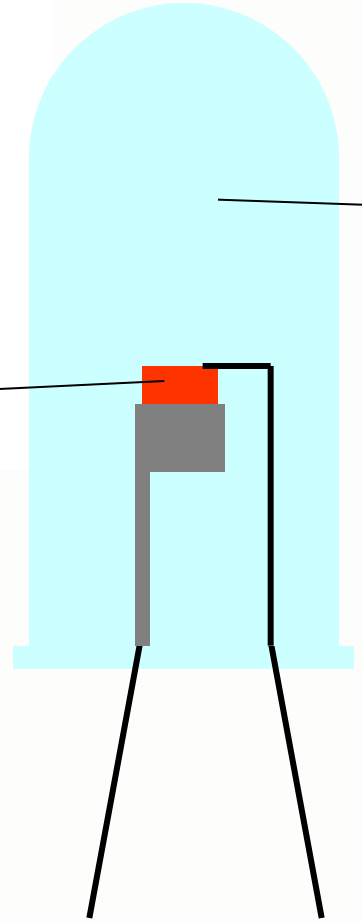
High pressure vapour lamp:





η = 20 - 25 %

LED:



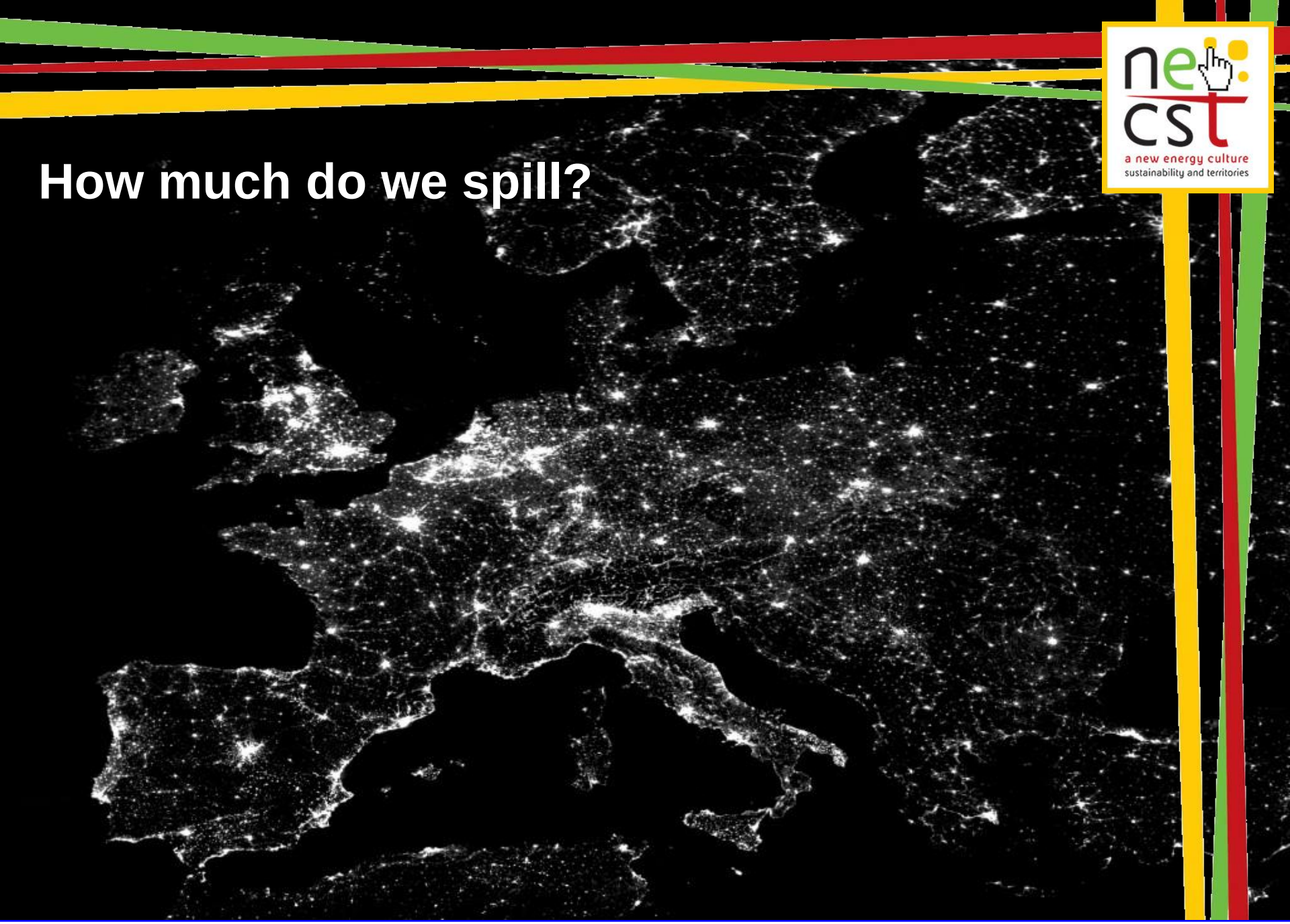
transparent casing/lens

LED crystal

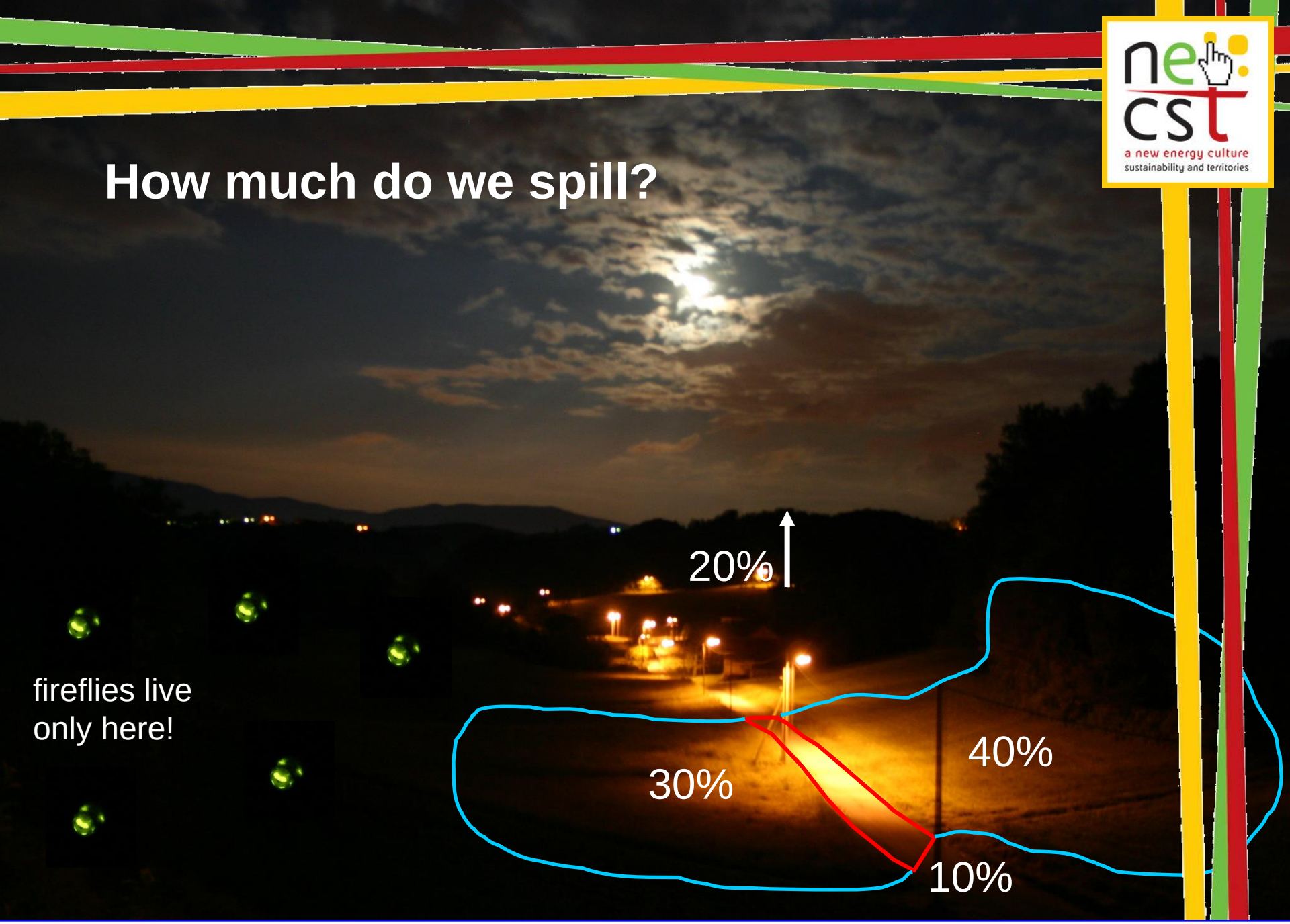
electrical contacts

η = 25 - 30 %

How much do we spill?



How much do we spill?



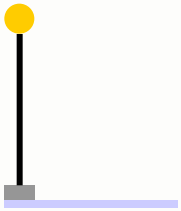
How much energy do we waste?

REMEMBER: wasted light = wasted electrical energy!

Would you drive or repair this car?

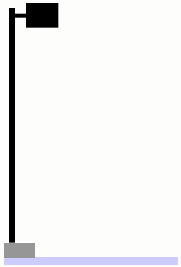
same applies to lighting systems!

