

# Light pollution affects biodiversity

It is important to protect the environment from the harmful effects of lighting.  
Our welfare relies on the pollination of animals.

## Impact of light pollution on biodiversity

Many organisms, including humans, have evolved molecular circadian rhythms controlled by natural day-night cycles, which play key roles in metabolism, growth, and behaviour. A substantial proportion of global biodiversity is nocturnal (30% of all vertebrates and more than 60% of all invertebrates).

Artificial light threatens biodiversity by changing the night behaviour of organisms, e.g. insects getting attracted to street luminaires. In Germany, each street light kills about 6.8 million insects every night in the summer. Birds, fish and amphibians also become confused by the presence of artificial light, which results in death due to exhaustion or collision with other birds. In addition, light pollution restricts the population of night predators, as they can only hunt in the darkness of a natural setting.

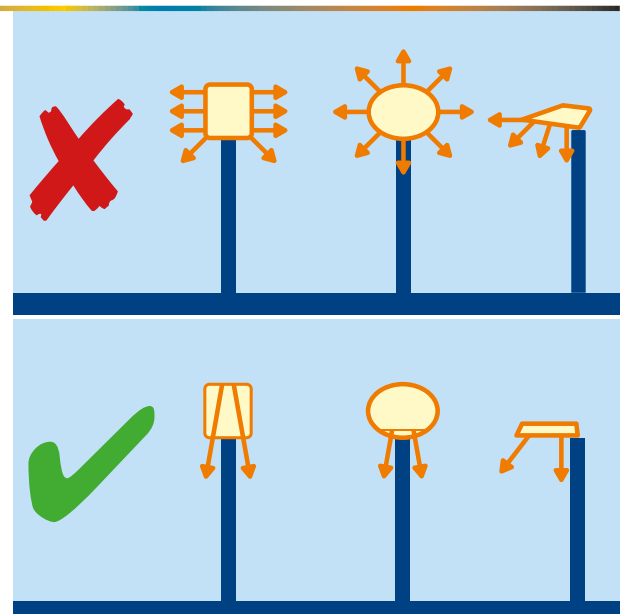
For plants, artificial light extends the growth period and causes early leaf out, impacting the wider composition of the floral community.<sup>1</sup>

Natural light controls circadian rhythms of living organisms and also influences seasonal processes. Unnecessary artificial light causes serious malfunctions in these biological natures. Light pollution causes many organisms to die, and humans also can suffer from health issues.

About 50% of all known animal species are insects that are essential for pollination. They are extremely sensitive to light. Ensure that all requirements are met for nature protection in city lighting design.

## How to protect biodiversity from light pollution<sup>2,3,4</sup>

- Reduce the overall light output.
- Use luminaires with direct light distribution (full cut off lighting).
- Choose warm white light colour for public lighting.
- Provide regulations for the maximum luminance level, size, and placement for advertising panels.
- Restrict sky beamer light shows (or limit to minimum periods).
- Install insect-tight luminaires.
- Reduce illumination in areas close to nature and parks.
- Use light control systems to lower the illumination level during the times of low traffic.



See next page for more information ➤

## Consequences of growing brightness (luminosity)

More and more cities are transforming public spaces into places of residence, resulting in a growing usage of artificial light for night time visibility. Over the past decades, the brightness level of major cities has increased tremendously. Higher brightness levels create a positive image, and people tend to equate brightness to safety. However, the nature suffers with a huge loss of biodiversity.

In an urban environment, insects actively congregate around the light sources and die of exhaustion, become an easy catch, starve to death, or burn inside a luminaire. Hence, light pollution harms insects by reducing their total biomass and population size, and by changing the relative composition of the population, all of which can extend the negative influence further up the food chain.

Furthermore, migratory fish and birds can become confused by artificial lighting, resulting in excessive loss of energy and spatial impediments to migration, resulting in reduced migratory success. Daytime feeders extend their activity under illumination, putting an increased predation pressure on nocturnal species.

Humans are not an exception when it comes to suffering from light pollution. Artificial light at night affects our melatonin production and can lead to symptoms like insomnia.



Photo: Shutterstock

## Where, when, and how much light?

It is important to develop lighting concepts with a consideration of biodiversity to avoid harmful lighting concepts (e.g. sky and façade lighting) that can harm the surrounding nature. The amount of light depends on the urban environment.

In designing lighting for festivities and advertising placards with LED, be careful in making decisions about the place and time of the light shows, in order to not disturb nearby living organisms.

- Only provide the needed amount of artificial light, in accordance with the surrounding and the vulnerability of living organisms nearby.
- Use shielded luminaires.
- Provide temporary lighting by precisely controlling where and when the light is needed.
- Switch off the artificial lights at times of low traffic and during critical periods for light-sensitive organisms (e.g. migration or hunting time).

### References:

- 1 Hänel, Andreas (2019): Light pollution in cities – challenges between marketing, public safety and environment. (Unpublished) Presentation 07.11.2019 – Workshop–Economy of Public Lighting. Hamburg.
- 2 Eisenbeis, Gerhard (2013): Lichtverschmutzung und die Folgen für nachtaktive Insekten. In: Held, Martin/Hölker, Franz/Jessel, Beate (Edit.). Schutz der Nacht – Lichtverschmutzung, Biodiversität und Nachtlandschaft. Bundesamt für Naturschutz. Bonn.
- 3 Fisher, Luci (2016): Understanding light pollution. In: Cities and lighting. The LUCI network magazine. No. 8–2016; pp 14–19.
- 4 Haupt, Heiko (2013): Lichtverschmutzung und die Folgen für Zugvögel. In: Held, Martin/Hölker, Franz/Jessel, Beate (Edit.). Schutz der Nacht – Lichtverschmutzung, Biodiversität und Nachtlandschaft. Bundesamt für Naturschutz. Bonn.