



European policy brief and recommended actions

Final: 20 October 2022

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Executive summary

The European Union is a key actor in enhancing environmental protection across its 27 member states. This document draws the attention of the European Union to the existing and rapidly growing problem of light pollution. The continued growth in light pollution across the European Union threatens European priorities related to environmental protection, cultural heritage protection, and energy efficiency.

Light pollution must be recognized as an urgent threat if the EU is to achieve the ambitious goals established in the Climate Targets Plan, the Biodiversity Strategy, and the Zero Pollution Action Plan. This document provides an overview of opportunities to address light pollution at the European level using the existing framework of directives, legislation, and funding initiatives. It recommends the European Union undertake actions in three areas:

- 1) *Recognize Artificial Light at night (ALAN) as an environmental pollutant (“light pollution”) that impacts biodiversity, human health, climate change, and cultural heritage.*
- 2) *Utilize existing European law and legislation to mitigate light pollution.*
- 3) *Promote the development of best practices to mitigate light pollution.*

This document summarizes the impacts of light pollution (**Section 1**), reviews the existing regulatory framework (**Section 2**), outlines existing EU efforts (**Section 3**), and recommends proposed actions (**Section 4**). It also includes a short appendix on the EU's role in international efforts toward environmental protection and sustainability.

This document supports the 2022 International workshop Light Pollution, organized by the Czech Republic Presidency, on October 26, 2022.¹

This report was endorsed by the IDA Board of Directors on October 20, 2022.

1. Impacts of light pollution

Light pollution is a growing problem caused by increased artificial light at night (ALAN). Satellite data show hardly any areas with complete nighttime darkness left in Europe.² Increased nighttime lighting has become a serious concern on many fronts, and light pollution is a significant driver of environmental damage. It contributes to climate change, significantly affects biodiversity, and disturbs natural habitats.

The adverse impacts of light pollution on the environment are well-evidenced. It is estimated that electric-powered indoor and outdoor lights consume 17% to 20% of global electricity production,³ with public lighting consuming approximately 2.5%.⁴ Recent studies estimate that light emissions from the continents as measured from the VIIRS satellite are equivalent to 248,238 gigawatt-hours of energy each year.⁵ Brightened nighttime conditions disrupt the proper functioning of flora and fauna, disturb ecosystems' integrity, and threaten biodiversity. ALAN impacts wild species, including many that are threatened, through effects on their physiology, behavior, and population dynamics, and changes the structure of the communities and ecosystems of which they are a part.⁶ In addition, light pollution significantly limits astronomical activities, adversely affects human health, and, in some cases, may negatively affect public safety.

Today, outdoor illumination lacks an adequate regulatory framework. The existing standards and technical norms do not consider all relevant interdisciplinary aspects, especially the adverse effects on the environment. In addition, mitigation of light pollution is a necessary and urgent issue that will support the EU in achieving the Climate Targets Plan, the objectives of the Biodiversity Strategy, the Zero Pollution Action Plan, and other adopted ambitious policy documents on climate change and environmental protection.

2. The EU regulatory framework

We contend that the existing EU regulatory framework can be used to mitigate the impact of light pollution.

2.1. Biodiversity

The EU has adopted legislation to protect the environment and biodiversity. Directives pertaining to habitats⁷ and birds⁸ form the regulatory foundation for the European biotope network "Natura 2000." The Natura 2000 regime seeks to provide adequate conservation of ecosystems and biodiversity by, among other things, avoiding the deterioration of habitats and disturbance of species.

However, protected areas within Natura 2000 are not protected from increasing light pollution from areas surrounding the habitat. Conversely, the obligations of the Directives were successfully interpreted and applied to the light pollution issues within the protected areas by the European Court of Justice.⁹ In 2016, the Court ruled that Greece had failed to fulfill its obligations under the Habitats Directive by not taking the necessary measures to reduce light pollution affecting the breeding beaches of sea turtles.

As a part of the Green Deal,¹⁰ the EU Biodiversity Strategy for 2030¹¹ was adopted. The Biodiversity Strategy addresses the five main drivers of biodiversity loss, including pollution, and sets out ambitious goals to ensure that by 2050 all of the world's ecosystems are restored, resilient, and adequately protected. In 2021, the European Parliament adopted a Resolution¹² regarding the strategies. Neither the Green Deal nor the EU Biodiversity Strategy mentions light pollution or ALAN impacts. However, recognizing the adverse effects of light pollution on humans and biodiversity, the EU Parliament called on the European Commission to set an ambitious reduction target for 2030 regarding the use of nighttime outdoor electric light and to propose guidelines on how the use of electric light at night can be reduced by the Member States.

