



From knowledge to regulations

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Environmentally Conscious Smart Lighting (ECOSLIGHT)

Official regulations

Greece, an EU country as a case study

Obligation to comply with:

European Norms and / or
National norms that are not against
European Norms

With any absence then:

European Technical guides and
Technical reports

With any absence then:

CIE Technical reports



Environmentally Conscious Smart Lighting (ECOSLIGHT)

EN 12464 - 2

Obtrusive light

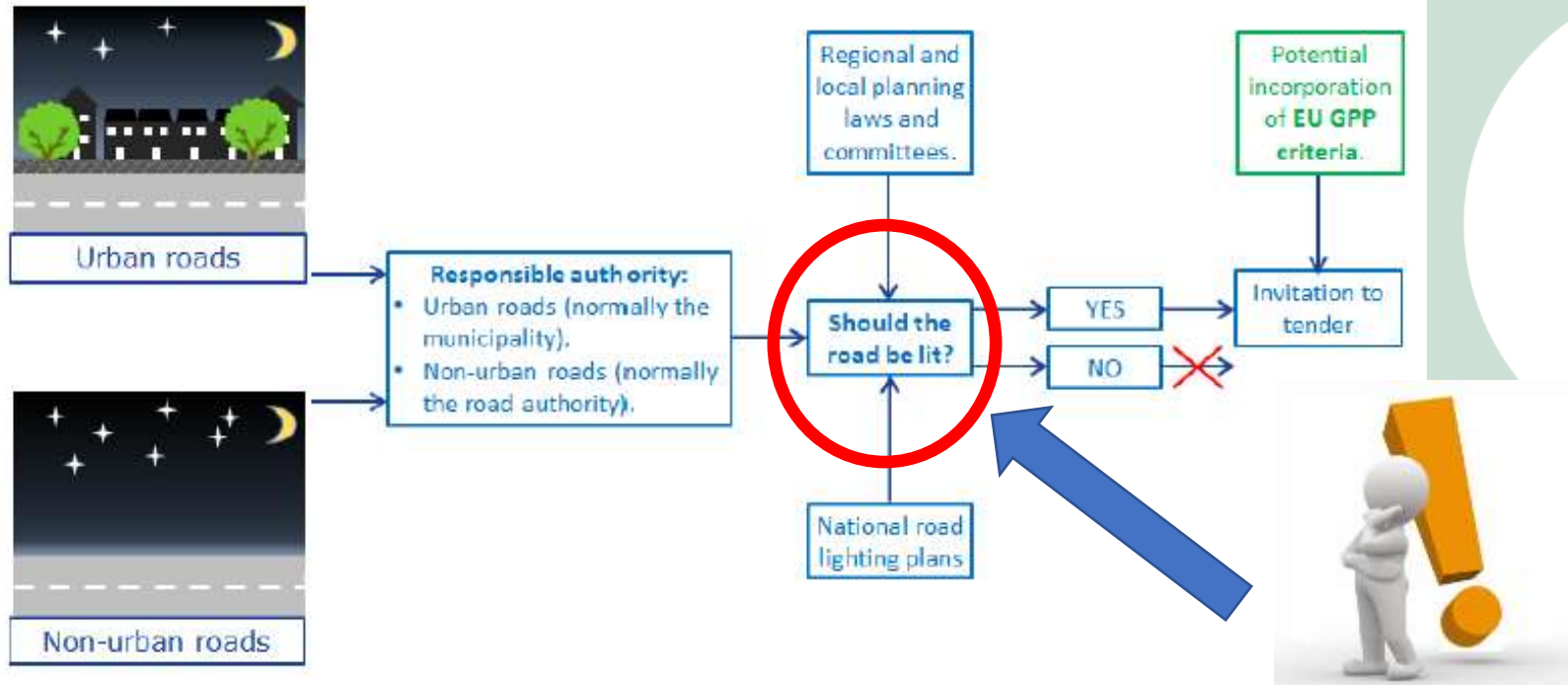
Table 2 — Maximum obtrusive light permitted for exterior lighting installations

