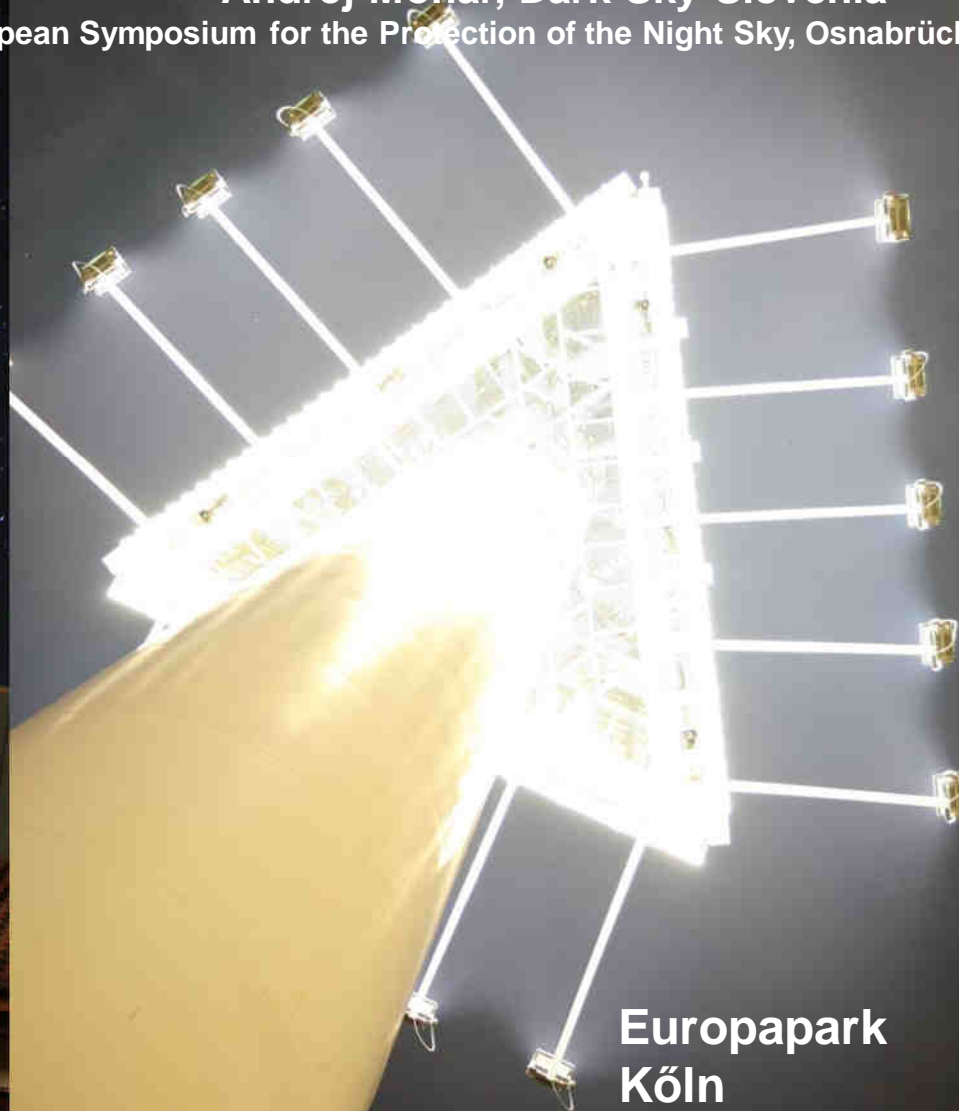


Slovenia has survived 4 years since adoption of Light Pollution Legislation

Andrej Mohar, Dark-Sky Slovenia

11th European Symposium for the Protection of the Night Sky, Osnabrück, 7th October, 2011



Europapark
Köln



Slovenia has adopted in august 2007 perhaps the most advanced light pollution legislation on our planet (similar to Lombardy type of law)

