Light Pollution: Why we cannot solve it?

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Zaplana, one of the darkest places in Slovenia ...

… with low clouds …

Reasonable Europe
Czech Presidency of the Visegrad Group 2019/2020

Credit: Javor Kac


Milky way at Grand Canyon
Lights of Phoenix - 285 km

A panorama from Porezen mountain, 1630m, almost darkest place in Slovenia

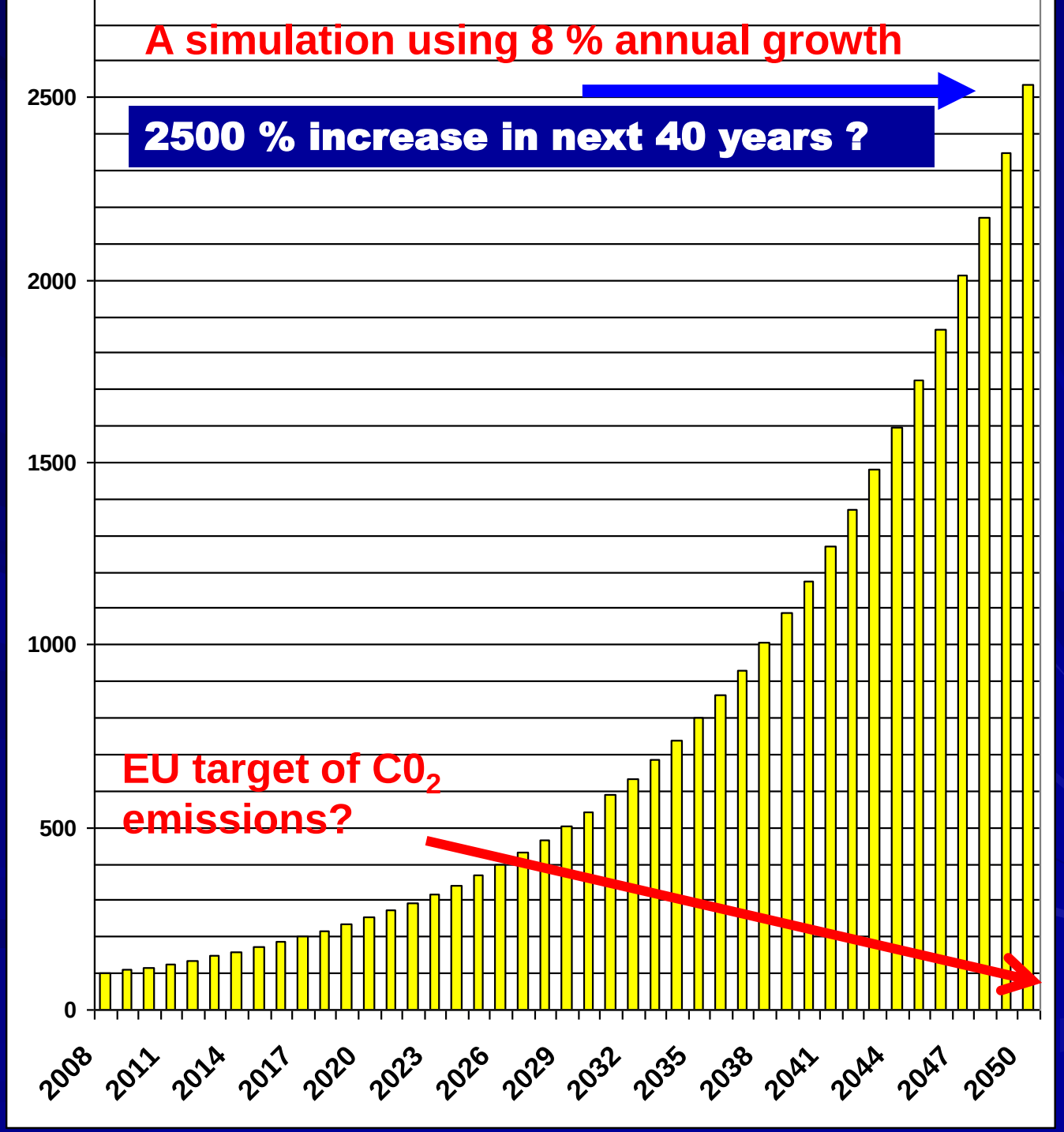
Health problems. It is necessary to sleep in total darkness.