Environmental zone	Light on properties		Luminaire intensity		Upward light ratio	Luminance	
	E_v lx		I cd			R_{UL} %	L_b cd·m ⁻²
	Pre-curfew ^a	Post-curfew	Pre-curfew	Post-curfew		Building facade	Signs
E1	2	0	2 500	0	0	0	50
E2	5	1	7 500	500	5	5	400
E3	10	2	10 000	1 000	15	10	800
E4	25	5	25 000	2 500	25	25	1 000

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GPP EU Technical report and criteria proposal

Role of EU Green Public Procurement criteria in planning process for road lighting installations



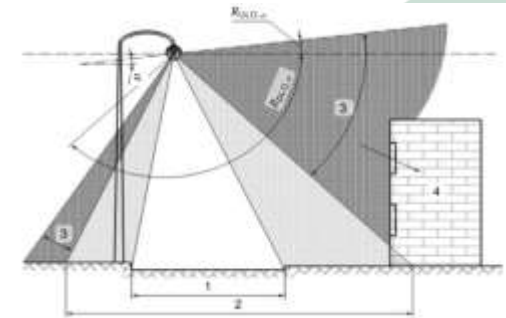
Donatello S., et al., Revision of the EU Green Public Procurement Criteria for Road Lighting and traffic signals, EUR 29631 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-99077-9, doi:10.2760/372897, JRC115406

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GPP EU Technical report and criteria proposal

Light pollution criteria

- All luminaire models purchased shall be rated with a **0.0 % R_{ULO}** . The 0.0 % R_{ULO} shall be maintained even when the luminaire is tilted at the required angle
- In residential areas, in order to reduce the risk of human annoyance, the CCT of **light sources shall be $\leq 3000K$** and a dimming or switch-off programme shall be implemented In parks, gardens and areas considered by the procurer to be ecologically sensitive, the **G-index shall be ≥ 1.5** .
- A **dimming programme** shall be implemented for parks and gardens that are **open during night-time hours**.
- A **switch-off programme** shall apply to any relevant **closing hours** for parks and gardens.
- A dimming and/or switch-off programme shall be implemented for any other ecologically sensitive areas



Donatello S., et al., Revision of the EU Green Public Procurement Criteria for Road Lighting and traffic signals, EUR 29631 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-79-99077-9, doi:10.2760/372897, JRC115406

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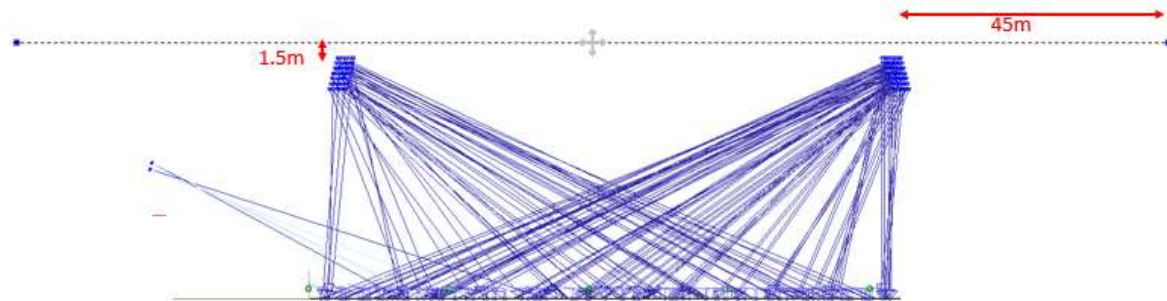
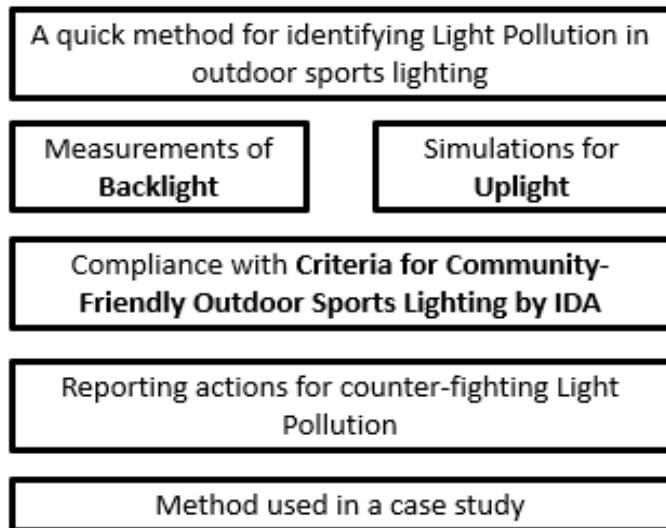
Greek Energy efficiency regulation of buildings