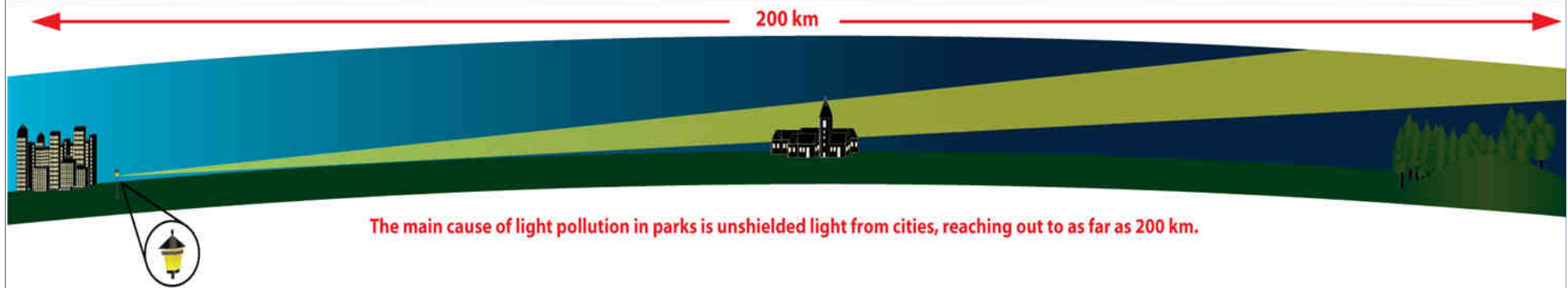


Ljubljana had before LP legislation better (newer) lighting than average German city

Below: results after reconstruction



Cities and towns are main sources of light pollution



- ☐ This is why Slovene light pollution legislation request 0% ULOR for all luminaires without any zones
- ☐ we in Slovenia understand zoning as technical mislead