New hotel Aurora, Mali Lošinj, Croatia

Never ending increase of light pollution!

Expected light pollution increase in EU?

8 % annual growth was measured in Slovenia 1990-2005



Light Pollution is so simple to solve like: 1+1 = ?

But Climate change is extremelly difficult problem, practicaly impossible to solve,

1000-times more difficult than light pollution:

$$\rho\left(\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}+w\frac{\partial u}{\partial z}\right)=$$
$$\rho g_x-\frac{\partial p}{\partial x}+\frac{\partial}{\partial x}\left[2\mu\frac{\partial u}{\partial x}+\lambda\nabla\cdot\mathbf{V}\right]+\frac{\partial}{\partial y}\left[\mu\left(\frac{\partial u}{\partial y}+\frac{\partial v}{\partial x}\right)\right]+\frac{\partial}{\partial z}\left[\mu\left(\frac{\partial w}{\partial x}+\frac{\partial u}{\partial z}\right)\right]$$

$$\rho\left(\frac{\partial v}{\partial t}+u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}+w\frac{\partial v}{\partial z}\right)=$$
$$\rho g_y-\frac{\partial p}{\partial y}+\frac{\partial}{\partial y}\left[2\mu\frac{\partial v}{\partial y}+\lambda\nabla\cdot\mathbf{V}\right]+\frac{\partial}{\partial z}\left[\mu\left(\frac{\partial v}{\partial z}+\frac{\partial w}{\partial y}\right)\right]+\frac{\partial}{\partial x}\left[\mu\left(\frac{\partial u}{\partial y}+\frac{\partial v}{\partial x}\right)\right]$$

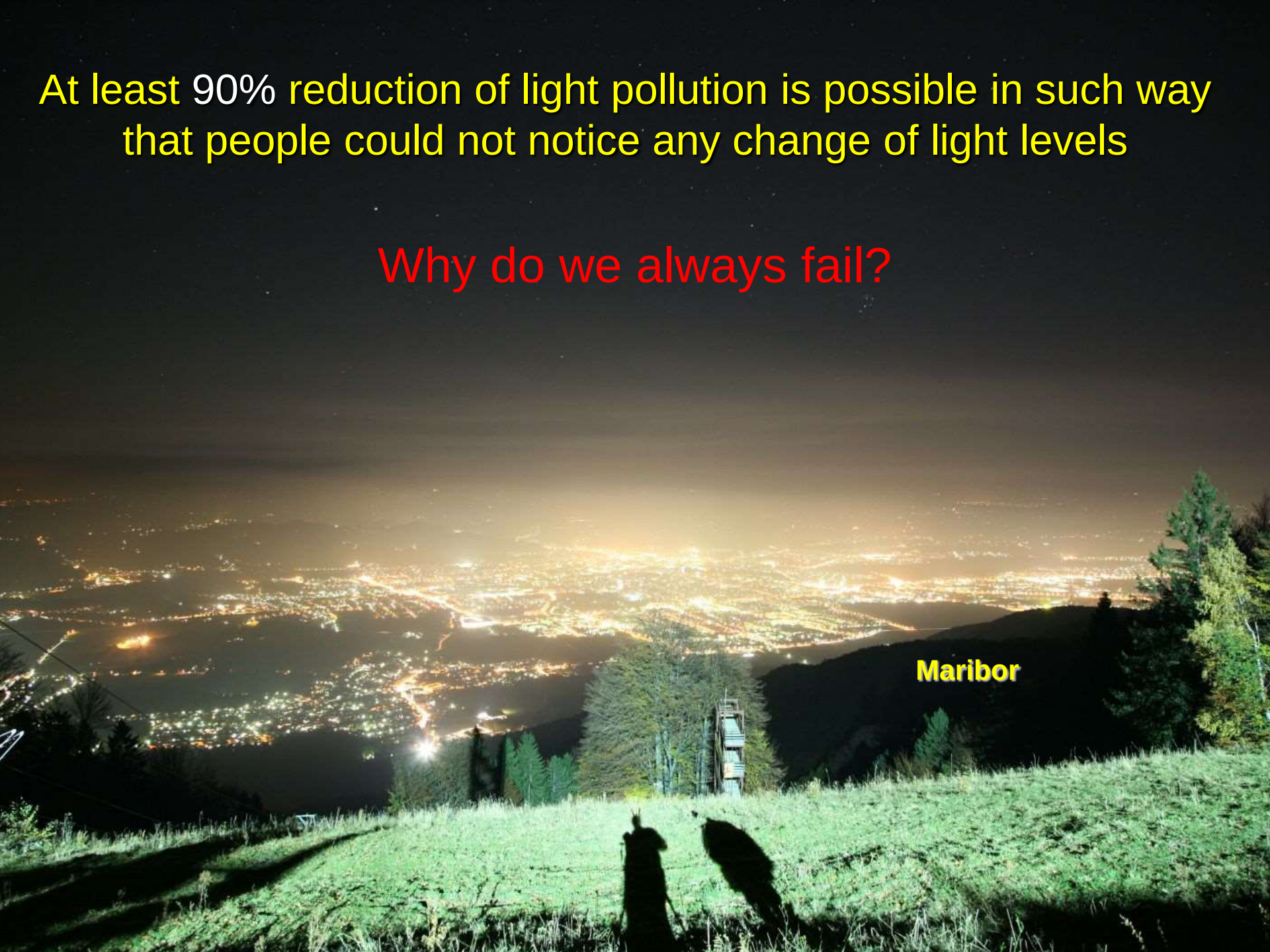
$$\rho\left(\frac{\partial w}{\partial t}+u\frac{\partial w}{\partial x}+v\frac{\partial w}{\partial y}+w\frac{\partial w}{\partial z}\right)=$$
$$\rho g_z-\frac{\partial p}{\partial z}+\frac{\partial}{\partial z}\left[2\mu\frac{\partial w}{\partial z}+\lambda\nabla\cdot\mathbf{V}\right]+\frac{\partial}{\partial x}\left[\mu\left(\frac{\partial w}{\partial x}+\frac{\partial u}{\partial z}\right)\right]+\frac{\partial}{\partial y}\left[\mu\left(\frac{\partial v}{\partial z}+\frac{\partial w}{\partial y}\right)\right]$$