- Adaptation of all exterior zones of the building to the Greek Energy Efficiency Regulation of Buildings
- Lighting levels -> adaptation of EN 12464-2
- Setting max 3000K, adaptation of G index
- Max luminance restriction from CIE 150 2017
- Adapting E0 zone from CIE 150 2017
- Setting illuminance restriction (average and max value) depending the reflectance of the material / façade for 3 types of areas
- Obligatory lighting control for light dimming in curfew hours
- Setting restrictions of W/m² from ASHRAE 90.1 for exterior areas
- Introducing light masterplan



Environmentally Conscious Smart Lighting (ECOSLIGHT)

Case study investigation: Stadium



Criteria for Community – Friendly Outdoor Sports Lighting by International Dark-Sky Association

G. Ntoutsos, L. T. Doulos, S.Zerefos, A. Papalambrou and Th. Balafoutis, Light pollution and sports lighting in dense urban areas: Early results in a case study, 2nd International Conference on Environmental Design, ICED2021, 23-24 October 2021, Virtual

Environmentally Conscious Smart Lighting (ECOSLIGHT)

Case study investigation: Stadium



Grid	Lighting levels when activating both the pitch lighting and the municipal lighting [lx]	Lighting levels when activating only the municipal lighting [lx]	Comments
1	63	58	Measurements on the municipal road
2	131	68.6	Measurements on the municipal road
3	127.6	71.8	Measurements on the municipal road
4	4.7	0.1	Measurements on the municipal road
5	10.2	4.3	Measurements on the municipal road
6	57	0.1	Measurements in front view of building.
7	128.8	0.4	Measurements in front view of building.
8	39	1.3	Measurements in front view of building.

Source of luminous flux	Percentage
	Luminous flux / Luminous flux of initial source
Luminaires (Initial source)	-
Uplight (Total)	29.4%
Useful pitch lighting	71.3%
Reflected lighting	12.1%
Direct uplight*	17.3%
Spill lighting (except uplight)**	11.4%