- ☐ Just 1 % of light going a little above horizon can increase light pollution by 100 %

In the first year(s) since adoption of LP legislation was a strong pressure that:

1. There will be more accidents

Result: Slovenia decreased number of deaths in traffic accidents by almost half since 2007.

2. Energy consumption in public lighting will increase

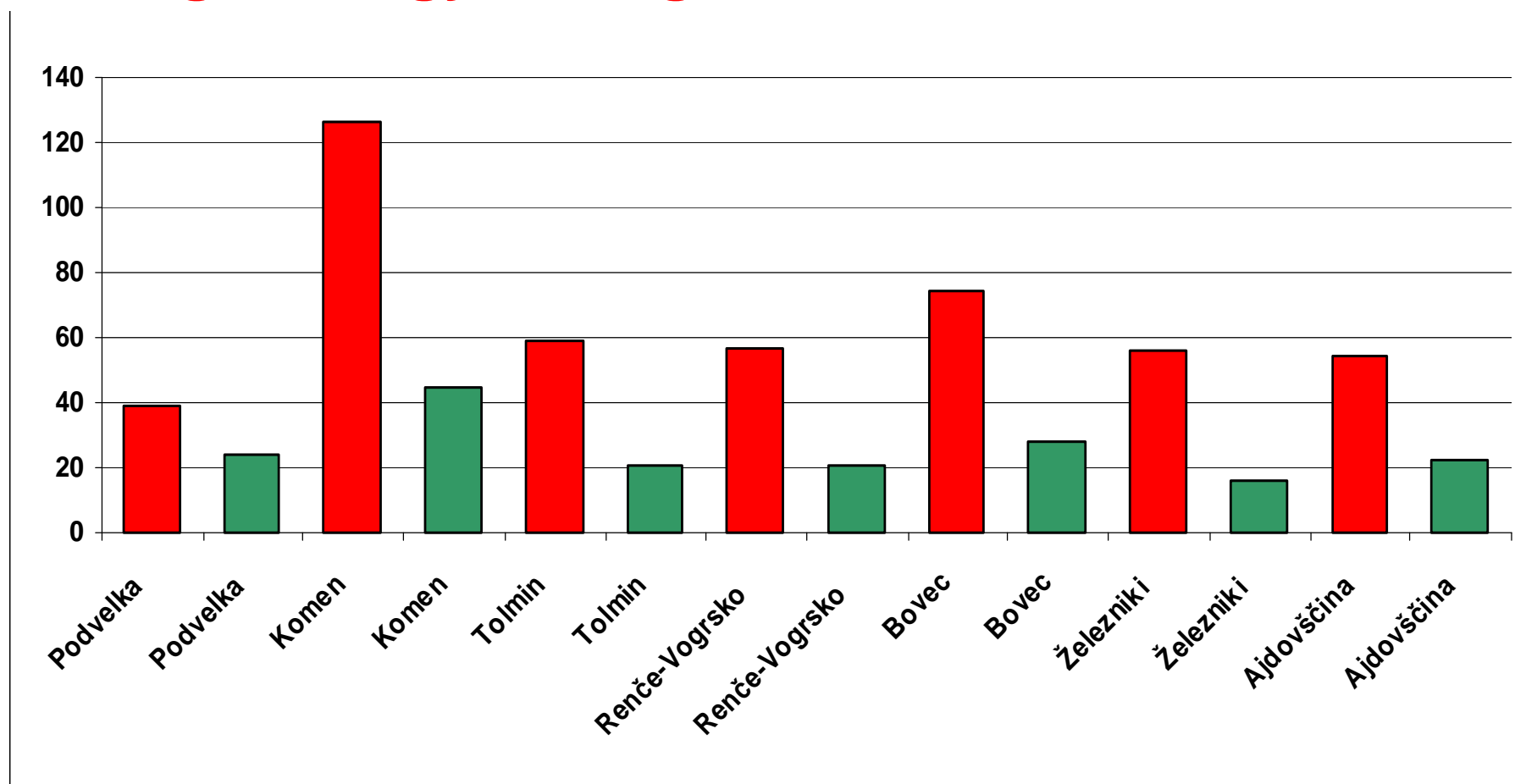
Result: savings in communities either planned or realized are 40 % to 60%.

