Optimal light at night

Creating safer, more livable and energy-efficient cities after dark — with lighting that respects people and the environment.

1. Lighting our nights responsibly

Artificial light at night (ALAN) is one of humanity's great enablers. It allows us to function, move, and connect after sunset — supporting public safety, productivity, and social interaction. From the first oil lamps of 17th-century Paris to today's LED-illuminated cities, light at night has been synonymous with progress and prosperity.

Yet the way we illuminate our nights is evolving. The growing awareness of energy use, carbon emissions, and ecological impacts has prompted a collective shift toward lighting that is both human-centric and environmentally responsible, with efficiency and effective use of energy in mind.

Optimal light at night is not about switching lights off, but about using the right light, at the right place, at the right time, controlled by the right system — ensuring illumination supports people while minimizing its footprint on nature and optimizing the budget of municipalities.

1.1 The principles of optimal light

At Signify, we advocate for the following techniques as a powerful way to illuminate responsibly:

1. **Conserve:**
   - Use only when and where required.
   - Set time schedules and use motion detection to optimize energy use.

2. **Contain:**
   - Direct light only towards the intended area.
   - Choose and install luminaires with the right optics to prevent unnecessary light spillage.

3. **Control:**
   - Adapt light output to no more than necessary.
   - Leverage LED flexibility to fine-tune light levels as needed.

4. **Color:**
   - Use warm white light.
   - Choose your light spectrum depending on the surrounding environment and biodiversity.

Together, these four techniques enable customers to use light intelligently, efficiently, and with respect for people and the environment.

[1]Conversion from conventional to standard LED saves 40% of electricity (Targeting 100% LED lighting sales by 2025), while the conversion to connected LED saves 70% of electricity (Estimating energy savings with lighting control and Quantifying National Energy Savings Potential of Lighting Controls in Commercial Buildings - additional 30% of energy saving)

2. Challenges and opportunities

2.1 The challenges we face

Artificial light at night offers valuable benefits—but when not used thoughtfully, it can lead to unintended challenges.

Poorly installed or misdirected luminaires contribute to skyglow, reducing the visibility of stars and altering the natural rhythm of night and day. Glare and light trespass disturb sleep and compromise comfort, while wildlife — from bats and migrating birds to insects — depends on darkness to feed and navigate.

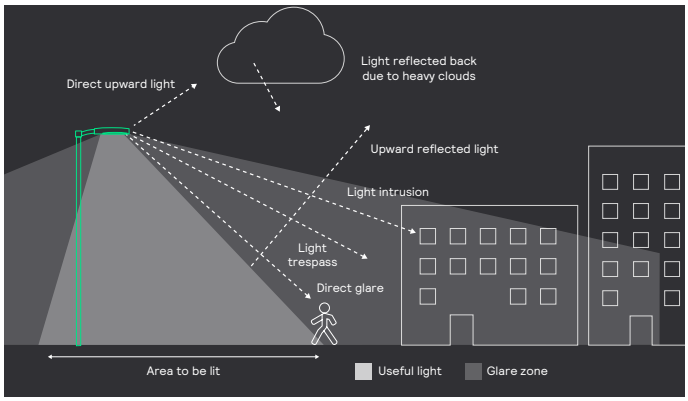


Figure 1: How skyglow occurs

From an environmental and economic perspective, wasted light means wasted energy. Each unnecessary kilowatt-hour adds to carbon emissions and municipal costs. With biodiversity loss and energy efficiency high on the global agenda, avoiding unnecessary light has become both an ecological and economic imperative.

Many areas of the EU lack regulations addressing the environmental impact of ALAN, and where rules exist, they vary widely between countries, regions, and even cities — creating inefficiencies in tackling the issue at a European level. For example, France regulates the color, timing, and direction of lighting; some regions in Spain quantify blue light using the spectral G-index; and Italy enforces 18 different regional lighting laws. Cities like London and organizations such as the ILP provide general design guidance referencing CIE environmental lighting zones to manage effects like skyglow and façade lighting — following the principle of "the right light, in the right place, at the right time, controlled by the right system."

2.2 Opportunities for communities

While challenges are real, the opportunities are greater. Modern lighting can make communities safer, more economical, and improve well-being. Good light design improves quality of life — enabling evening recreation, supporting tourism, and reinforcing the identity of public spaces.

Upgrading outdated systems unlocks major energy savings: switching to connected LED luminaires can cut consumption by 70%[1] while reducing maintenance and operational costs.

Renovating today rather than tomorrow means cities save money sooner, comply earlier with future regulations, and deliver visible environmental benefits immediately.

2.3 Leading the way to responsible lighting solutions

Signify actively supports municipalities, planners, ESCOs, and everyone who specifies lighting in utilizing the potential of modern, connected lighting to achieve measurable results.

Signify Interact: Adaptive, efficient, connected
With Interact, connected LED lighting management systems from Signify, cities and operators can monitor, schedule, and adapt lighting in real time. Lights operate only when needed, reducing both skyglow and energy costs. Dynamic control, presence detection, and data insights help to deliver measurable results in line with your sustainability goal, proviging comfort, safety, and environmental performance in one system.

