

INDICATOR 7: Spatial Lightening

a) File Name: LA_SOL_Settl

Coordinate Reference Systems: WGS 84 / UTM zone 34N (EPSG:32634)

b) File Name: LA_SOL_Mun

Coordinate Reference Systems: WGS 84 / UTM zone 34N (EPSG:32634)

Attribute	Alias	Pseudonim
MatBrO	Municipality identification number	Matični broj opštine
MatBrNas	Settlement identification number	Matični broj naselja
ImeNasCir	Name of the settlement in Cyrillic	Ime naselja (ćirilica)
ImeNasLat	Name of the settlement in Latin	Ime naselja (latinica)
ImeOpsCir	Name of the municipality in Cyrillic	Ime opštine (ćirilica)
ImeOpsLat	Name of the municipality in Latin	Ime opštine (latinica)
P_LA_15	Share of lighted area 2015 (%) in total area of settlement/municipality	Učešće osvetljene površine 2015 (%) u ukupnoj površini naselja/opštine
P_LA_15-19	Share of lighted area 2015–2019 (%) in total area of settlement/municipality	Učešće osvetljene površine 2015–2019 (%) u ukupnoj površini naselja/opštine
SOL_15	Sum of light 2015 ($\text{nW cm}^{-2} \text{ sr}^{-1}$) for settlement/municipality	Suma radijanse 2015 ($\text{nW cm}^{-2} \text{ sr}^{-1}$) za naselje/opštinu
SOL_15-19	Sum of light 2015–2019 ($\text{nW cm}^{-2} \text{ sr}^{-1}$) for settlement/municipality	Suma radijanse 2015–2019 ($\text{nW cm}^{-2} \text{ sr}^{-1}$) za naselje/opštinu

c) File Name: Ngt_Lt_2015

Coordinate Reference Systems: WGS 84 (EPSG:4326)

Resolution: $0.00416667^\circ \times 0.00416667^\circ$

Max: 213.7830657959

Min: 0

Units: $\text{nW cm}^{-2} \text{ sr}^{-1}$

d) File Name: Ngt_Lt_2015-2019

Coordinate Reference Systems: WGS 84 (EPSG:4326)

Resolution: $0.00416667^\circ \times 0.00416667^\circ$
Max: 236.82099914551
Min: 0.164186835289
Units: $\text{nW cm}^{-2} \text{sr}^{-1}$

e) LA_2015

Coordinate Reference Systems: WGS 84 (EPSG:4326)
Resolution: $0.00416667^\circ \times 0.00416667^\circ$
Lighted area: 1
No lighted area: 0
Threshold of *Nglt_Lt_2015*: $0 \text{ nW cm}^{-2} \text{sr}^{-1}$

f) LA_2015-2019

Coordinate Reference Systems: WGS 84 (EPSG:4326)
Resolution: $0.00416667^\circ \times 0.00416667^\circ$
Lighted area: 1
No lighted area: 0
Threshold of *Nglt_Lt_2015-2019*: $1 \text{ nW cm}^{-2} \text{sr}^{-1}$

Description of Indicator: Spatial Lightening monitors demographic trends attractively via satellite images of nightlights, providing the possibility of a realistic view of the concentration of permanent population, economic activity (both permanent and seasonal), and identification of spreading of development represented by the increased intensity of nightlights. The lower intensity of nightlights indicates weak activity, both population and economic, and thus the higher degree of exposure to depopulation. For calculation (1) average annual values for 2015 and (2) mean monthly values of nighttime lights in the period 2015–2019 were used. Originally, data are filtered to exclude impact by stray light, lightning, lunar illumination, and cloud-cover. In the case of the dataset for 2015, data were additionally filtered to fires and other ephemeral lights and with a background (non-lights) set to zero. The dataset of monthly values for the period 2015–2019 was processed in two steps: excluding negative values and interpolation of excluded pixels applying the Nearest-neighbor interpolation method. Additionally, both sets are checked on outliers that have been removed from the analysis. Annual values were calculated as the average of monthly values and mean annual values for the entire period were estimated. Two indicators were calculated: the share of the light area (LA) (%) in the total area of settlement/municipality and the sum of lights (SOL) ($\text{nW cm}^{-2} \text{sr}^{-1}$) for settlement/municipality. In the case of the dataset for 2015, non-lights is assumed to have the radiance of $0 \text{ nW cm}^{-2} \text{sr}^{-1}$, while for dataset 2015–2019, only the share of the lighted area with radiance higher than $1 \text{ nW cm}^{-2} \text{sr}^{-1}$ is calculated assuming that areas with lower values are unpopulated or with low population activity.

Source data for Indicator calculation

Type of data	Source
Nighttime Lights	Version 1 VIIRS DNB [Earth Observation Group (EOG); Colorado Mining School, 2015–2019]
Administrative units*	GeoSrbija [Open data of the National Data Infrastructure, Republic Geodetic Authority, n.d.]

* GeoSrbija (Open Data of the National Data Infrastructure, Republic Geodetic Authority, n.d.) from which the administrative settlements boundaries were taken have no data for the province Kosovo and Metohija. Accordingly, these administrative units were not included in the analysis.