Energy savings in communities in Slovenia in kWh/person/year:

red (kWh/person/year before reconstruction),

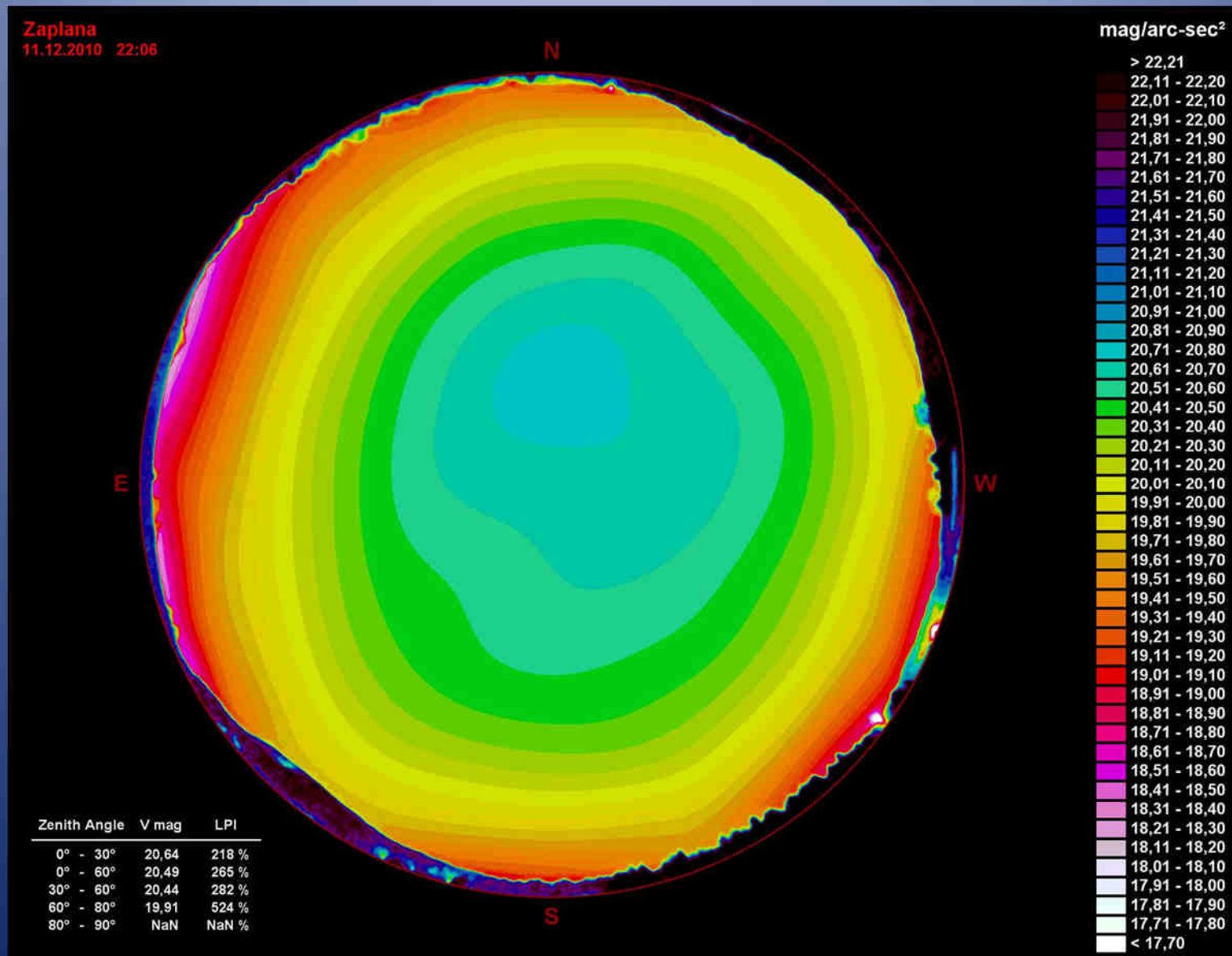
green after reconstruction according to Slovene LP Law