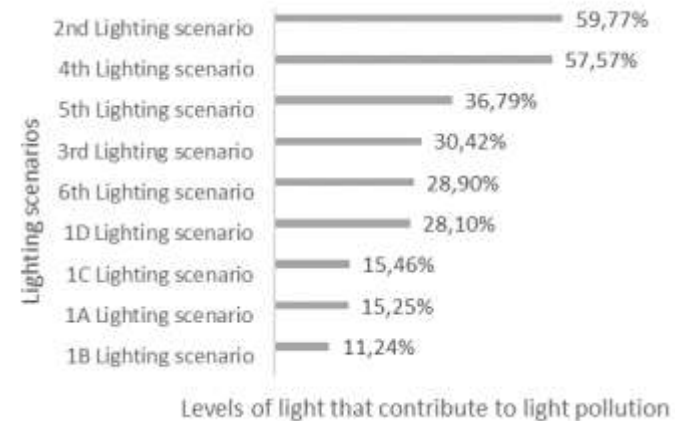
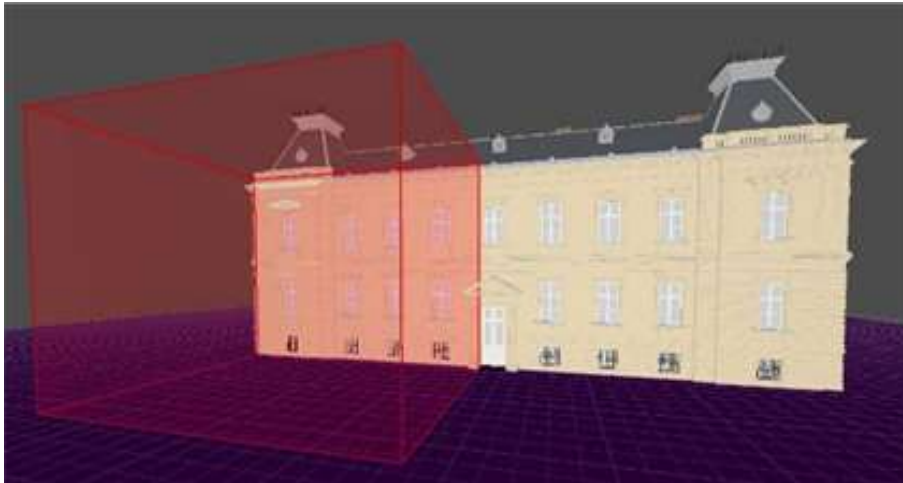
* Direct uplight: Uplight (Total) - Reflected lighting
 ** Spill lighting: Useful pitch lighting - Direct uplight



G. Ntoutsos, L. T. Doulos, S.Zerefos, A. Papalambrou and Th. Balafoutis, Light pollution and sports lighting in dense urban areas: Early results in a case study, 2nd International Conference on Environmental Design, ICED2021, 23-24 October 2021, Virtual

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Case study investigation: Facade lighting

