

IDA Practical Guide



Sky glow over the Netherlands

Photograph by Wim Schmidt

Topic : *Introduction to Light Pollution— What's the Problem?*

FOR MOST OF EARTH'S HISTORY, our spectacular universe of stars and galaxies has been visible in the darkness of the night sky. From our earliest beginnings, the vast spectacle arrayed across the dark sky has inspired questions about our universe and our relation to it. The history of scientific discovery, art, literature, astronomy, navigation, exploration, philosophy, and even human curiosity itself would be diminished without our view of the stars. But today, the increasing number of people living on earth and the corresponding increase in inappropriate and unshielded outdoor lighting has resulted in light pollution—a brightening night sky that has obliterated the stars for much of the world's population. Most people must travel far from home, away from the glow of artificial lighting, to experience the awe-inspiring expanse of the Milky Way as our ancestors once knew it.

The negative effects of the loss of this inspirational natural resource might seem intangible. But a growing body of evidence links the brightening night sky directly to measurable negative impacts on human health and immune function, on adverse behavioral changes in insect and animal populations, and on a decrease of both ambient quality and safety in our nighttime environment. Astronomers were among the first to record the negative impacts of wasted lighting on scientific research, but for all of us, the adverse economic and environmental impacts of wasted energy are apparent in everything from the monthly electric bill to global warming.

In refreshing contrast to some of today's complex and lingering environmental problems, many existing solutions to light pollution are simple, cost-effective, and instantaneous.

Recognizing when outdoor lighting no longer serves its function and becomes a pollutant is the first step toward choosing appropriate solutions.

Light pollution is excessive and inappropriate artificial light. The four components of light pollution are often combined and overlapping:

- Urban sky glow**—the brightening of the night sky over inhabited areas.
- Light trespass**—light falling where it is not intended, wanted, or needed.
- Glare**—excessive brightness which causes visual discomfort. High levels of glare can decrease visibility.
- Clutter**—bright, confusing, and excessive groupings of light sources, commonly found in over-lit urban areas. The proliferation of clutter contributes to urban sky glow, trespass, and glare.

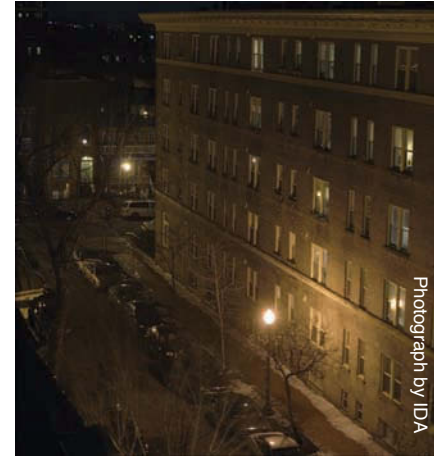
Increased **urban sky glow** is responsible for the disappearance of the Milky Way from our night skies. For professional astronomers, the increasing distance to prime observing sites, well away from sources of air pollution and urban sky glow, becomes more problematic as economic and environmental energy costs continue to rise. Amateur astronomers, meanwhile, find prime observing spots eradicated by commercial and

residential development and must travel farther from home for a clear view of the skies. Increasingly, the most important equipment needed to enjoy the wonders of the night sky is an automobile with a full tank of gas and a map.



Glaring lights can actually reduce visibility. Here the brightest most visible objects in the area are the lighting fixtures, not the roadways, walkways or parking areas which a driver or pedestrian would expect to be lighted. Atlanta, Georgia.

The adverse effects of light pollution extend well beyond astronomy. New research suggests that light at night may interfere with normal circadian rhythms—the 24-hour cycle of day and night that humans have used to maintain health and regulate their activities for thousands of years. **Light trespass**, occurring when streetlights or a neighbor's security light directs unwanted lighting onto our property or into our homes, contributes to a loss of natural darkness. Wildlife, too, is harmed by the unnecessary brightening of the night. From newly hatched sea turtles to migrating birds, fish, frogs, salamanders, and lighting bugs, artificial night lighting disrupts the cycles of nocturnal creatures in potentially devastating ways. While research is still ongoing, it is becoming apparent that both bright days and dark nights are necessary to maintain healthy hormone production, cell function, and brain activity, as well as normal feeding, mating, and migratory behavior for many species, including humans.



Light trespass, Washington, DC. This "street lighting" directs very little light onto the street. Instead, it sends wasted light into the sky and the sides of residential buildings where it may not be needed or wanted.



Sky glow over Istanbul, Turkey.



Effects of two different types sports lighting: Partially shielded lighting directed downward in Tucson, Arizona, USA (left); stadium lighting contributes to sky glow Portsmouth, Hampshire UK (right).