Similar to green and blue infrastructure plans, dark infrastructure plans should be developed and adopted.¹³ To protect flora, fauna, and habitat from unnecessary light pollution, it is essential to create buffer zones around the protected areas and establish protected dark wildlife corridors. These dark wildlife corridors allow the movement of many kinds of organisms on land and through water and the air at night, protected from the effects of light pollution.

2.2. Climate change

To promote the implementation of legislation, the EU updates policy to address newly emerging issues. One of the recent policy documents was the European Green Deal,¹⁰ an ambitious package of measures designed to enable the EU to become carbon neutral by 2050. Limiting excessive outdoor lighting will decrease the unnecessary use of energy and hence contribute to the goal of becoming carbon neutral.

2.3. Energy efficiency and lighting

The European energy sector is governed by a solid legislative and policy framework. The legislative framework consists of several acts that govern different aspects of energy use, such as energy efficiency,^{14,15} and renewable energy.¹⁶ This regulatory basis aims at providing affordable and efficient energy use, including with regard to lighting installations.

On 14 July 2021, the Commission adopted a package of proposals entitled [Delivering the European Green Deal](#),¹⁷ with the aim of reducing emissions by at least 55% by 2030. This large package consists of a revision of all existing EU acts on climate and energy, including the Energy Efficiency Directive.¹⁸ The proposed amendments provide for the reduction of final energy consumption in any area of the public sector, including public lighting.

The regulation of the EU energy sector separately addresses issues related to lighting and lighting installations. Lighting is regulated from the perspective of energy efficiency^{19,20} and ecodesign.²¹

Targeting product energy efficiency alone can lead to more efficient products being installed in increasing numbers. However, this does not achieve the overall result of possible energy savings and increases the adverse effects of ALAN from efficient lighting

products. It is necessary to consider both the efficiency of the individual fixture and the overall application efficiency of outdoor lighting. Control systems allow light to be on when needed, and off or dimmed when not.

With the lack of EU-wide regulations for outdoor lighting, technical standards such as the European standard for street lighting,²² for lighting of outdoor workplaces,²³ or sports facility lighting²⁴ provide the de-facto illumination levels in many member states. Following these norms will likely lead to a rapid brightening of European nighttime landscapes. The reason for this is that, to date, only a few municipalities with old lighting technologies have achieved the brightness levels recommended by the standards. Therefore, a simple retrofit can threaten to increase the brightness level significantly. The Standards Committee incorporates state-of-the-art information and considers national viewpoints and interested parties' perspectives. Private associations develop their recommendations for minimum requirements for lighting in public spaces. Technical standards developed by private associations should not generate independently applicable legal obligations.

3. Existing EU efforts

The EU has taken first steps to act in this area to close knowledge gaps. Additional investments are required to build on this foundation. In particular, the EU has invested in several projects related to reducing and mitigating light pollution.

- EU COST ACTION ES1204, Loss of the Night Network (2012-2016), <https://www.cost.eu/actions/ES1204/>
- H2020 EU [project STARS4ALL](https://cordis.europa.eu/project/id/688135m) (2016-2018), <https://cordis.europa.eu/project/id/688135m>
- Night Light project²⁵ (2017 – 2021), which included regional authorities from the Netherlands, Hungary, Spain, Luxemburg, Denmark, Slovenia, and Italy and has resulted in the introduction of regional policy measures per region, leading to the reduction of light pollution, the designation of dark sky protected nature areas, and the introduction of new services and facilities to attract eco-tourism to these dark sky areas. The implementation of these projects proves the urgency and public interest in light pollution issues
- Keep It Dark; Interreg Project Partners from the Netherlands (lead), Denmark, and Germany (Start: 2022). <https://northsearegion.eu/about-the-programme/programme-news/first-approvals-in-the-new-programme/>

4. Proposed actions

Because public funding supports many lighting systems, the drive for energy-efficient products must be matched with requirements to regulate the quality of light and mitigate the adverse effects on fauna, flora, and habitats.

