



TOMPKINS COUNTY

ENVIRONMENTAL MANAGEMENT COUNCIL



121 East Court Street Ithaca, New York 14850

Telephone (607) 274-5560

<http://www.tompkinscountyny.gov/emc>

ENVIRONMENTAL ALERT

IMPORTANT RECOMMENDATIONS FOR INDOOR AND OUTDOOR LIGHTING

Background

Over the last decade there have been both rapid advances in lighting technology and converging lines of scientific inquiry documenting health and environmental issues with “blue light”.¹ Municipalities, businesses, schools, and individuals all need to be aware of the implications of the lighting decisions they make.

Recent studies indicate that a substantial composition of blue light in the spectrum is conducive to productive work for persons who work inside during the day, but deleterious to human health at night, altering circadian rhythms necessary for a “good night's sleep”.

Besides human-health impacts, blue light has been implicated in a wide range of ecological impacts as well as increased “sky glow” at night. Minimizing blue light output at night for human health reasons also decreases these additional deleterious impacts.

¹ Picture the color spectrum of a rainbow. “Blue light” refers to short wavelength visible light in general, and spans from a violet-blue to a green-blue visible color (~380 to ~500 nanometer wavelengths). In this document, we refer to this color range simply as blue light.

Indoor lighting technology. We are moving away from the familiar warm yellow-orange incandescent lights to light-emitting diodes (LEDs), which offer better efficiency and economics over time and a wider range of spectrum and light intensity. Although commercially available LEDs include some that are similar to incandescent bulbs, we find ones termed “warm white,” “cool white,” and “daylight,” all of which have a higher proportion of blue light emissions.

Outdoor lighting technology. For street lights, the old standard high-pressure sodium bulbs with their orange-hued spectral output are in many cases being replaced with more efficient bright-white LEDs, greatly increasing the municipality's blue light output at night. (In 2016 Binghamton, NY, finished transition of its ~2000 orange-hued high-pressure sodium street lights to bright-white LEDs.)

Personal electronic devices. Luminous computer screens, tablets, and smart phones also emit blue wavelength light with potential health impacts. Many operating systems on these devices now include software (or apps can be added) that can be set to limit the devices’ blue light emissions at night. (As of 2017, the computers Ithaca public schools provide to students for home use do not include such capabilities.)

Recommendations

Municipalities

1. Transition to LED street lights with low blue light emissions. Even street lights with 3000K CCT² have increased blue light output compared with existing high-pressure sodium street lights, which are ~2100K CCT. Ideally, from a human health and ecological impact standpoint, street light conversion to LED would involve the equivalent (or lower) blue light output as that from high-pressure sodium (~2100K CCT) street lights. While street light

² “CCT” stands for “Correlated Color Temperature” and uses the Kelvin temperature scale to roughly indicate spectral content of whitish light. Lower CCT points toward warmer hues (yellowish, orangish) with a lower percentage of blue light, while higher CCT points toward cooler hues (greenish, blueish) and higher blue-light output.

manufacturers have been promoting 3000K+ CCT varieties, “amber” LED street lights are available that have very low blue light output (<2000K CCT). While these may not be the most energy efficient LEDs on the market (i.e. ~3% less efficient), there is still a great energy & maintenance savings compared with existing gas discharge or metal halide street lighting.

2. Avoid using metal halide fixtures for street lights or other outdoor lighting. These are typically strong blue wavelength emitters and less efficient than LEDs. (e.g., Ithaca Wal-Mart parking lot)
3. Consider incorporating Dark Sky³ outdoor lighting standards into municipal codes. This includes stipulating that no light be directly emitted horizontal or above the horizontal plane of the light — in other words, all direct light emission should be downward. Dark Sky standards currently call for all outdoor lighting to be no higher than 3000K CCT. Yet 3000K CCT is typically composed of substantial blue light. