



INTERNATIONAL DARK-SKY ASSOCIATION

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To Whom It May Concern:

Natural nighttime darkness is rapidly disappearing from much of our world. Over 99% of people living in the United States and Europe live under night skies contaminated by artificial light at night (ALAN)¹. Beyond the aesthetic value of dark night skies and its connection to art and culture, there are distinct environmental and rural economic development benefits associated with the conservation of natural darkness. ALAN emission into the nocturnal environment has been identified as a threat to a host of organisms, including plants², mammals³, birds⁴, and insect pollinators of food crops⁵. These effects of ALAN potentially involve responses in humans as well⁶. Sustainable tourism programs increasingly identify access to naturally dark night skies as a desirable attribute among visitors to parks and protected areas⁷.

A number of national-level public policies have been enacted to address the problem. Regional policy in Italy's northern Lombardy region⁸ and national laws in Slovenia⁹ and France¹⁰ have come into force in recent years with the intent of reducing the impact of outdoor lighting in parts of Europe and helping to maintain the integrity of natural nighttime darkness where it still exists. Many of these laws are tied to European Union (EU) targets for reducing carbon emissions in order to meet obligations under international legal conventions aimed at reducing climate change¹¹. Reducing electricity consumption through improved outdoor lighting is one way to approach meeting these requirements¹².

Taking cues from these European examples, Croatia enacted a national light pollution law in 2012. However, it is generally now agreed that those laws were ineffective at addressing outdoor lighting issues and that a need exists to update policies in order to bring them into conformity with revised EU environmental standards published since 2015. The Croatian Ministry of the Environment and Energy recently convened a work group consisting of staff from various government ministries as well as members of Croatian astronomy societies and the Naše Nebo society, an organization that advocates for the protection of the night sky. Many of the suggestions of those among the group with expertise in the abatement of light pollution were incorporated into the text of the bill. The legislative proposal is known as the "Law on Protection against Light Pollution".

As the preamble of the proposal states, its constitutional basis is contained in Article 2, paragraph 4 (sub-paragraphs 1 and 2) Article 3, and Article 52 of the Constitution of the Republic of Croatia¹³. It is further supported by Article 32 of the Environmental Protection

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Act¹⁴, which provides for light pollution as “a change of the natural light level in night conditions caused by the introduction of light produced by human activity.” Based on the Environmental Protection Act, in 2011 the Croatian Ministry of Environmental Protection and Energy, passed the Law on Protection against Light Pollution¹⁵, which entered into force on 1 January 2012 .

The International Dark-Sky Association (IDA) was initially hopeful about a number of provisions in the legislative proposal that we considered quite robust in nature. These included:

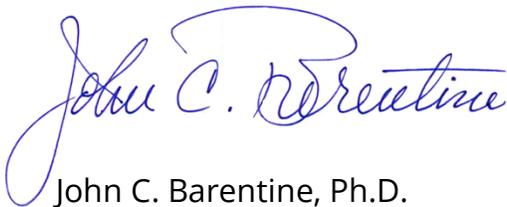
- **Clearly stated objectives** (Articles 2 and 8). These consist of reducing light pollution generally; protecting human health, biodiversity, the ecology, and sustainable development; ensuring proper design of lighting before installation; and reducing the overall electricity consumption of lighting.
- **Extensive definition of terms used throughout the law** (Article 5), including “ecology lighting” (fully shielded lighting having 0% illumination above the horizontal, plus correlated color temperature, or CCT, not to exceed 2700K) that is the only form of lighting allowed outdoors. It is an important advance over existing national laws elsewhere in the world.
- **Limited exemptions** (Article 3). These include temporary lighting in places like construction sites, along with lighting required in cases of emergencies and disasters as well as use of lighting by the military.
- **A permitting process** (Article 10) requiring lighting installers to be licensed by the state.
- **Various forms of lighting prohibited** (Article 11). Sky beams, uplighting, and external illumination of windows and doors, and illuminated signs and lamps whose correlated color temperature exceeds 2200K in ecologically sensitive places are all forbidden under the proposal. Screening of interior lights to prevent outdoor light pollution is required, and although permitted, architectural facade lighting must be strictly confined to building faces and cannot spill beyond those surfaces.
- **Required submission of lighting plans to ensure compliance with the law** (Articles 12 and 13).
- **Enforcement of the law through a robust inspection regime** (Articles 16, 17 and 18).
- **Obligation of local governments to proactively implement and enforce the law** (Article 6).

