

Kompleksen pristop pri načrtovanju cestne in ulične razsvetljave

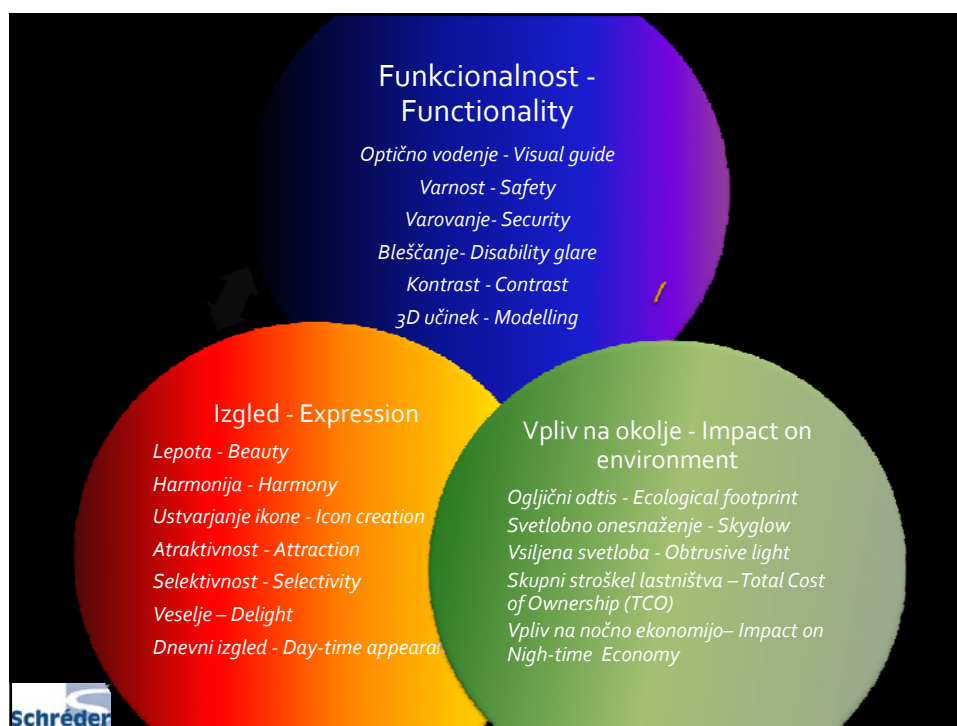
Complex Approach for Street and Urban Lighting Design

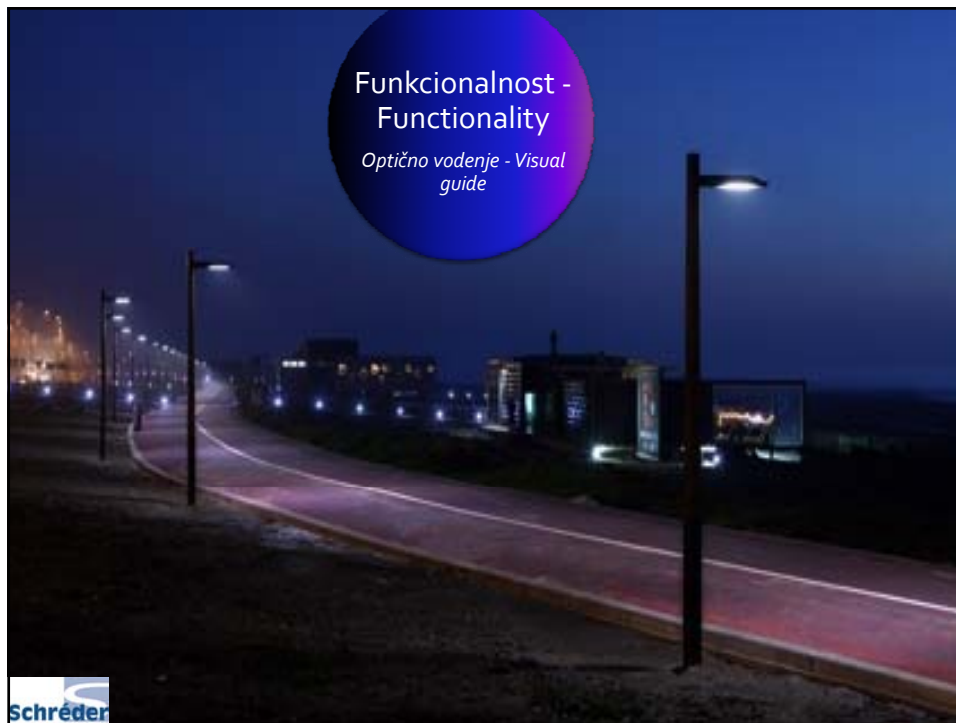
Péter Schwarcz



25.10.2012. Rimske Toplice





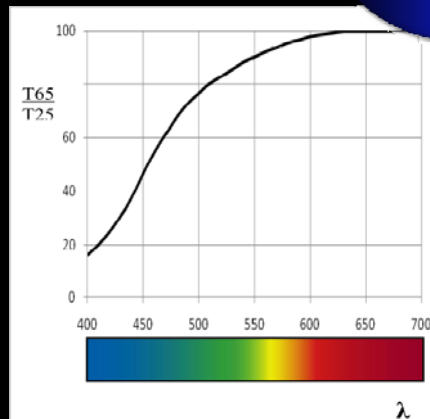


Modrikasta svetloba: Za katero starostno skupino osvetljujemo?

Funkcionalnost – Functionality

Varnost za vse uporabnike – Safety for each user

Blue Rich Light: Which age group we are lighting for?