Aesthetic versatility – design freedom with responsibility
Signify offers one of the industry's broadest portfolios of decorative and functional luminaires that meet dark-sky and safety requirements without sacrificing design. Whether contemporary or heritage-inspired, Signify outdoor luminaires combine precision optics with visual harmony to enhance city identity.

Compliance and certification you can trust
Signify outdoor luminaires and systems comply with mandatory standards for performance, safety, environmental responsibility, IT security and ISO norms.

Sustainability and circularity built in
Signify solutions pair energy-efficient LED technology with advanced optics to minimize waste, glare, and maintenance. Beyond product performance, our circular strategies help customers adopt circular-economy solutions through clear labeling and new ownership models — ensuring lighting remains economical across its entire lifecycle.

A global partner for responsible lighting
As a global leader, Signify combines more than a century of expertise with a strong local presence. We collaborate with industry organizations to advance responsible lighting practices, ensuring consistent quality, reliability, and compliance for projects of any scale — from small towns to metropolitan networks.

3. Practical lighting specification guidance

3.1 A pivotal role

When you specify lighting, you play a decisive role in realizing optimal light at night. Your expertise determines whether luminaires are chosen, aimed, and programmed to achieve functional, environmental and economical goals.

You not only design; you educate and advise — helping clients and municipalities understand that responsible lighting is not about turning lights off but about delivering illumination that serves people and protects nature.

3.2 Planning for optimal light

Every successful project begins with thoughtful planning. Many lighting installations still provide excessive light levels or illumination out of harmony with their surroundings. Early planning helps define the true need for light and align technical, environmental and social priorities.

When you plan a project, consider these essentials:

- **Assess the need:** Is lighting truly required, and to what extent?
- **Understand users:** Identify visual tasks, activity patterns, and safety needs.
- **Respect the environment:** Recognize nearby habitats, dark-sky areas, or EU Natura 2000 areas.
- **Check regulations:** Review applicable national, regional, and municipal ordinances.
- **Set sustainability goals:** Define measurable outcomes for energy savings, biodiversity protection, and long-term maintenance.

Projects should aim to provide safe, functional, and inviting nighttime environments while minimizing unwanted effects on the night sky, wildlife, and neighboring communities.

3.3 Engaging clients and stakeholders

Responsible lighting starts with collaboration. Effective projects depend on shared understanding and clear communication between all stakeholders (lighting designers, installers, contractors, municipalities, ESCO/utilities, operators).

In early stages, discuss both the benefits of good lighting and the potential side effects of poor implementation. This allows you to align expectations, define realistic budgets, and include commissioning and maintenance within the scope from the beginning.

Key practices include:

- Involve clients early to establish goals and environmental considerations.
- Clarify trade-offs between light levels, cost, and ecological impact.
- Document control strategies and dimming schedules in the design brief.
- Advocate for lifecycle thinking — evaluating total cost of ownership, not only initial investment.
- Engage community stakeholders for public or nature-adjacent sites.

Even within limited budgets, well-balanced design using modern optics and controls can deliver excellent results. This approach helps empower clients to appreciate the long-term value of responsible lighting choices.

3.4 Lighting design and optics – precision where it matters

Effective optical control is key to sustainable and responsible lighting design. High-quality luminaries should precisely direct light to functional areas, enhancing visibility while minimizing spill light and glare.

When selecting luminaires, ensure they:

- Direct light exclusively on essential surfaces, such as roads and pathways.
- Keep Upward Light Ratio (ULR) values low, tailored to the environmental zone requirements.
- Incorporate shielding or louvers to reduce glare and prevent light trespass into surrounding homes or natural habitats.
- Adhere to CIE 150, EN 12464-2 and EN 13201-2 standards to mitigate obtrusive light effectively.

Signify's LEDgine optical platform offers a broad range of standardized distributions, ensuring consistency across projects and simplifying design and maintenance.

