

Photometric Monitoring of Luminous Street Furniture in Porto: 2024–2025 Evolution and Policy Implications

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Abstract: Background - Advertising light sources (LED panels, MUPI, bus shelters) contribute to urban light pollution. In 2021, Porto, Portugal, municipal tender specifications set night-time thresholds of luminance ($L_v \leq 100 \text{ cd}\cdot\text{m}^{-2}$) and correlated colour temperature ($\text{CCT} \leq 2200 \text{ K}$). We report compliance and change across three campaigns (2024–2025).

Methods - Stratified night-time measurements were undertaken by typology and concessionaire, on a sample of the equipment. For each radiant face, mean and peak luminance were recorded with two calibrated instruments by three independent observers – targeting the brightest content for peaks –, plus illuminance (under selected shelters) and CCT.

Results - campaign 1 (May 2024) showed low compliance despite prior specification provided to concessionaires (BrandExposure, DreamMedia, JCDecaux). Considering % mean, % peak luminance compliance, result was: (shelters) JCDecaux 60.0, 60.0; DreamMedia 0.0, 0.0; (MUPI) JCDecaux 100, 75.0, DreamMedia 25.0, 25.0; (LED panels) BrandExposure: 85.7, 42.9. By campaign 3 (July 2025) the picture improved: (shelters) JCDecaux 100, 100; DreamMedia 75.0, 50.0; (MUPI) DreamMedia 57.1, 25.0; (LED panels) (BrandExposure): 50.0, 0.0. Luminance trajectories show general improvement, with few exceptions. CCT generally exceeded 2200 K (except for some JCDecaux equipments) and has not suffered major corrections yet. Illuminance was not considered due to interference from streetlights.

Conclusions - Gains in campaigns 2 and 3 suggest that an assess-implement-audit loop is effective. Persistent LED-panel breaches support the luminance control approach with content-based caps, night-time switch-off, and $\text{CCT} \leq 2200 \text{ K}$. We recommend incorporating peak-based compliance and biannual audits into contracts.

Keywords: light pollution; led panels; light pollution policies; light pollution ordinances.

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