Primerjava faktorja presevnosti za 65 in 25 let starega opazovalca (WvB)

	Visual dose (%)	
	25yr.	65 yr.
GLS	100	92,9
LED 2700K, Ra 80	100	64,6
LED 4000K, Ra 65	100	52,2
CFL 2700K, Ra 80	100	55,3

The transmission factor of a 65 year old man compared to 25 year old (WvB)

TI: Za katero starostno skupino osvetljujemo?

Funkcionalnost – Functionality

Bleščanje - Disability glare

TI: Which age group we are lighting for?

L_v ekvivalentna zastirajoča svetlost (nova)

L_{av} povprečna svetlost vozišča (nova inštalacija)

E_k osvetljenost na ravnini očesa, ki jo povzroča k-ta svetilka (novo)

θ_k kot med smerjo pogleda in smerjo proti središču svetilke od opazovalca

c Konstanta, ki je odvisna od starosti opazovalca ($c=10$ za starost 23 let)



$$TI = 65 \frac{L_v}{L_{av}^{0,8}}$$

$$L_v = c \sum_{k=1}^n \frac{E_k}{\theta_k^2}$$

$$c = 9,86 \cdot \left[1 + \left(\frac{age}{66,4} \right)^4 \right]$$

L_v equivalent veiling luminance (new!)

L_{av} average road surface luminance (as new!)

E_k illuminance at the plane of the eye made by luminaire 'k' (as new)

θ_k The angle between the line of sight and the direction of the centre of the luminaire from the observer

c Constant depending on the age of observer ($c=10$ at the age of 23)

Meta analiza je potrdila, da je teh 5 študij pokazalo, da izboljšana razsvetljava zmanjša kriminaliteto za 30 % (VB)

Funkcionalnost –
Functionality
Varovanje - Security

A meta-analysis found that these five studies showed that improved lighting reduced crime by 30 per cent. (UK)

Home Office Research Study 251, David P. Farrington and Brandon C. Welsh: Effects of improved street lighting on crime: a systematic review, August 2002



Ali je dobra cestna razsvetljava luxus?

V letu 2009 je socialni strošek zaradi kriminala znašal 3 BnEUR (10⁹) (HU), kar je 3% BDP

Funkcionalnost –
Functionality
Varovanje - Security

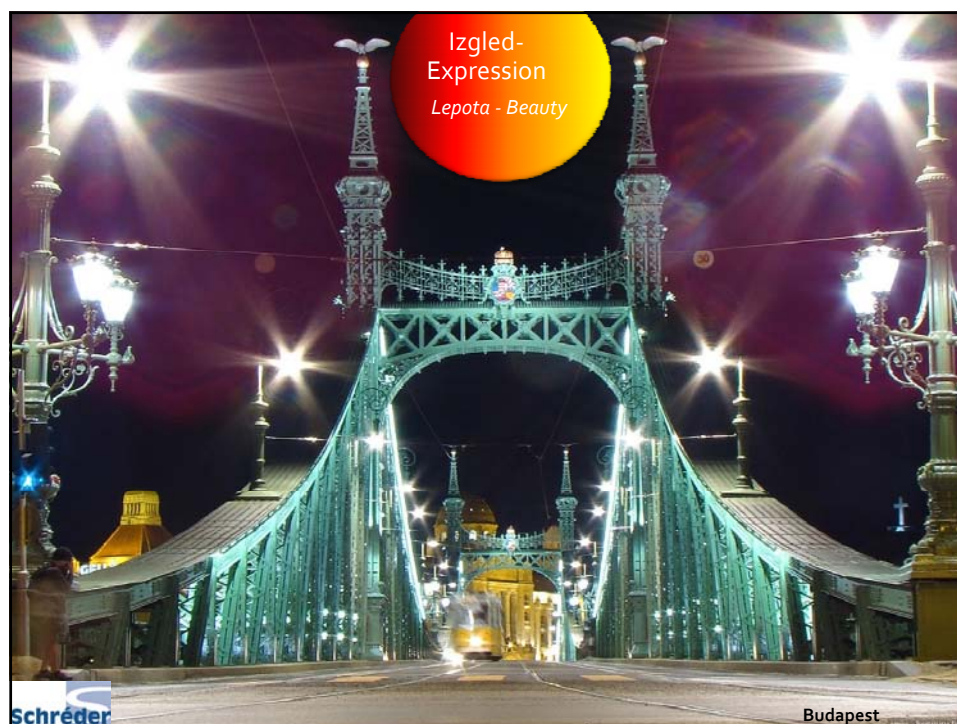
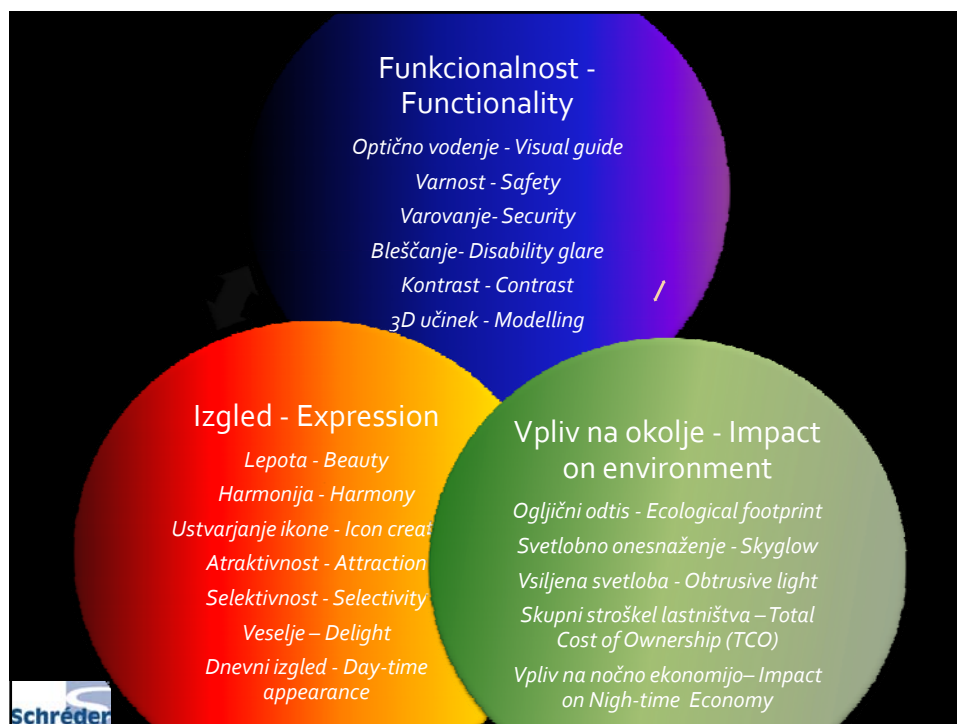
Is a good street lighting a luxury?