And what environmentalists and governments do?

They put all energy and money into climate change, despite that they are not able to solve super simple light pollution!

At least 90% reduction of light pollution is possible in such way that people could not notice any change of light levels

Why do we always fail?



Slovenia has THE world‘s strongest light pollution law adopted in 2007 – it is not effective because it is still too soft

Because of law, LP decreased in 2006 -2012 (ULOR 0 % helped)

Since 2012 LP increases again because of EN 13201 and white 4000K LED

Ljubljana, BTC (commercial center) as seen from Šmarna gora hill

How much light do we send into Universe / per capita?

Source: VIIRS Satellite 2019

Germany:

Radiance per person:

42 units

Poland:

Radiance per person:

83 units

Slovakia, Slovenia, Hungary:

Radiance per person:

63 units

Czechia:

Radiance per person:

66 units

Matajur mountain, 1400m, border Slovenia - Italy

Why are highways in Slovenia illuminated?

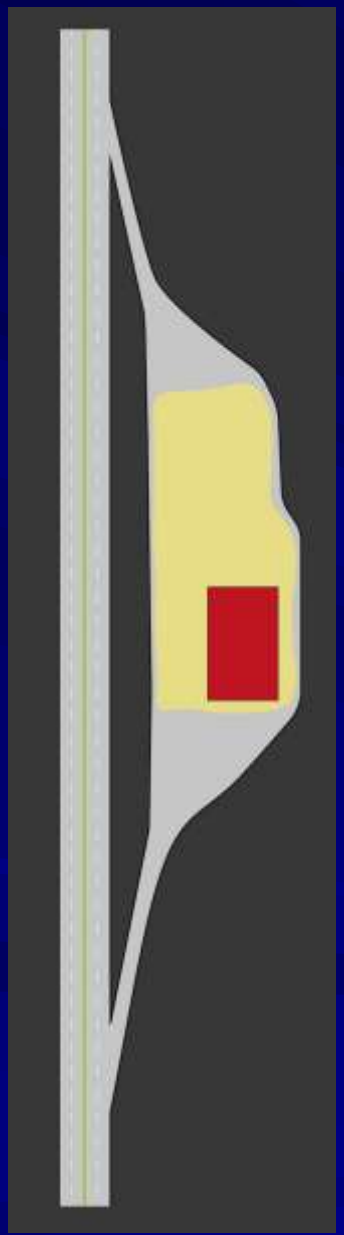
CIE DIV 4 member (20+ years?)
Mr. Marko Bizjak was technical director of lighting company „Javna razsvetljava“ which was the main supplier of lighting for highways.