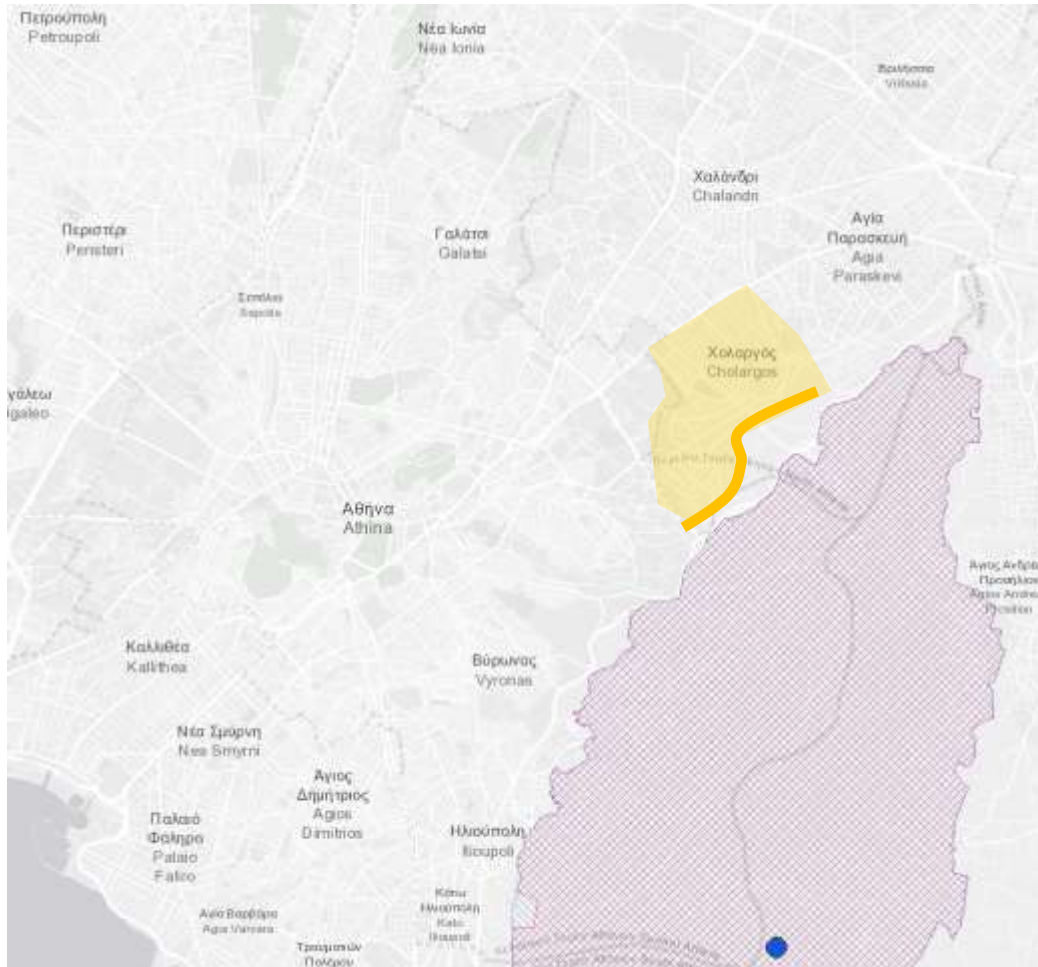


M. Tomasovits, L. Doulos, S. Zerefos and T. Balafoutis, Overview of a method for lighting the facades of historic buildings by considering light pollution as a design factor, 2nd International Conference on Environmental Design, ICED2021, 23-24 October 2021, Virtual

S. Zerefos, T. Balafoutis and L. Doulos, A methodology for combining light pollution, energy consumption and aesthetics of lighting design schemes for historical buildings, 11th International Conference on Improving Energy Efficiency in Commercial Buildings and Smart Communities (IEECB&SC'20), 1-2 December 2020, Virtual

Environmentally Conscious Smart Lighting (ECOSLIGHT)

Holargos Municipality, Athens



First municipality in Athens, yet
LED 3000K
Adaptive lighting
Near mountain area / Natura ->
2000K



Environmentally Conscious Smart Lighting (ECOSLIGHT)

Holargos Municipality, Athens



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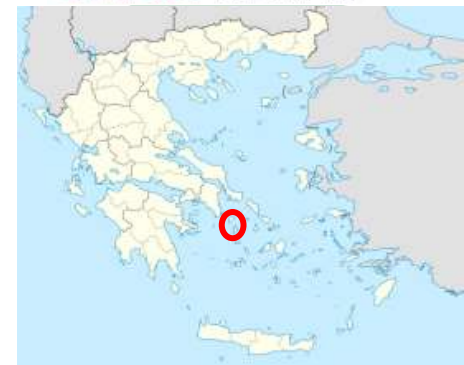


Environmentally Conscious Smart Lighting (ECOSLIGHT)

Kythnos Smart island



**KYTHNOS
SMARTISLAND**



<https://dafninetwork.gr/en/portfolio/kythnos-smart-island/>

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Kythnos Smart island



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Kythnos Smart island



23W, E27, 5000K



20W, Luminaire,
3000K
Light adaptation
20W->10W



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NTUA, University building complex