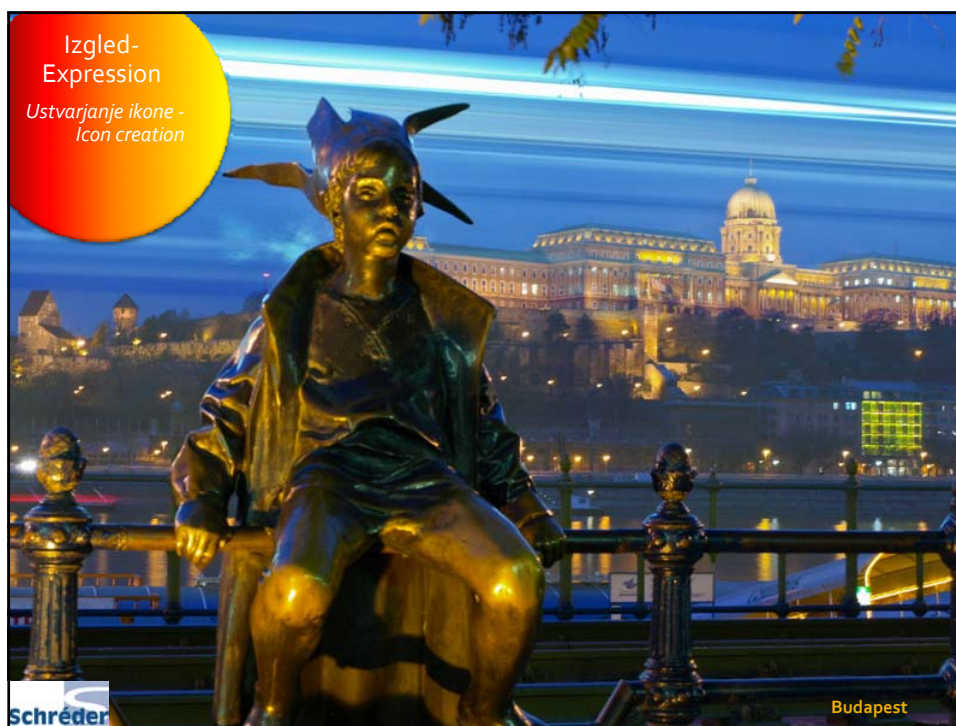
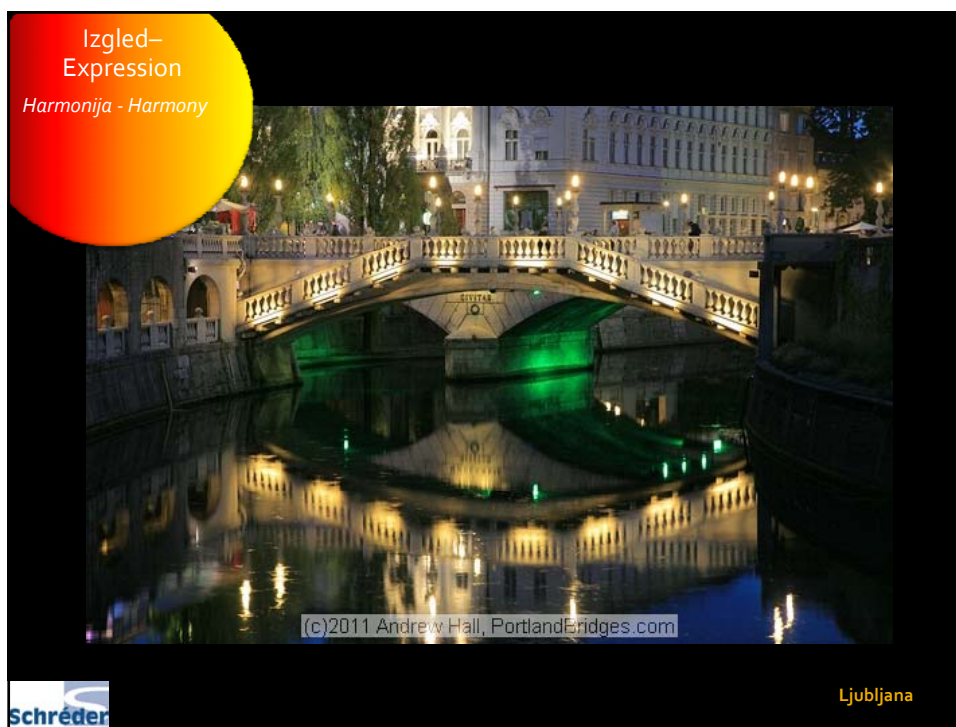
In 2009, the society cost of crime paid by the state was 3 BnEUR (10⁹) (HU). 3% of the GDP!!