Bizjak wrote in 2001 a „Study“ that illumination is necessary on highways (junctions and exits).

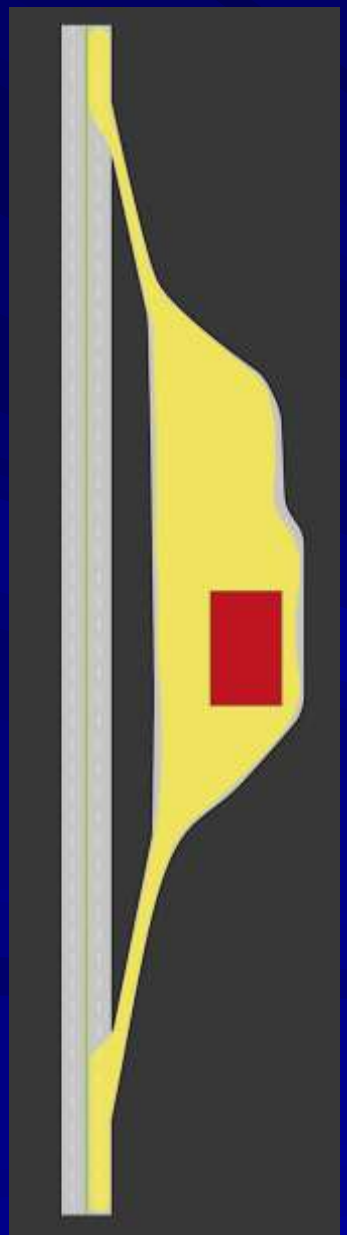
Based on Bizjak‘s study Government of Slovenia in 2006 adopted legislation - illumination is now obligatory on highways!

