Diurnal organisms/humans:

They are disturbed in their night's rest. Permanent lack of sleep leads to exhaustion and even illness.

Nocturnal creatures:

More than 60% of all creatures are nocturnal. Light disturbs them in their nocturnal activities (pollination, reproduction, foraging). Their vision is impaired; they are displaced, distracted and irritated, and behavioural changes occur. For countless insects, light even becomes a deadly trap.

Plants:

In many plants, the rhythm of fragrance and nectar production is disturbed, or the seasonal vegetation rhythm shifts. Trees, for example, flower earlier and shed their foliage too late in the autumn, as the increased amount of light suggests it is still summer. This results in frost damage.

Pollination in danger

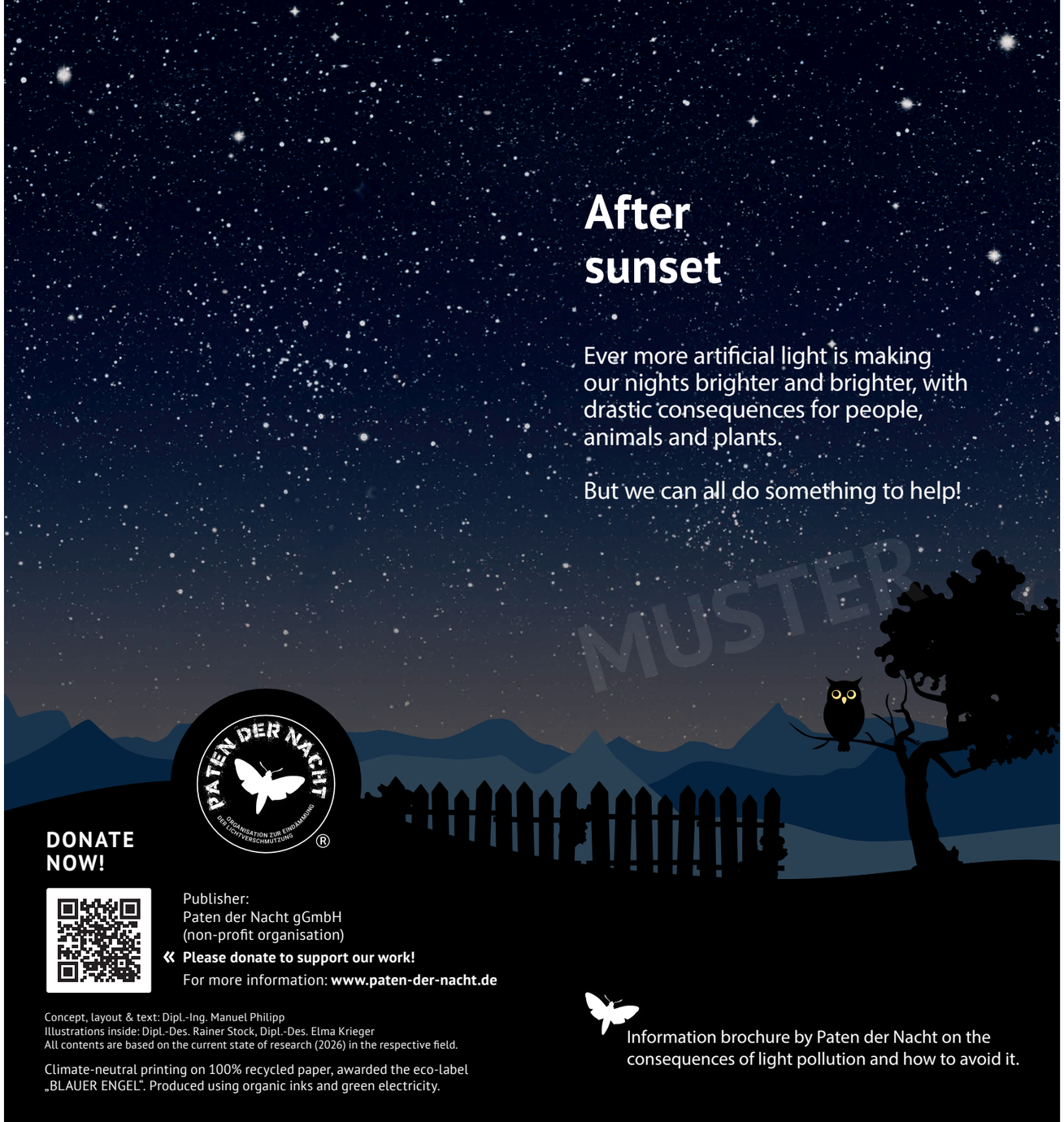
Insects are not only the largest and most significant food source in the animal kingdom, but also the most important pollinators. Almost all wild and cultivated plants depend on them. Insects are therefore indispensable.

Wild bees make the most extensive contribution, followed by more than 3000 species of butterfly, of which over 90% are nocturnal.

If the excess of nocturnal light prevents them from pollinating, our entire ecosystem is ultimately threatened. Diurnal insects cannot compensate for this pollination deficit.

The result: a decrease in food supply for all animal species and a reduction in biodiversity. For us humans, extensive **crop failures** are the direct consequence.

> **The biomass of flying insects has declined by almost 80% in the last three decades. Nocturnal light pollution is one of the main reasons for this dramatic development. This flyer shows what simple measures each of us can take to counteract the negative effects of light pollution.**



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Information brochure by Paten der Nacht on the consequences of light pollution and how to avoid it.