Kerezsi Klára, Kó József, Antall Szilvia: A bűnözés társadalmi költségei, Kutatási összefoglaló, Kriminológiai Tanulmányok 48. kötet, 2011 (Szerk.: Virág György) OKRI, Budapest

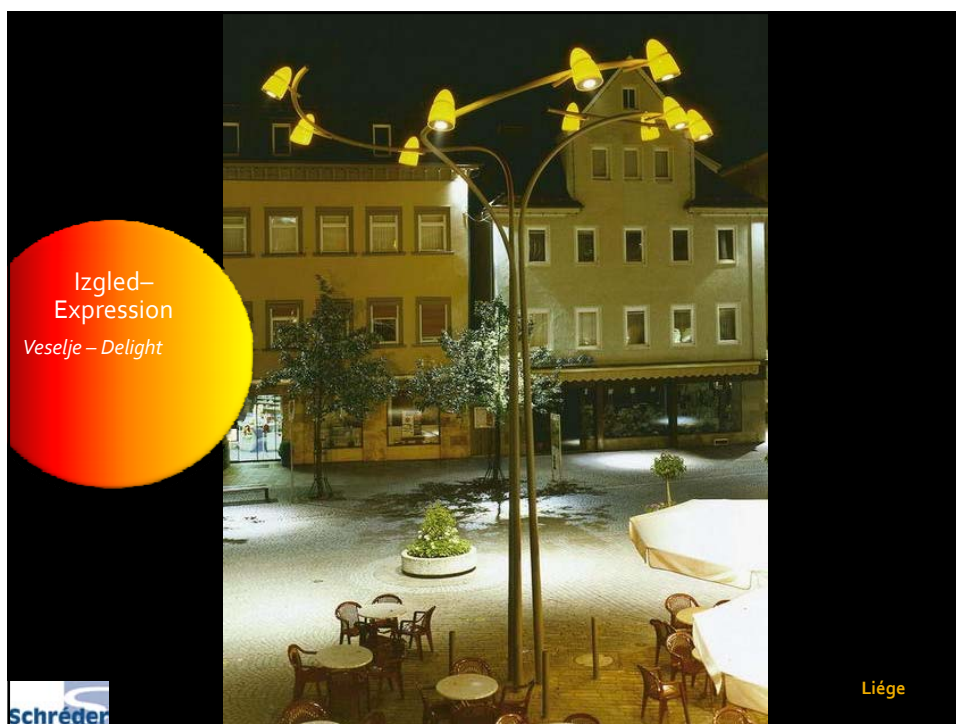


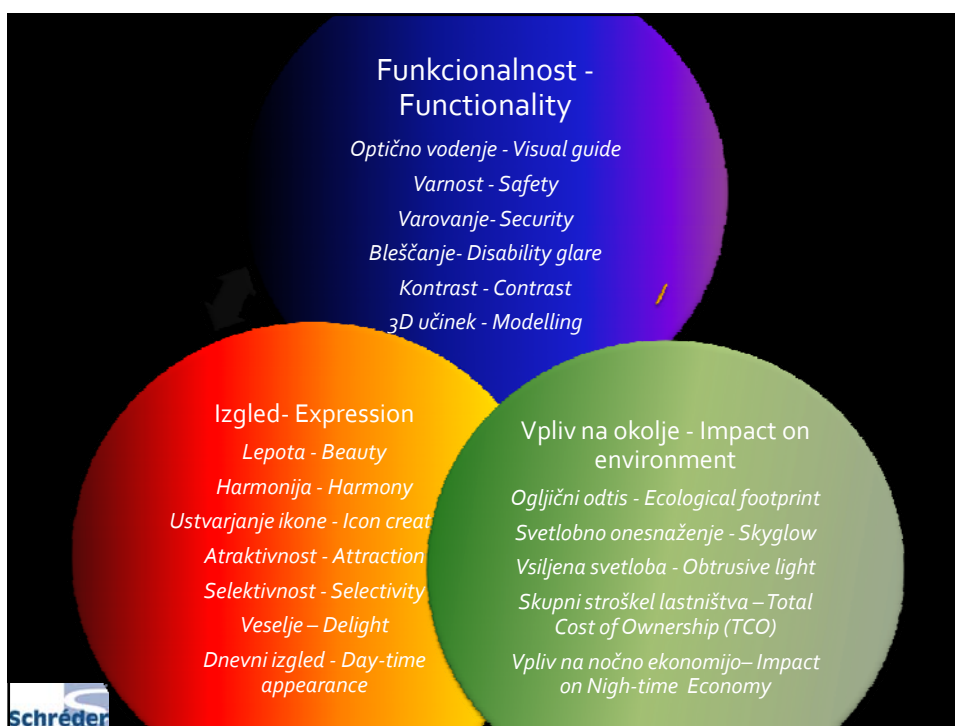
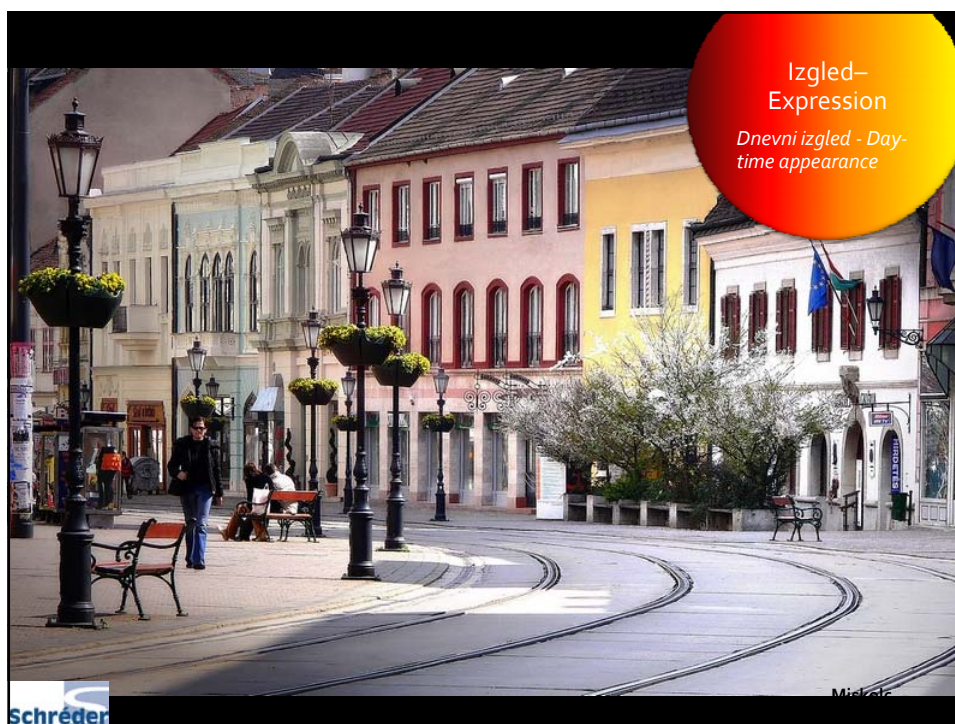