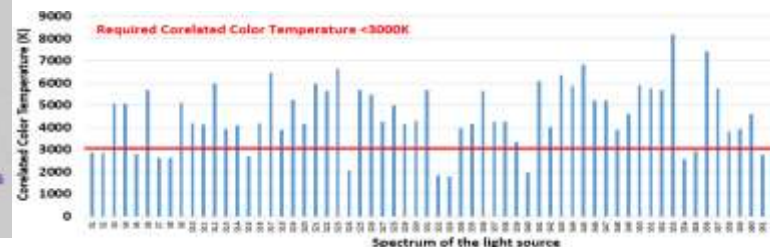
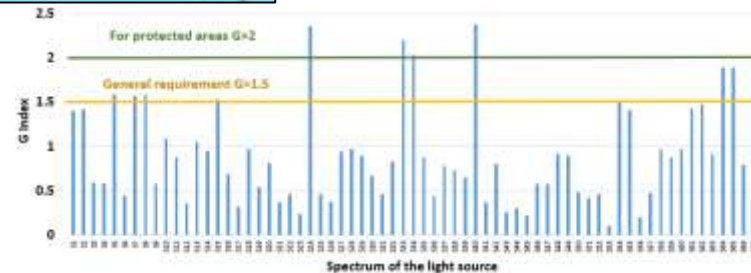
National Technical
University of Athens

70 luminaires, 21kW
53 LED 3000K, 2,1kW
5lx-10lx
Adaptive lighting, 23:00 -> 50% - 40%
Bluetooth communication



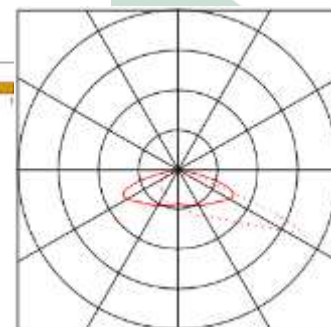
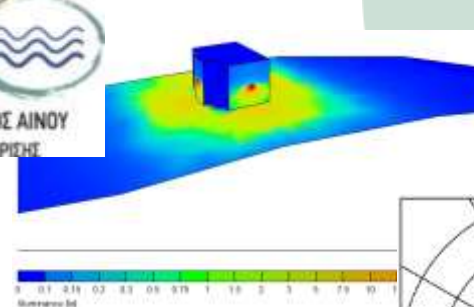
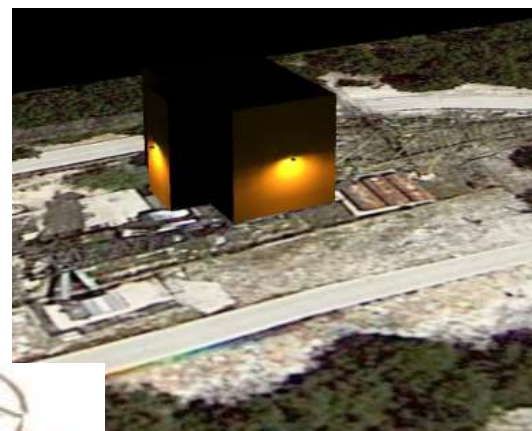
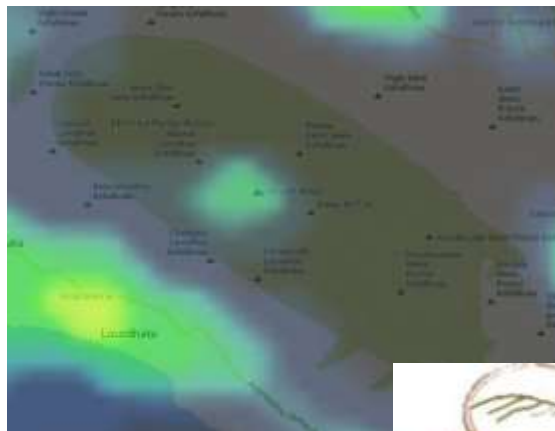
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The first Dark Sky Park in Greece?



Environmentally Conscious Smart Lighting (ECOSLIGHT)

The first Dark Sky Park in Greece?



Donated: Philips ClearWay gen2 BGP307 T25 DX10 /420 with installed power of 17.5W and luminous flux of the luminaire 1450 lm (light source 2000K)
The lighting levels were ranged from 4.27lx to 4.62lx and uniformity from 0.44 to 0.50

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Questions?



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www.ecoslight.eu