Average energy savings are between 40% - 60 %



Zaplana Observatory – 25 km distance from Ljubljana - 0.1 magnitude darker

Črni Vrh observatory – 40 km distance from Ljubljana - 0.1 magnitude darker

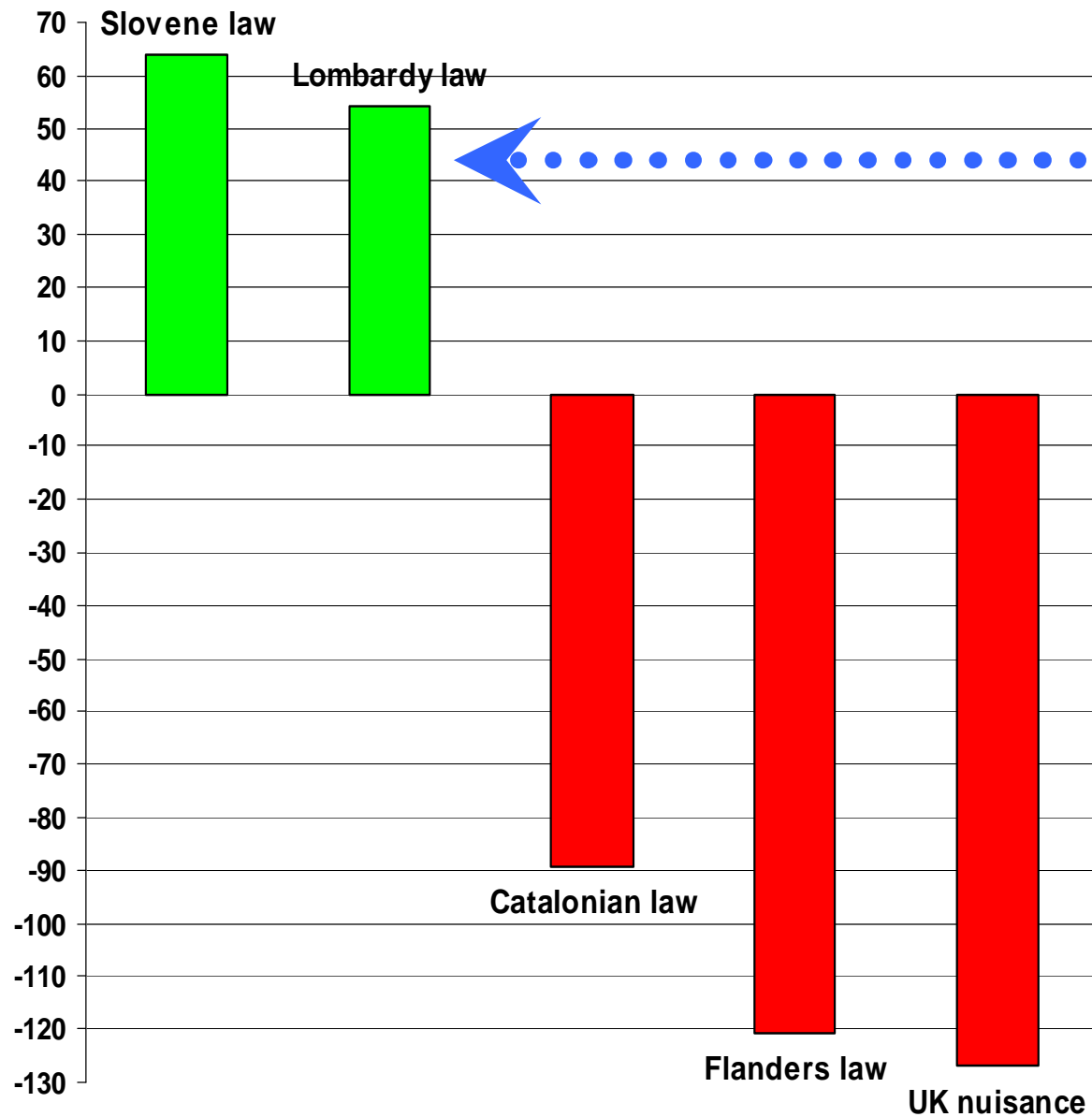


LEX – Light pollution Law Efficiency indexX



Protection

Degradation



less glare, beter visibility !!!

**New
(FCO)**

Old

Ljubljana,
Tivolska road



Light Pollution Law consequences in Ljubljana



250 W



150 W (FCO)

+20 %

higher level of road illumination !!!

From 1970 to 2007

2008



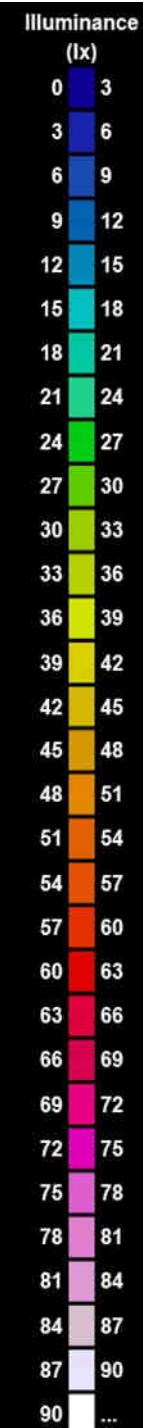
Object: Tivolska road

Location: From Prešernove to Celovške road

City: Ljubljana



Average Illuminance: 38.4 lx



Camera position

Date and Time: 19. 6. 2011 23:21

50 m

Importance of LP protection factors:

1. Zero (0%) light

above horizontal

2. No blue light

3. Use lower levels of illumination

**Extreme importance of zero light (0% ULOR) above horizon –
this is the most important factor to reduce light pollution**

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



No comment.....



Church in Tupaliče

Life at Night



A Project for Decreasing the Negative Impacts of Illuminating Cultural Heritage Sites and for Improving the Nature Conservation Status of Nocturnal Animals



What is light pollution?



Why should cultural heritage sites be illuminated properly?



What impact does artificial light have on animals?



What kind of project and solutions did we prepare?