Razsvetljava stavb, javna razsvetljava, dekorativna razsvetljava in osvetljene oglaševalske površine morajo biti izvedene tako, da ne povzročajo

d) svetlobnega onesnaženja

Vpliv na okolje-
Impact on environment
Svetlobno onesnaženje - Skyglow

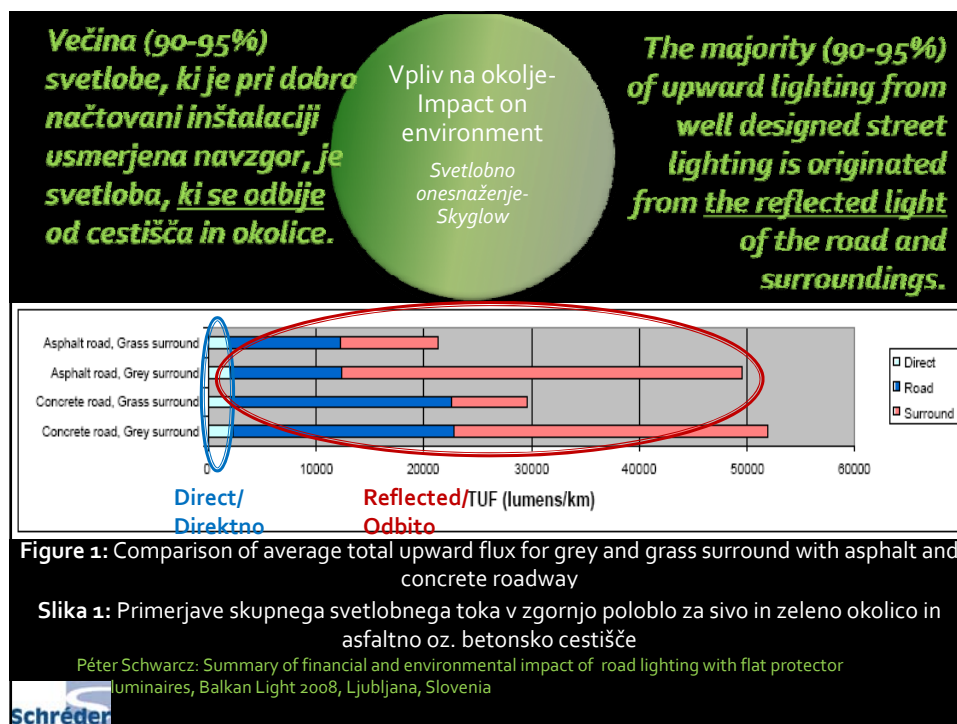
The lighting of buildings, the public lighting, decorative lighting and illuminated advertisements must be made and positioned on a way that they do not cause

d) light pollution.

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...

Az országos településrendezési és építési követelményekről szóló 253/1997. (XII. 20.) Korm. rendelet (OTÉK) 2012. július 30-án megjelent módosítása, Budapest

Schreder



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Vpliv na okolje-
Impact on
environment
Svetlobno onesnaženje
- Skyglow

Nonsense
Nesmisel

...
...
...

Az országos településrendezési és építési követelményekről szóló 253/1997. (XII. 20.) Korm. rendelet (OTÉK) 2012. július 30-án megjelent módosítása, Budapest

Schréder

„Kvota svetlobnega onesnaženje” v odvisnosti od lokacije.

„Quota for the artificial sky-glow” by area or applications.

V bližini observatorijev omejeva (vendar ne nič).
V mestnih središčih nekoliko več.

Near observation sites limited (but not zero).
In city centres a little bit more.

CIE (CEN) naj bi izdelal metodologijo izračuna.

CIE (CEN) should work on calculation method.