Illumination of services (gas stations) on highways in Europe

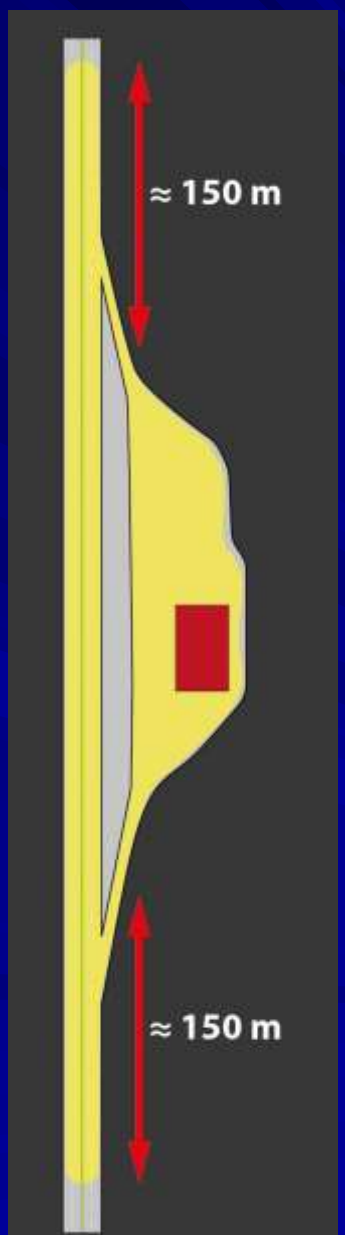
Germany

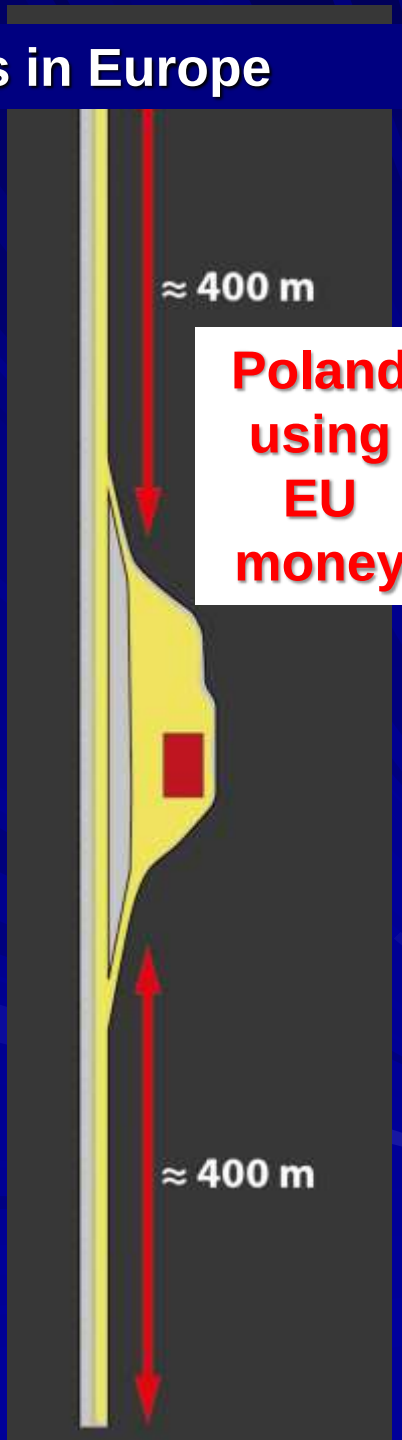


Slovenia, Italy



Croatia – high glare





Poland using EU money

Poland – un-necessary illumination on highways

(north of town Zabrze 9.10.2014, measured by Andrej Mohar)

99% roads in EU are less illuminated than it is requested in EU norm EN 13201-x

Las Vegas – main road in city center – 0.08 cd/m^2

Requested luminance levels In EN13201 (cd/m^2)

0.30
0.50
0.75
1.00
1.50
2.00

Lighting as a fashion

New white LED luminaires (4000K) are versus old environmentaly friendly HPS (yellow light) or amber LED similar degradation as we could see in fashion industry…

We loose billions on „fashion“ jeans which is not practical and it is not long-lasting – the same is in lighting industry.

Park-Ride – Ljubljana Barje, paid by EU funds
Made according to EU norm EN 13201
Higher uniformity = higher lighting poles = more energy needed

European Union
European Regional Development Fund
Investing in your future!

Almost every investment from EU means degradation of night environment!

Slovenia – we have about 100 fatal casualties per year on roads

2 people out of 100 (2%) die because of crashes into lighting pole

More lighting poles = more chances for crashes

Higher uniformity = taller and stronger poles = higher chances for fatal injuries

Sežana, Slovenia

62 %

of fatalities during night time is due to alcohol !!!

Based on police data for 10 years (2009-2018)

Italy and Slovenia – Light pollution laws request fasade luminance below 1 cd/m^2

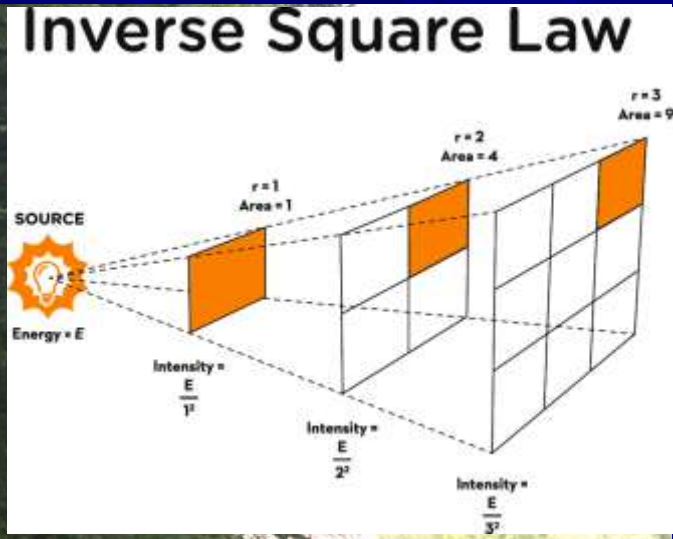
EU norm EN 13201 must NOT be applied in rural areas, because requested illumination levels and uniformities are too high.

a.) people walk in light tunel, black holes on left and right side (unpleasant).

b.) every lighting ends somewhere and then people fall into dark trap.