However, in the months since the legislation was introduced in the Hrvatski Sabor, amendments have been proposed with we feel significantly undermine both the intent and the practical effect of the new policy. The following summarizes these changes, dated 22nd November 2018:

- **Article 3, section 1, line 1:** All production facilities would be exempt from complying with the new law. We are very confused by the reasoning for this policy. While we readily agree that light is needed for outdoor work during nighttime hours at these facilities, there is no clear reason why that light should not also conform to the prescriptions elsewhere in the document imposing a CCT limit of 3000K and an upward light output ratio (ULOR) of 0%. In comparison, the Slovene law requires that lighting in workplaces shall not be more than 10% higher than the values provided by the standard¹⁶. We believe that the Slovene provision should be viewed as a best practice. At the same time, while we appreciate that the legislation calls for outdoor lighting at production facilities to be extinguished within 30 minutes of the end of regular business hours, we note that many such facilities in Croatia operate continuously for 24 hours per day. The lack of a reasonable lighting curfew in these cases is problematic in the context of overall environmental protection.
- We also note the revision in **Article 5, item 5**, of the allowed CCT to 3000K from 2700K, while arguing that the lower value is a better option and should be retained.
- **Article 3, section 2** provides exemptions for “temporary” lighting, problematic wording that includes all ports, cultural heritage structures, and even entire towns if the law so designates them. We believe this provision is far too broad in scope.
- **Article 5, item 5**, and **Article 11, section 5, item 9** exempt landscape lighting from the 0% ULOR requirement elsewhere. This essentially guts the requirement of full shielding in landscape situations because of the tendency to light trees from below. While Article 11 requires that light should be confined to the shape of the object illuminated, this is obviously impossible in the case of vegetation. This change disadvantages environmental protection and is incompatible with the stated aims of the legislation. 2700K white LED chips have become ubiquitous for the lighting of interior settings, and most global manufacturers can easily supply the same for outdoor light fixtures. We find no evidence of supply-chain limitations that would prevent Croatian lighting engineers from specifying a 2700K color temperature standard in outdoor lighting designs.
- **Article 11, section 5, item 10** retains the 2200K CCT limit and allows no lighting of billboards in protected places such as nature parks. However, this provision does not go far enough in these sensitive areas. We argue that, rather, landscape lighting should be prohibited in protected places, and restrictions on the lighting of roadways immediately adjacent to these places should also exist.
- **Article 12, section 1** requires that all construction projects must adhere to the complete set of lighting standards specified in Article 9, which refers to the British Standards Institution’s lighting standard BS EN 13201 for roadway lighting¹⁷. We concur with the conclusion of the European COST Action ES 1204 (Loss Of The Night Network)¹⁸ that the recommended minimum street lighting specifications of BS EN 13201 are inappropriately high and consensus-based levels not rooted in empirical evidence¹⁹.

We strongly urge the Hrvatski Sabor to reject any version of the proposed legislation inclusive of the recent changes outlined above and adopt the original version introduced previously. Otherwise, the legislature runs the risk of repeating mistakes made in the enactment of previous Croatian light pollution laws that prioritized various commercial and industrial concerns over environmental concerns. If the stated intent of the legislation – to “protect against light pollution caused by ambient light emitted by artificial light sources exposed to humans, the plant and animal world in air and water, other natural goods, the night sky and [astronomical] observatories” – is the true motive for considering this legislation, then the Sabor is obligated to vacate the proposed changes and adopt what would immediately become the world’s most progressive law aimed at protecting the natural nighttime environment.

Respectfully,



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- ² Bennie, J., Davies, T. W., Cruse, D., & Gaston, K. J. (2016). [Ecological effects of artificial light at night on wild plants](#). *Journal of Ecology*, 104(3), 611–620; Borges, R. M. (2018). [Dark Matters: Challenges of Nocturnal Communication Between Plants and Animals in Delivery of Pollination Services](#). *Yale Journal of Biology and Medicine*, 91(1), 33–42.
- ³ Duffy, J. P., et al. (2015). [Mammalian ranges are experiencing erosion of natural darkness](#). *Science Reports*, 5, 12042; Hoffmann, J., Palme, R., & Eccard, J. A. (2018). [Long-term dim light during nighttime changes activity patterns and space use in experimental small mammal populations](#). *Environmental Pollution*, 238, 844–851; Robert, K. A., et al. (2015). [Artificial light at night desynchronizes strictly seasonal reproduction in a wild mammal](#). *Proceedings. Biological Sciences / The Royal Society*, 282(1816).
- ⁴ La Sorte, F. A., Fink, D., Buler, J. J., Farnsworth, A., & Cabrera-Cruz, S. A. (2017). [Seasonal associations with urban light pollution for nocturnally migrating bird populations](#). *Global Change Biology*, 23(11), 4609–3619; Ouyang, J. Q., de Jong, M., van Grunsven, R. H. A., Matson, K. D., Haussmann, M. F., Meerlo, P., et al. (2017). [Restless roosts: Light pollution affects behavior, sleep, and physiology in a free-living songbird](#). *Global Change Biology*, 23(11), 4987–4994; Raap, T., Casasole, G., Pinxten, R., & Eens, M. (2016). [Early life exposure to artificial light at night affects the physiological condition: An experimental study on the ecophysiology of free-living nestling songbirds](#). *Environmental Pollution*, 218, 909–914.