LIFE project – LIFE AT NIGHT

budget 595.000 euro

3 ½ years

Življenje ponoči

Evropski projekt

Life at Night

improving the conservation status of nocturnal animals by reducing the effect of artificial lighting at cultural heritage sites

Projekt za zmanjšanje negativnih vplivov osvetljevanja objektov kulturne dediščine in izboljšanje naravovarstvenega statusa nočnih živali



Kaj je svetlobno onesnaženje?



Zakaj je potrebno pravilno osvetljevati objekte kulturne dediščine?



Kako umetna svetloba vpliva na živali?



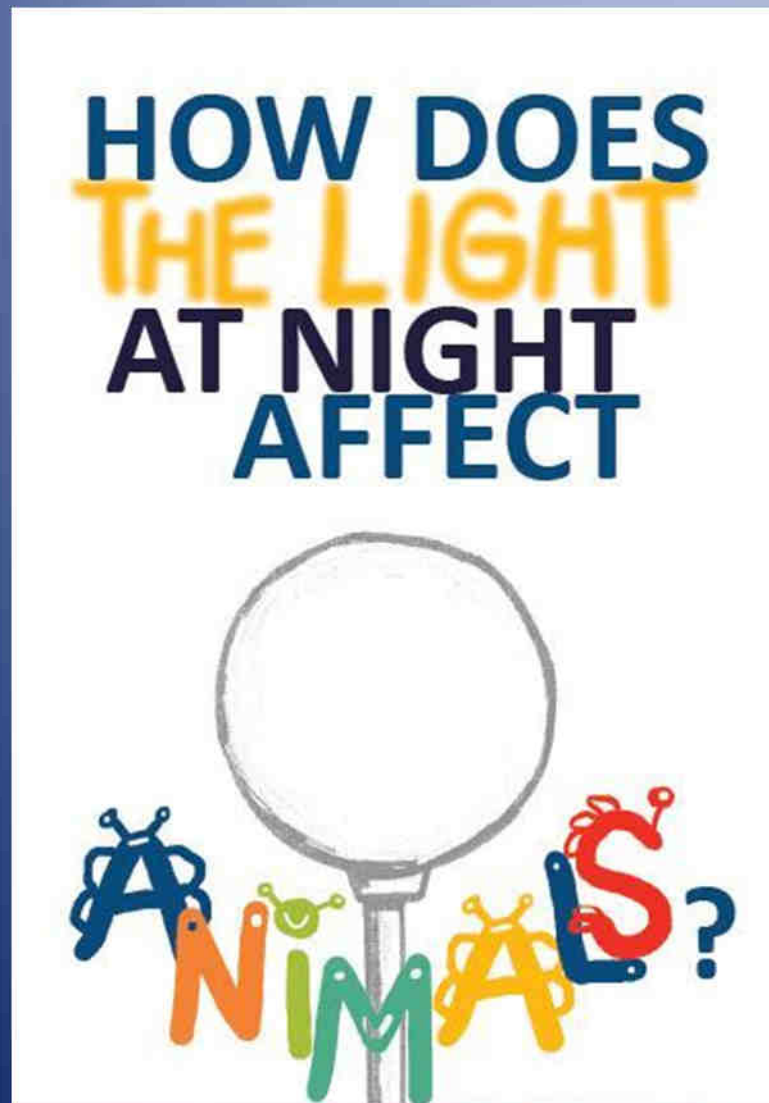
Kakšen projekt in rešitve smo pripravili?

A special projection luminaire was developed by Dark-Sky Slovenia & Euromix company (Life at night project)



This technology can provide that less than 1 % of light pass by facade





LIFE project – LIFE AT NIGHT

budget 595.000 euro

3 ½ years

Leaflets for children...