Vpliv na okolje-
Impact on
environment
Svetlobno onesnaženje
- Skyglow

Schwarzc Péter

Schréder

■ Prvič, o kakšnih strških govorimo?

- Strošek svetilke, skupaj s predstikalno napravo
- Svetlobni vir – strošek vzdrževanja-skupinska zamenjava svetlobnih virov
- Strošek energije, upošteva vsak prihranek zaradi znižanja svetlobnega toka (dimanje)

Vpliv na okolje-
Impact on environment

Skupen strošek lastništva – Total cost of ownership (TCO)

■ Firstly, what are the costs involved?

- Luminaire cost, including relevant control gear
- Light source maintenance cost – group lamp changes
- Energy cost, accounting for any savings through dimming



Kateri stroški NISO upoštevani?
Skupni stroški za.

- Namestitev kandelabra in svetilke
- Čiščenje svetilke in vzdrževanje ohišja svetilke
- Vzdrževanje predstikalne naprave – življenjska doba in zanesljivost
- Električni preizkus
- Popravilo/zamenjava kandelabra

Vpliv na okolje-
Impact on environment

Skupen strošek lastništva – Total cost of ownership (TCO)

What costs have NOT been considered?
Those common to all:

- Column and luminaire installation
- Luminaire cleaning & luminaire body maintenance
- Control gear maintenance cost – gear life & reliability
- Electrical testing
- Column repair/replacement



Kako naj primerjamo stroške?

4 scenariji, 60W CPO-T (COSMO) kot osnova:

1. CPO-T HID, stalna 100% moč (osnova)
2. CPO-T HID, zmanjševanje svetlobnega toka v nočnem času na 65%
3. LED, svetilka je nadomestilo CPO-T svetilki s 100% močjo
4. LED, zmanjševanje svetlobnega toka v nočnem času na 50%

Vpliv na okolje-
Impact on environment

Skupen strošek lastništva –
Total cost of ownership (TCO)



How do we expect the costs to compare?

Four scenarios, based on 60W CPO-T as the baseline:

1. CPO-T HID, 100% power (*baseline*)
2. CPO-T HID, part-night dim to 65% power
3. LED, light is equivalent to CPO-T at 100% power
4. LED, part-night dim to 50% power



1. ponudnik:

Sijalka 21. stoletja: COSMO

- Preverjena tehnologija - Sealsafe
- Bela svetloba dovoljuje nižje svetlobnotehnične razrede - CPO sijalka
- Elektronska predstikalna naprava - visoko učinkovita
- Nizka cena
- Zadnje posodobitve:
 - 45W možnost zatemnitve na 65 % moči (32W)
 - 6 let življenjske dobe

Vpliv na okolje-
Impact on environment

Skupen strošek lastništva – Total cost of ownership (TCO)

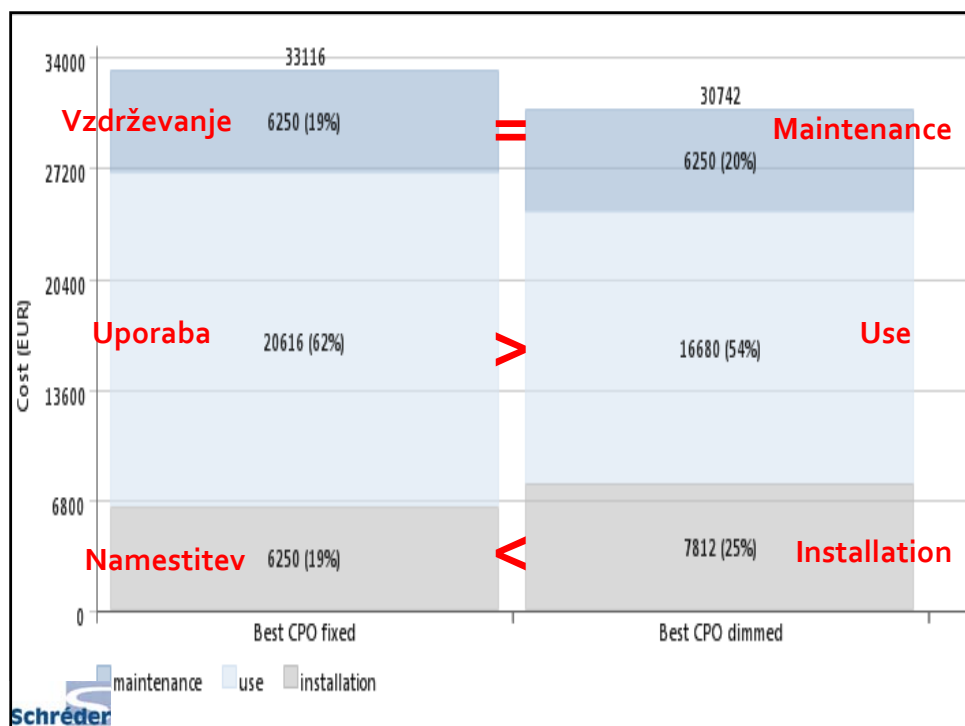
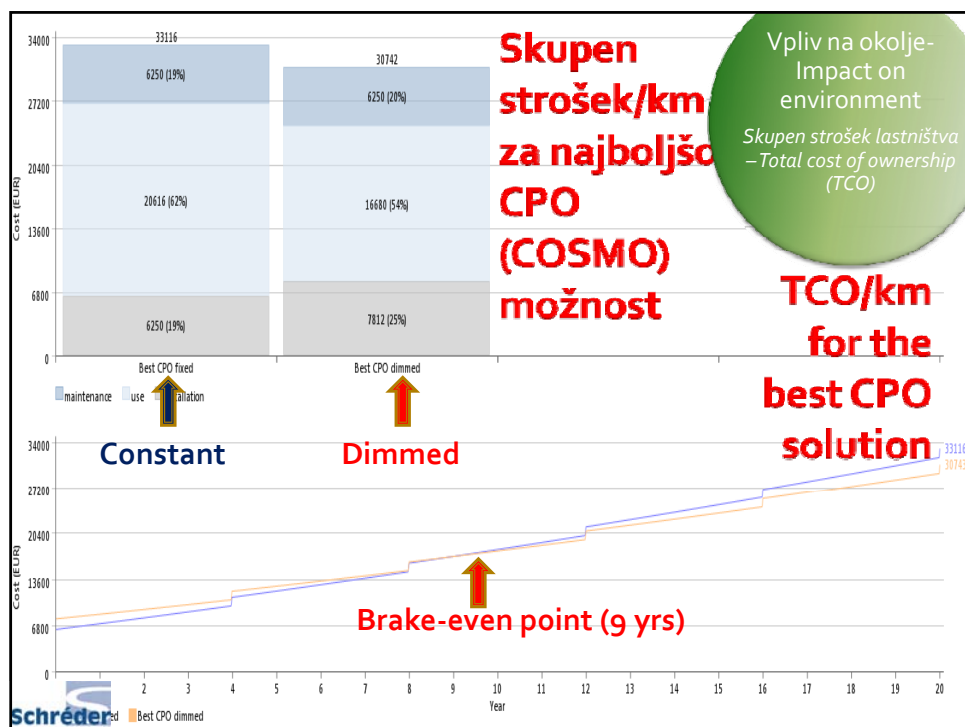