After sunset ...

... we turn on the lights.
More often and for longer periods. Our nights are getting brighter and brighter. In Europe, by about 6% per year; worldwide, by almost 10%. This phenomenon is known as **light pollution**.

Vast amounts of light radiate needlessly up into the sky. Through scattering effects in the atmosphere, immense "light domes" form over populated areas. In these areas, it can be over 4000% brighter than the natural night sky. These domes of light cover hundreds of kilometres and illuminate the night well beyond the areas for which lighting is primarily intended.

The frenzied expansion of artificial light not only consumes vast amounts of energy and obscures the stars in the night sky, but also has even more serious consequences. For example:

- More than 100 billion insects die during the summer due to Germany's street lamps alone (death from exhaustion due to the constant orbiting of the light, burning or exposure to predators).
- Millions of migratory birds crash into building facades on their nocturnal routes due to disorientation (two-thirds of all migratory birds migrate at night).

Out of rhythm

For around three billion years, the daily light/dark rhythm has been firmly anchored in the genes of almost all organisms. It controls most vital processes, especially waking and sleeping phases and cell repair and regeneration. All this gets out of sync when it no longer gets genuinely dark at night.

As a result, entire ecosystems are faltering. As these are all closely connected, the consequences are far-reaching. In animals and plants, it can lead to full-scale "burn-out" phenomena and ultimately even to species extinction.

But we humans also suffer from too much of the wrong light at the wrong time.

6 ways to soften outdoor light

With simple means, everyone can make a contribution to reducing nocturnal light pollution:

1 **Intensity**
Use the lowest possible lumen values (lm). For larger areas, it is better to use several weak light sources than one single very bright light source. Bright light impairs our night vision, making it harder to see clearly once darkness resumes.This effect can pose a genuine safety hazard.

2 **Direction**
Only downwards. Avoid stray light to the side and especially upwards (using shielded housings or LED reflector lamps). With these features, a weaker light source can be used to achieve the same ground-level brightness.

3 **Mounting height**
The lower, the better. This reduces glare and stray light and a weaker light source can be used to achieve the same ground-level brightness.

4 **Colour**
The closer to yellow or orange, the better. Do not exceed colour temperatures of 2700 Kelvin.

5 **Duration**
Use lighting only when you need it and only for as long as necessary. This is where motion detectors can be very useful. Avoid continuous light and switch off at 10 p.m. at the latest (timer).

6 **Necessity**
Use lighting only for orientation and ensuring the safety of pathways. Outdoor lighting for decorative purposes should generally be avoided – especially in gardens. Do not direct light onto trees, nature areas or ponds.

Extra tip: Close blinds/curtains. This prevents indoor light from inadvertently illuminating outdoor spaces.

These measures all help to keep insects away from the house, protect diurnal and nocturnal creatures, save large amounts of energy and CO_2, and bring back the stars in the night sky.

Lighting is also a question of colour

In the evening and at night, only yellowish to orange lighting with low intensity should be used. When there are more **blue components** in the spectrum of a bright light source,

- the glare is stronger (safety hazard);
- the formation of light domes in the atmosphere is intensified;
- more insects are attracted (leading to their death);
- diurnal organisms experience poorer quality sleep.

1700 to **2200 Kelvin**
Light colour "amber"

No or very few blue components – highly recommended, cosy.

2400 to **2700 Kelvin**
Light colour "warm white"

Low blue content – recommended, a good compromise.

4000 to **5000 Kelvin**
Light colour "neutral white"

Significant blue components – very problematic.

5000 to **6500 Kelvin**
Light colour "cool white" or "daylight white"

Very high blue content – should be avoided at all costs.

Guideline for the maximum brightness of LED outdoor lighting:
- Unshielded: approx. 500 lumen (equivalent to approx. 5 watts)
- Shielded: approx. 800 lumen (equivalent to approx. 8 watts)

The human rhythm out of sync

The rhythmic change between light (day) and dark (night) is determined by sunlight in combination with the earth's rotation. All organisms follow this pattern. However, as the nights become brighter and brighter, this rhythm becomes harder to perceive. The lives of animals and plants get out of sync – with the consequences described.

But we humans are also affected. We find it harder to get a good night's sleep and the melatonin balance in our bodies can be disturbed. The "darkness hormone" melatonin is indispensable for almost all organisms as it controls a large number of bodily functions, repair and regeneration processes, and the waking/sleeping rhythm. It is also an effective antioxidant.

For healthy, restful sleep: Bright and, above all, bluish light should be avoided for one to two hours before going to bed.

Such light inhibits and significantly delays melatonin production. As a result, the ease with which we fall asleep and the quality of our sleep are noticeably impaired. A dark sleeping environment cannot compensate for long periods of time spent standing in bright bathroom light, staring at bright screens or being exposed to dazzling street lamps and car headlights while driving.

It has been proven that persistently disturbed sleep can promote the development of serious illnesses such as obesity, depression, cardiovascular disease, a weakened immune system, diabetes and even cancer. One study in this field also shows a significant increase in the consumption of sleeping pills in heavily lit places.

> **If lights were loud, nobody would ever leave them on all night.**

Further information:
www.paten-der-nacht.de