Paradoxically, in addition to wasting resources, a nighttime environment that is over-lit results in *lowered* visibility: direct **glare** from improperly shielded fixtures is often blinding. Light spilling into the sky does not light the ground where we need it. The redundant lighting found in many urban centers results in a **clutter** of lights that contribute to sky glow, trespass, and glare while destroying the ambiance of our nighttime environment. Our eyes, when dark-adapted, have good natural capacity in low-light situations. But when nightscapes are over-lit, eyes never have a chance to become dark-adapted, and areas adjacent to brightly lit areas become impenetrable, reducing safety. Some communities have experienced a decrease in crime by reducing or eliminating nighttime lighting in appropriate areas.

Light pollution wastes money and energy. Billions of dollars are spent on unnecessary lighting every year in the United States alone, with over \$2.2 billion going directly into the nighttime sky via unshielded outdoor lights. Unshielded outdoor lights are directly responsible for 14.7 million tons of carbon dioxide waste. Simply reducing and removing unnecessary lighting saves money and energy, often at minimal expense. Over-lighting the night neither improves visibility nor increases nighttime safety, utility, security, or ambiance.

Many homeowners, city planners, and lighting contractors rely on the theory that “more is better” when it comes to lighting our nightscapes. We have learned, however, that the glare of excessive light can actually reduce visibility and that well-planned lighting can save money, decrease crime and improve nighttime ambiance. Learning what does and does not constitute quality lighting is the next step toward implementing simple, common sense strategies for effective, efficient outdoor lighting. Set a good example in your own environment, and when selecting or recommending an outdoor fixture, refer to the guidelines suggested in the *Practical Actions* listed on the right.

Practical Actions

Use light only when and where it's needed. Turn off lights when they are not needed and create a curfew for lights-out. Minimize interim light use with timers and motion detectors.

Use only as much light as needed. Over lighting reduces the eye's ability to see outside of the lit area. In addition, excess light can produce glare, which also reduces visibility. Selecting the correct lamp wattage for your needs increases safety and reduces costs.

Shine lights down, not up. A well-designed fixture will direct the light where it's needed most—at the ground. Select new fixtures that are fully shielded; retrofit or replace poor quality fixtures. For more information on selecting dark-sky friendly fixtures, refer to IDA's Web site and the fixtures featured in the IDA Fixture Seal of Approval program.

Use efficient light sources for outdoor lighting around homes and businesses. Consider a compact fluorescent for good, energy efficient, economical lighting—a low-wattage lamp gives plenty of light for most properties and applications, and in a fully shielded fixture, it makes an excellent choice. When higher wattage lamps are necessary, be sure that they are fully shielded and energy efficient.



Photograph by Jeremy Stanley

Solutions exist now for the problem of light pollution, and control programs are underway in many communities. Education and personal action can begin in your own neighborhood. IDA's Web site provides sample letters and information to help you implement constructive solutions to lighting problems in your community. Community involvement can pave the way for the adoption of outdoor lighting codes and ordinances essential to the long-term preservation and protection of our dark skies. Thousands of communities around the world have established lighting ordinances to regulate efficient, effective nighttime lighting. In response to this, IDA's "Simple Guidelines for Lighting Regulation" is a useful tool for developing lighting ordinances that reflect community standards and conform to recommended practices of the international lighting associations.

Light pollution affects every citizen. It is a serious environmental concern that wastes money and resources while jeopardizing wildlife, our environment, health, and human heritage. Each of us can implement practical solutions to combat light pollution locally, nationally, and internationally.

Learn the facts about light pollution. Learn how to recognize fixtures that are well-designed, dark sky friendly and efficient. IDA is the leading authority on the problems and solutions related to light pollution, and IDA's Web site is a great educational resource.

Educate others. Educating the public, government officials, and lighting professionals is an important part of combating light pollution. Share what you know about the value and effectiveness of quality outdoor lighting with your friends, neighbors, and community leaders. Find a local IDA section in your community.

Get Involved. Encourage your community to implement lighting regulations. The "Get Help" section of the IDA Web site offers many resources to help you get started. "Simple Guidelines for Lighting Regulations" and the "Homeowner's Guide to Outdoor Lighting" are especially informative.

Donate now. Established in 1988, the International Dark-Sky Association is an educational, environmental 501(c)(3) nonprofit dedicated to protecting and preserving the nighttime environment and our heritage of dark skies through quality outdoor lighting. With over thousands of members in more than 70 countries, IDA relies on contributions from concerned citizens like you who become members, donate, or make us a part of their planned giving portfolios.

We could all see the sky as our ancestors once saw it just by turning off the lights.

Referenced Material:

U.S. Lighting Market Characterization, Volume I: National Lighting Inventory and Energy Consumption Estimate—Received by Building Technologies Program; Office of Energy Efficiency and Renewable Energy; U.S. Department of Energy; Prepared by Navigant Consulting Inc. 1801 K Street, NW Suite 500 Washington DC, 20006 with XENERGY, Inc. Burlington, MA; September 2002.

Related Practical Guides and Web Links:

“PG2: Effects of Artificial Light at Night on Wildlife”—www.darksky.org

For information on IDA membership and donations, visit our Web site at www.darksky.org.

Updated 2009/June