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- ⁵ Knop, E., Zoller, L., Ryser, R., Gerpe, C., Hörler, M., & Fontaine, C. (2017). [Artificial light at night as a new threat to pollination](#). *Nature*, 548(7666), 206–209.
- ⁶ Garcia-Saenz, A., Sánchez de Miguel, A., Espinosa, A., Valentin, A., Aragonés, N., Llorca, J., et al. (2018). [Evaluating the Association between Artificial Light-at-Night Exposure and Breast and Prostate Cancer Risk in Spain \(MCC-Spain Study\)](#). *Environmental Health Perspectives*, 126(04); Nagare, R., Plitnick, B., & Figueiro, M. (2018). [Effect of exposure duration and light spectra on nighttime melatonin suppression in adolescents and adults](#). *Lighting Research & Technology*, in press. Nelson, R. J., & Chbeir, S. (2018); [Dark matters: effects of light at night on metabolism](#). *Proceedings of the Nutrition Society*, 77(3):223-229.
- ⁷ Collison, F. M., & Poe, K. (2013). ["Astronomical Tourism": The Astronomy and Dark Sky Program at Bryce Canyon National Park](#). *Tourism Management Perspectives*, 7, 1–15; Labuda, M., Koch, R., & Nagyová, A. (2015). ["Dark Sky Parks" as measure to support nature tourism in large protection areas – case study in the Nature Park "Nossentiner/Schwinzer Heide"](#). *Naturschutz und Landschaftsplanung*, 47(12), 380–388.
- ⁸ Zitelli, V., di Sora, M., & Ferrini, F. (2001). [Local and National Regulations on Light Pollution in Italy](#). Preserving the Astronomical Sky, Proceedings of IAU Symposium 196, held 12-16 July 1999, in Vienna, Austria. Edited by R. J. Cohen and W. T. Sullivan, p.111.
- ⁹ [Uredba o mejnih vrednostih svetlobnega onesnaževanja okolja](#) ("Decree on limitation of light pollution of the environment"). Official Gazette of the Republic of Slovenia, No. 81/07, 109/07, 62/10 and 46/13).
- ¹⁰ [Arrêté du 25 janvier 2013 relatif à l'éclairage nocturne des bâtiments non résidentiels afin de limiter les nuisances lumineuses et les consommations d'énergie](#) ("Order of 25 January 2013 on night lighting of non-residential buildings to limit light pollution and energy consumption"). NOR: DEVP1301594A.
- ¹¹ See European Union, [2050 long-term strategy](#) and the associated report ["A Clean Planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy"](#) (2018).
- ¹² See ENTREACT GA No.308481, ["An Overview on Current Climate Policies in the European Union and its Member States"](#) (2012); p. 34: *"Under the European Climate and Energy Package, Croatia has already been appointed the targets of reaching 21,8 Mt CO₂e of greenhouse gas (GHG) emissions or less from sources outside the EU Emissions Trading System (non-ETS) and increasing the share of Renewable Energy Sources (RES) in final energy consumption to 20%."*
- ¹³ Official Gazette 85/10 and 5/14 ("Decision of the Constitutional Court of the Republic of Croatia").
- ¹⁴ Official Gazette 80/13 and 78/15.
- ¹⁵ Official Gazette 114/11.
- ¹⁶ Article 27: *"Until the adoption of the SIST EN 12464-2 standard referred to in point 16 of Article 3 of this Decree, the standard illumination of the workplace shall be applied to the standard workplace illumination, which are specified in the standard with reference number OSIST prEN 12464-2: 2004."*
- ¹⁷ See the full list of included standards on <https://landingpage.bsigroup.com/LandingPage/Series?UPI=BS%20EN%2013201>.
- ¹⁸ "Comment on the current EN 13201 draft" (<http://www.cost-lonne.eu/wp-content/uploads/2013/08/LetterEN13201.pdf>).
- ¹⁹ Fotios, S. & Gibbons, R. (2018). [Road lighting research for drivers and pedestrians: The basis of luminance and illuminance recommendations](#). *Lighting Research and Technology*, 50(1), 154-186.