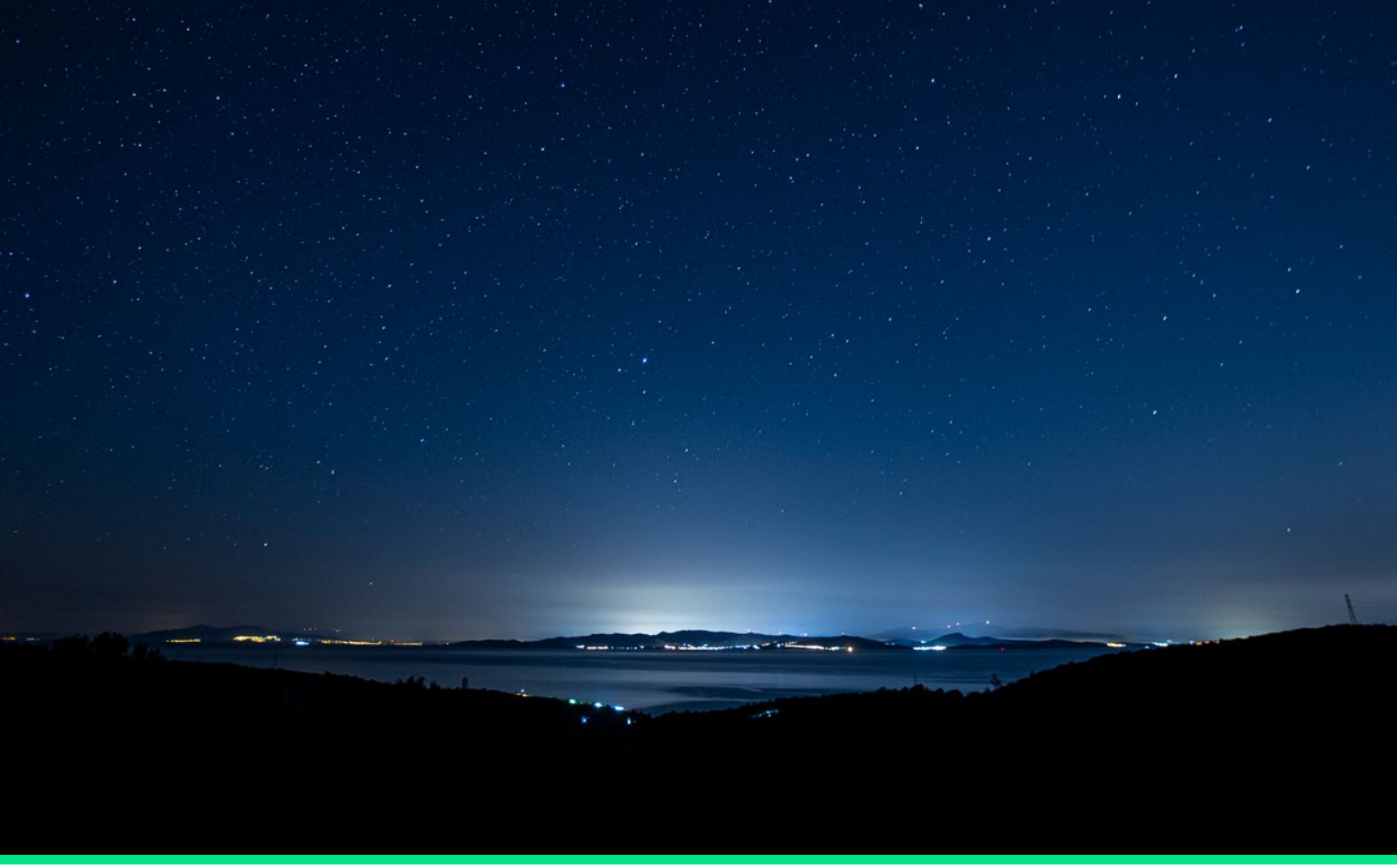
3.5 Controls and dimming – the power of flexibility

Dimming and controls make it possible to balance safety with efficiency. LEDs can be dimmed smoothly down to 10% without color shift, adapting to traffic, presence levels, and weather or road conditions.

When you specify lighting controls:

- Set time-based schedules or curfews to reduce lighting levels during low-activity hours.
- Use motion and presence sensors for localized activation.
- Integrate ambient-light sensors to detect sunrise and sunset.
- Deploy programmable dimming profiles that gradually lower output through the night.

With Signify Interact, these settings can be monitored and adjusted remotely, allowing real-time optimization and data-driven decisions — achieving energy savings while ensuring comfort and safety. To connect to the Signify Interact system, luminaires need to be dimmable with an SR or Zhaga-D4i interface.



3.6 Spectrum and color temperature

The spectral composition of light plays a critical role in both skyglow and ecological impact. Short-wavelength (blue) light is particularly disruptive for many nocturnal species and can contribute to increased skyglow. For this reason, warm color temperatures (≤ 3000K) are generally preferred for outdoor lighting.

Wildlife-friendly spectral solutions minimize blue-light content while still providing sufficient visibility and safety for people.

4. Conclusion: Lighting a better night for all

Optimal lighting at night represents progress, not compromise, and Signify is leading the way in harmonizing technology, design, and environmental care. Addressing the growing challenges of ALAN—including its impact on biodiversity, energy waste, and skyglow—Signify offers innovative solutions such as connected LED lighting, adaptive optics, light colour and intelligent controls. With products designed to deliver precise optics, tailored light spectra, and customizable lighting scenarios, Signify empowers cities and communities to create lighting systems that enhance safety, comfort, and beauty while respecting the planet's natural rhythms.

Achieving optimal light at night requires collaboration among policymakers, designers, manufacturers, and operators. Signify is committed to ensure that every lumen serves a purpose, supports life, and minimizes ecological impact. Together, we can restore the balance between human needs and the natural night.

Find out how Signify can transform your business
www.signify.com