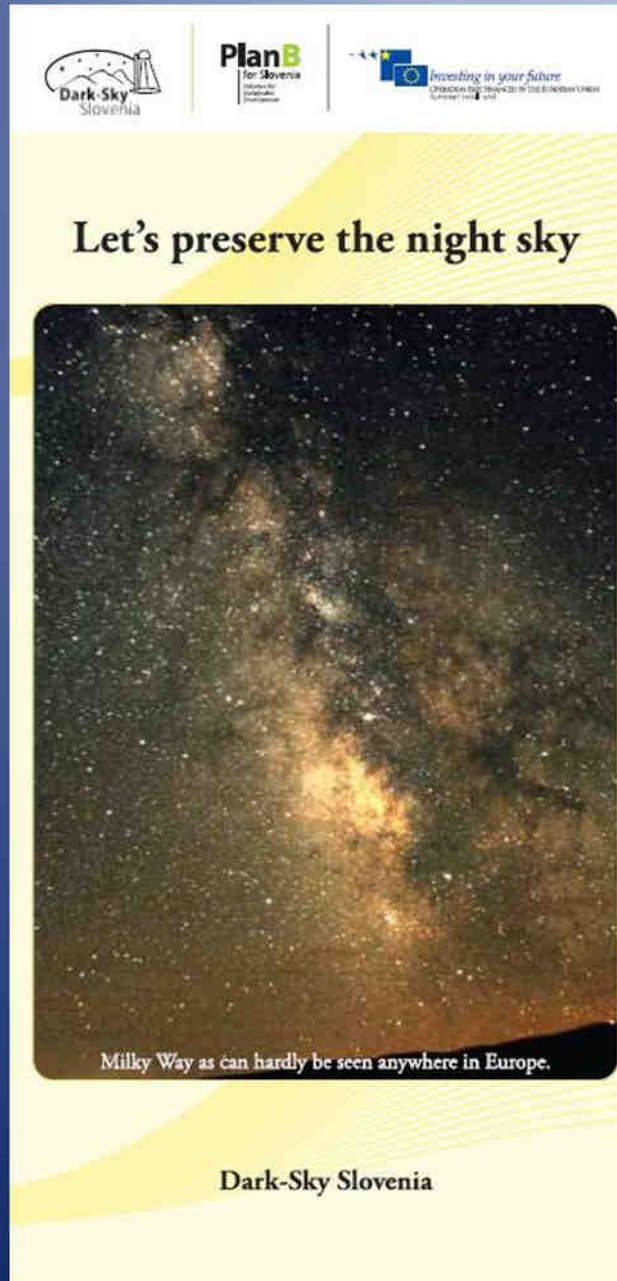


Dark-Sky Slovenia

3 full time employees

LIFE at NIGHT

Project Futurelights (Slovenia – Italy) – participant 95.000 euro
Leaflets for children...
Several new projects in procedure



Object: Villach-Beljak main road crossing town

Location:

City: Villach-Beljak

Average Illuminance: 5.1 lx

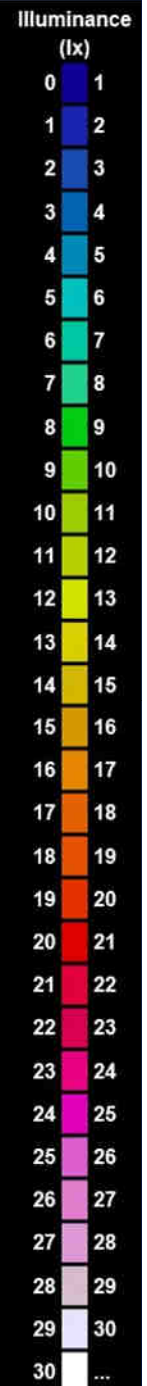
RoadScan System

commercial product, patent pending

Villach, Austria, 59.000 inhabitants

Date and Time: 20. 6. 2011 02:02

500 m



Object: Road Armando Diaz

Location: From center direction west

City: Tarvisio-Trbiž, Italy

Average Illuminance: 20 lx



Illuminance
(lx)

0	3
3	6
6	9
9	12
12	15
15	18
18	21
21	24
24	27
27	30
30	33
33	36
36	39
39	42
42	45
45	48
48	51
51	54
54	57
57	60
60	63
63	66
66	69
69	72
72	75
75	78
78	81
81	84
84	87
87	90
90	...