In general, we recommend that all actions to mitigate light pollution be based on the following fundamental principles, taken in this order²⁶:

1. All light must have a clear purpose; remove unnecessary lights, and for new installations, design with fewer lights when possible.
2. Light should be directed only to where needed; avoid uplight and restrict the lighting to the specific task area to avoid light trespass, glare, and obtrusive lighting.
3. Light should be no brighter than necessary; use the lowest light levels required - do not over-light.
4. Light should be used only when it is useful; use controls such as dimmers, timers, and motion controllers to turn off lights or dim them down when full-level lighting is not needed.
5. Once the first four principles have been addressed, warmer-colored light should be used where possible; a light source should be chosen that meets the needs of the visual application while limiting the amount of shorter wavelength (violet, blue) emissions to the degree practical.

In particular, we call on the EU to take actions and measures including, but not limited to, the following:

I. Recognize Artificial Light At Night (ALAN) as an environmental pollutant, specifically:

- In relation to art. 3 sec. 3 TEU and art. 11 TFEU: Recognize ALAN as a hazardous threat to biodiversity and the environment, and human health.
- Recognize the adverse effects of light pollution on climate change mitigation and cultural heritage protection.
- Implement a system to monitor light pollution levels using the best available techniques.
- Provide access to information on light pollution levels and effects for the relevant administrative bodies and the general public.

II. Include light pollution as a prohibited entity in the enforcement of existing European Law legislation, specifically through the application of the following directives:

- Strategic Environmental Assessment (Directive 2001/42/EC)
- Environmental Impact Assessment Directive (Directive 2011/92/EU)
- Habitats Directive (Directive 92/43/EEC)
- Wild Birds Directive (2009/147/EC)
- Ecodesign Directive (Directive 2009/125/EC)
- Water Framework Directive (Directive 2000/60/EC)
- Marine Strategy Framework Directive (Directive 2008/56/EC)
- Zero Pollution Action Plan
- European Green Deal
- Green Public Procurement

III. Promote the development of best practices to mitigate light pollution, including:

- Establishing an EU-wide dark infrastructure strategy to support biodiversity protection and strengthen the biodiversity network Natura 2000
- Funding research projects on the adverse effect of light pollution on human health and the environment
- Initiating a process to establish technical standards and best available techniques for sustainable and “dark sky friendly lighting” for urban planning and approval procedures
- Funding the construction and reconstruction of sustainable and “dark sky friendly” public lighting to address light pollution issues that are not limited to energy efficiency
- Including electric light in the approval and planning procedures, such as construction permits, zoning permits, environmental impact assessments (EIA), and urban planning procedures
- Supporting an EU-wide awareness campaign on the impacts of light pollution

The requirement to mitigate light pollution across the EU will spur the development and deployment of intelligent and adaptive lighting systems. It will stimulate innovation, open up new opportunities, and spur economic growth. The EU can be a partner in this innovation by building upon and expanding its investments in past light pollution projects. Through these coordinated actions, the EU can develop and maintain a global leadership role in quality outdoor lighting that is energy efficient, protects biodiversity, and supports sustainable development.

Appendix – International framework

The EU plays a key role in promoting international environmental protection and sustainable development. It is a party to numerous environmental agreements (e.g., the United Nations Environment Programme, UNEP) on a wide range of issues, such as nature protection and biodiversity, climate change, and transboundary air or water pollution, such as the Bonn Convention on the Conservation of Migratory Species of Wild Animals (June 1979) and the Bern Convention on the Protection of European Wildlife and Natural Habitats (1982). The UNEP framework started a comprehensive work recognizing light pollution as one of the issues affecting biodiversity and causing ecosystem fragmentation.²⁷ UNEP provides for the development of the international obligation to mitigate ALAN in the future.

Notably, attempts to create international legal protection of dark skies and reduce light pollution were made back in 2007. During the International Conference in Defence of the Quality of the Night Sky and the Right to Observe the Stars, in La Palma, Canary Islands, Spain, the representatives of UNESCO, UNWTO, IAU, other international agencies, and members of the academic community signed the Declaration in Defence of the Night Sky and the Right to Starlight,²⁸ which declared that control of obtrusive light must be a basic element of nature conservation policies.

Considering the character of the discussed issue, the EU competencies, and the existing regulatory framework, the EU Commission should take a leadership role in elevating light pollution as a global issue that requires a coordinated international response.

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