Competitor1:

High Intensity Discharge lighting of the 21th century: COSMO

- Proven technology - Sealsafe
 - White light allows lower lighting levels - CPO lamp
 - Electronic control gear – high efficiency
 - Low cost
- Latest improvements:
 - 45W dimmable down to 65% power (32W)
 - 6 year lamp life





2. ponudnik: zadnja LED tehnologija

- Bela svetloba dovoljuje nižje svetlobnotehnične razrede
- Močnostne LED (1 watt)
- Optično učinkovit sistem
- Dolga življenjska doba
- Možnost skoraj linearnega zmanjševanja svet. toka
- Zadnje posodobitve:
 - Visoko učinkovite LED
 - 24 LEDs = 30W ~ ekvivalentno 45W CPO

Competitor2: Latest LED lighting

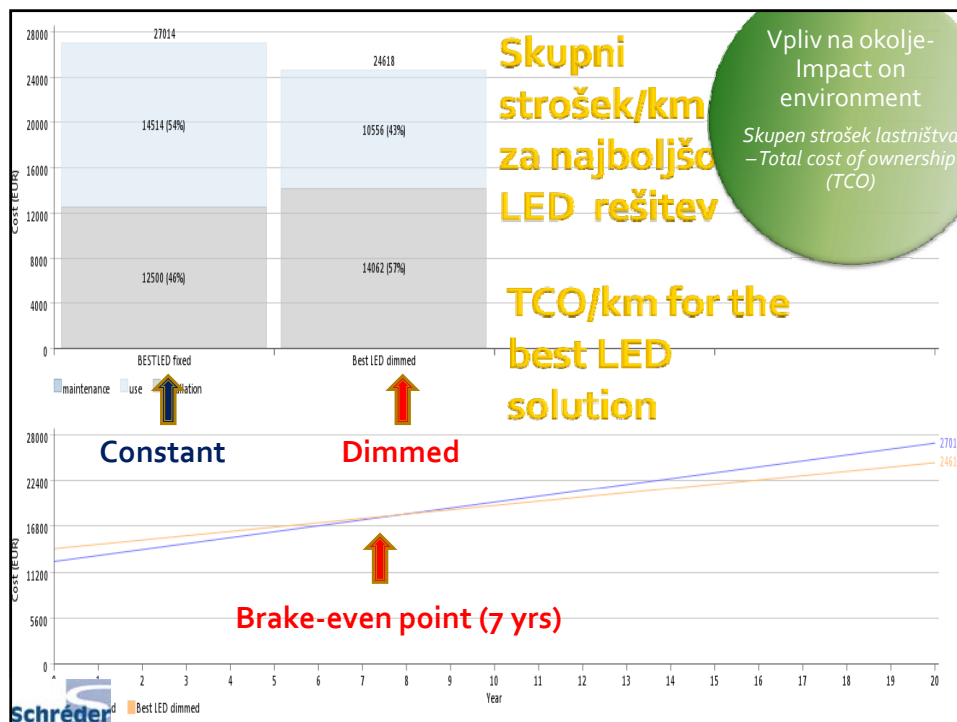
- White light allows lower lighting levels
- High power LEDs (1 watt)
- Optically efficient
- Long life
- Dimmable down to zero with good linearity
- Latest improvements:
 - Highly efficient LEDs
 - Low power consumption
 - 24 LEDs = 30W ~ equivalent to 45W CPO