Main road in Tarvisio, 4800 inhabitants

Date and Time: 20. 6. 2011 03:03

200 m

EcoCandela Measuring System

Brightness of roads, Fassades, billboards – commercial product

Luminance
(cd/m²)

0	25
25	50
50	75
75	100
100	125
125	150
150	175
175	200
200	225
225	250
250	275
275	300
300	325
325	350
350	375
375	400
400	425
425	450
450	475
475	500
500	525
525	550
550	575
575	600
600	625
625	650
650	675
675	700
700	725
725	750
750	775
775	800
800	825
825	850
850	875
875	900
900	925
925	950
950	975
975	1000
1000	...

Approximate Calibration



Billboard Name
UniCredit Bank

Address
BTC Ljubljana

Date
29.6.2010

Area
2,1 m²

X Average Luminance
463 cd/m²

X Environmental Impact
1802 lm

X Average Color
Corrected Luminance
530 Color cd/m²

X Color Corrected
Environmental Impact
2063 Color lm

Color Temperature
4912 K

Photographer	
Longitude	E 0° 0' 0,0"
Latitude	N 0° 0' 0,0"
Camera Azimuth	0 °
Camera Height	0 m
Distance	8,94 m
Height	0 m

**SVETLOBNO
ONESNAŽENJE
IN ENERGETSKO
UČINKOVITA
ZUNANJA
RAZSVETLJAVA**



**Light Pollution and Energy
Efficient Outdoor Lighting**

Dark-Sky Slovenia, 2010, 28 pages

15

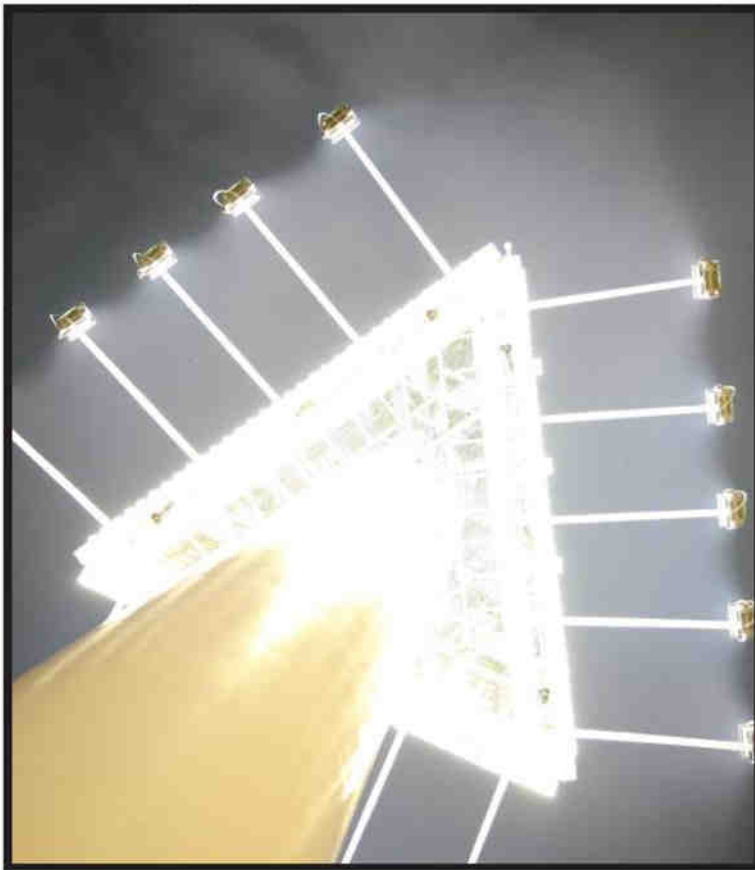
Mentor prof. dr. Igor Žiberna,
Dept. of Geography, University of Maribor

Diploma thesis

3

times on German TV, once
on TV YLE, Finland, ...

Osvetljevanje objektov za oglaševanje



Illumination in Outdoor Advertising

**Dark-Sky Slovenia, Oct 2011,
28 pages**

Initiative and (co) realisation of
4 International Symposia for Dark-sky Parks (last one at Montsec, Spain)



Lastovo 2011

Thank you for your attention