EU norm EN 13201 requests high poles to achieve high uniformity

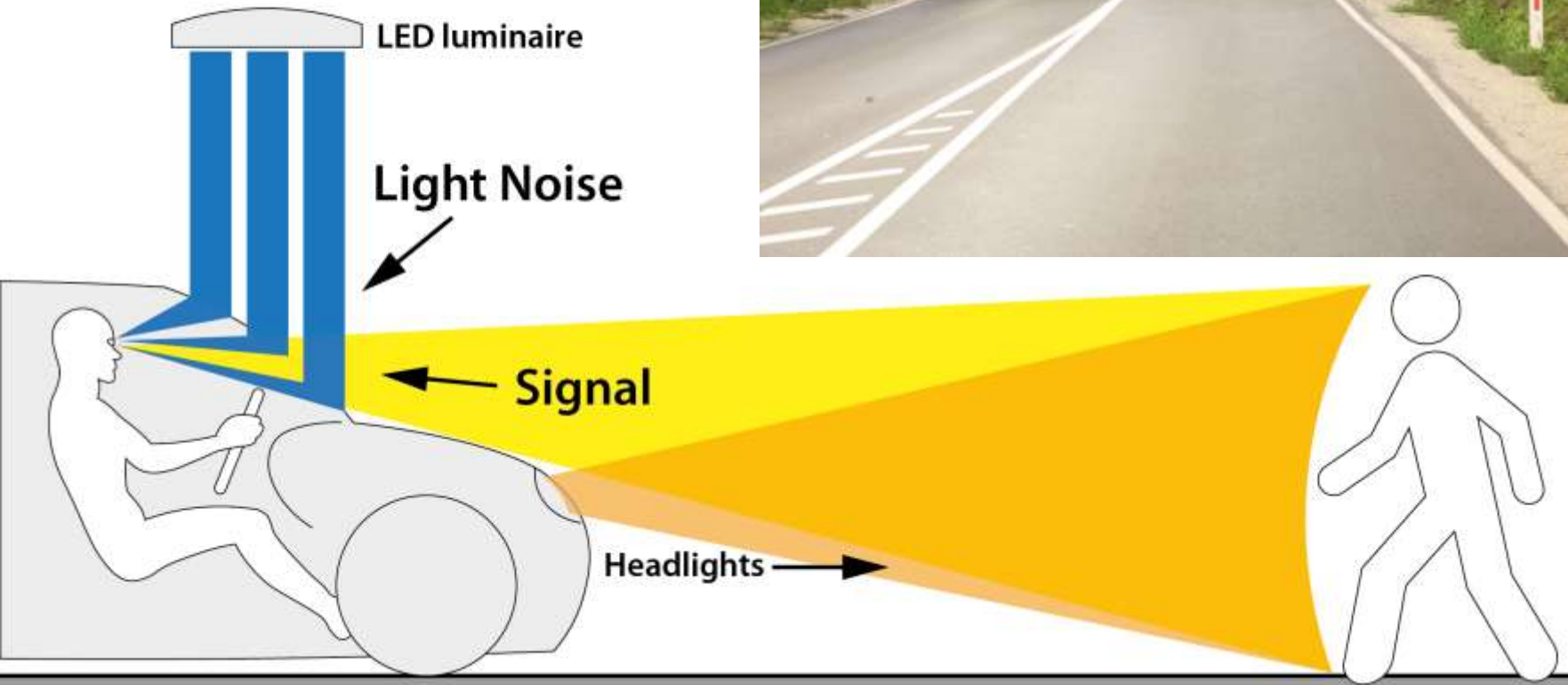
Results: too high energy consumption, too many lamps, often lamps in trees