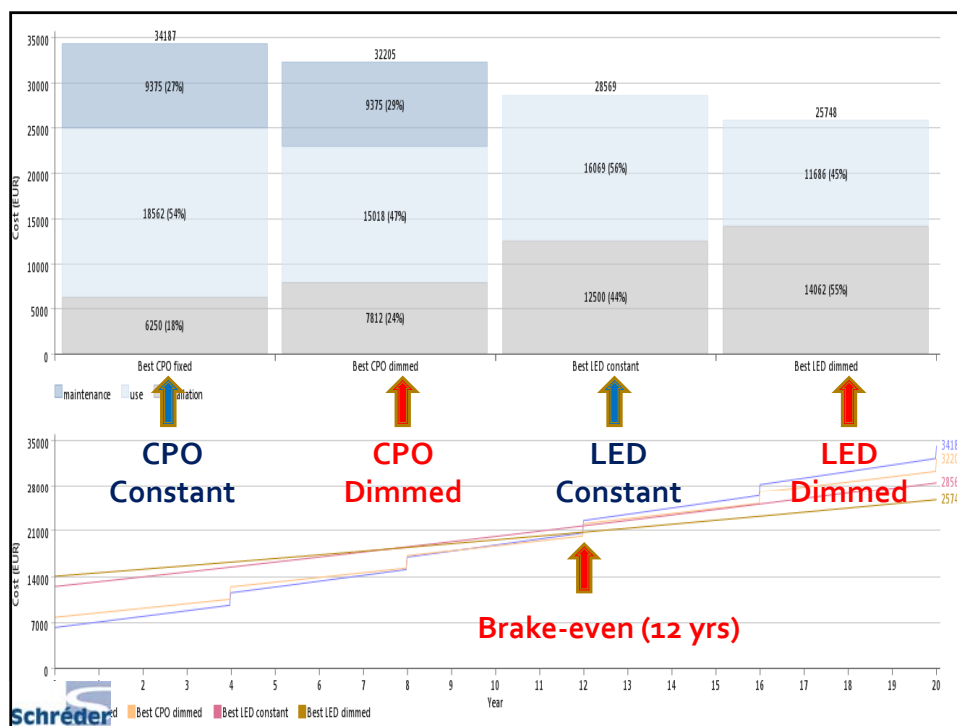
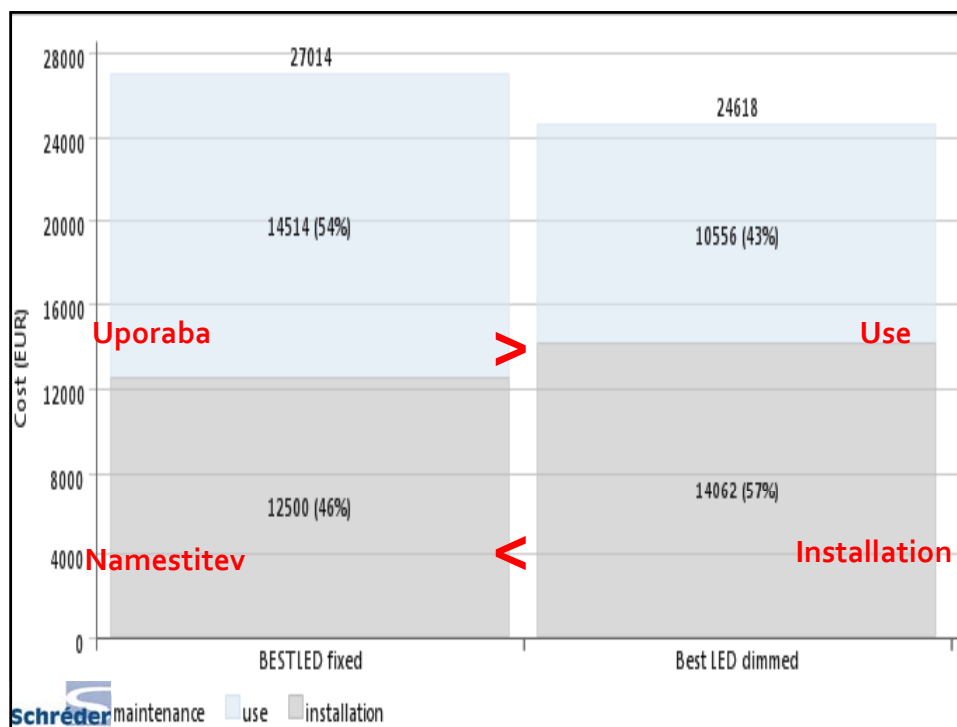
Vpliv na okolje-
Impact on environment

Skupen strošek lastništva – Total cost of ownership (TCO)




Schreder





Povzetek

- Edina poštena primerjava je med 2 novima inštalacijama
- Edina poštena primerjava je med inštalacijami s podobnimi svetlobnotehničnimi lastnostmi in skladnostjo s standardi
- Skupen strošek lastništva je edino merodajno merilo

Vpliv na okolje-
Impact on environment

Skupen strošek lastništva – Total cost of ownership (TCO)

Summary

- The only fair comparison is between 2 new installations
- The only fair comparison is between solutions with similar lighting performance and meeting standards
- TCO (Total cost of ownership) is the only reliable measure method



Vpliv (primer)

„The Bay Lights“ is a monumental tour de force eight times the scale of the Eiffel Tower's 100th Anniversary lighting. Shining from dusk to midnight for two years, it will impact over 50 million people in the Bay Area, with billions more seeing it in the media and online.

Po skromni oceni bo v lokalno ekonomsko blagajno dodanih 97 MIO dolarjev.”

Vpliv na okolje-
Impact on environment

Vpliv na nočno ekonomijo - Night-time economy

Impact (example)

„The Bay Lights“ is a monumental tour de force eight times the scale of the Eiffel Tower's 100th Anniversary lighting. Shining from dusk to midnight for two years, it will impact over 50 million people in the Bay Area, with billions more seeing it in the media and online.

By conservative estimates, \$97 million dollars will be added to the local economy.”




<http://thebaylights.org/>