Bad or good?



opaque globe, 5m pole, every 15 m

1 000 m road: 66x150 W = 9 900 W



closed lamp, 8m pole, every 25 m

1 000 m road: 40x150 W = 6 000 W

3 900 W (39%) saved!

Meet Croatia!

- EU country in SE Europe
- situated between panonic plain and adriatic sea
- about 4,3 million inhabitants

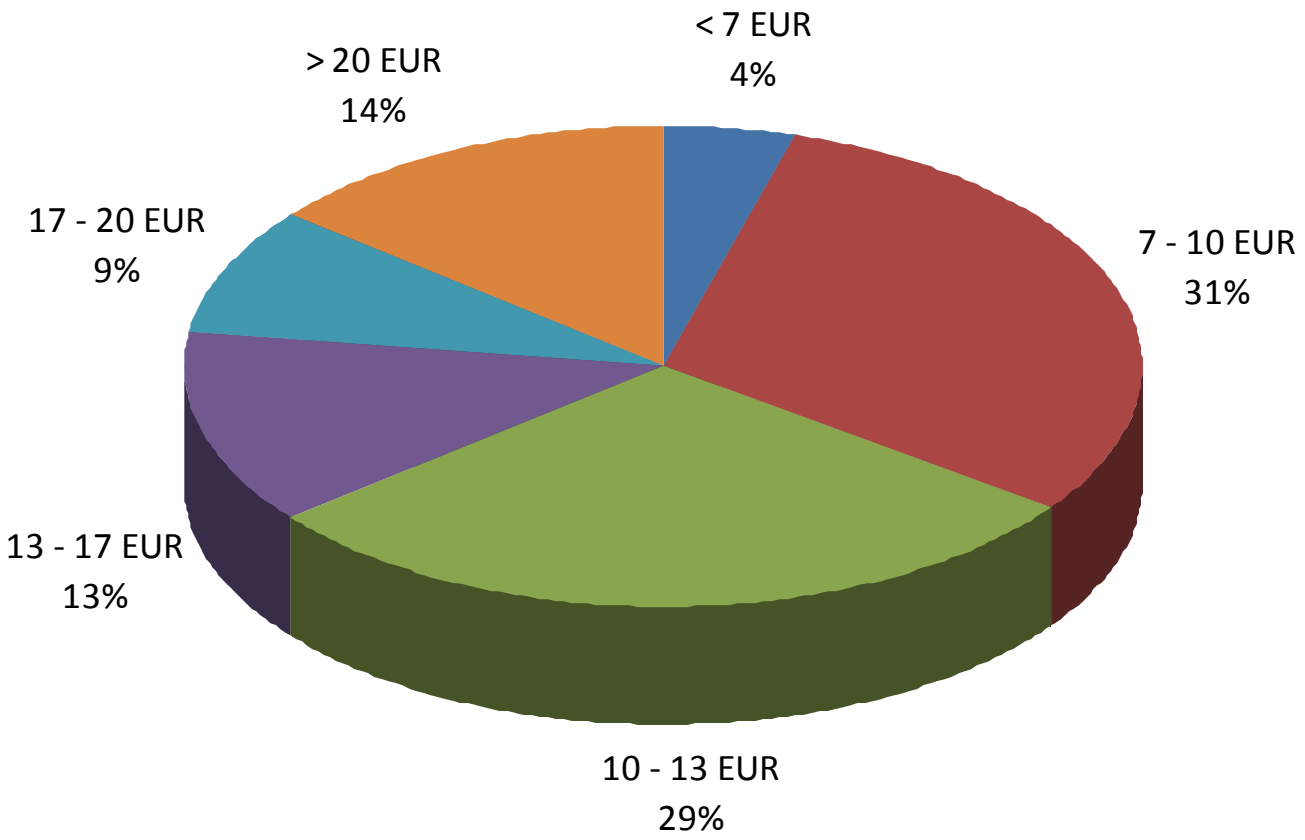
Gathering data:

- town and comunity budgets from their web pages

- about 3 million inhabitants included in the data

(data from B.Sc. thesis of Zdenko Kordić)

Cost of energy for public lighting (per inhabitant, for one year):



Conclusions

- extremes: 0 to 50 EUR, both in smaller comunities

- big cities around average!

- energy costs: 13 EUR per year and inhabitant

- total lighting costs: 19 EUR per year and inhabitant

Conclusions 2

- total cost of public lighting is 83 million EUR per year.

- reducing costs for 10% would save 8.3 milion EUR per year.

Is the future bright or dark?

Depends solely on our awareness that light pollution is a problem and that this problem can be solved if we want it.

We can spill more light around if we do not care.

Or, we can reduce light pollution and save a lot money if we do, without reducing lighting where we really need it.

Example: do we really need light in the sky?

Want to learn more?

https://en.wikipedia.org/wiki/Light_pollution

http://www.darksky.org/