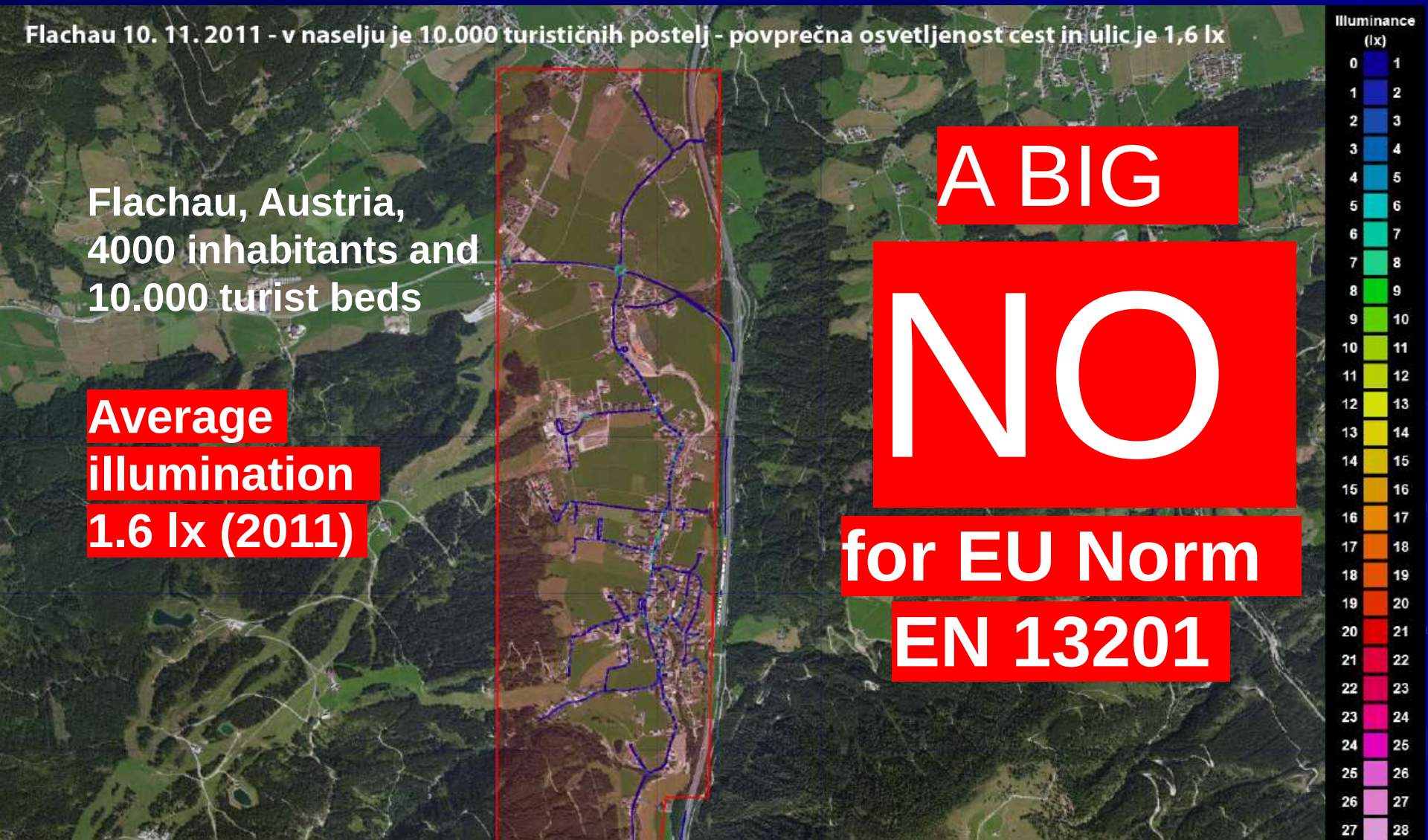
Bukovica

EN 13201 illumination levels stimulate accidents because they are too high – case town Šentjur

Light Noise from 4000 K LED luminaire was too high and pedestrian was not visible. Road illuminated according to EN13201.



If we illuminate EU according to EN 13201, illumination levels and light pollution will increase from 1000% to 2000%. Nobody has money to pay this in next 200 years and we are not allowed to experiment with human health and biodiversity!



Recommended documents for sustainable lighting:

Minimum Requirements for the EU Green Public Procurement Criteria for Street Lighting and Traffic Signals

Criteria Proposal

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Fabio Falchi
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22th of January 2017

Light Pollution Experts Coalition

Members of the European Environmental Bureau (EEB), www.eeb.org

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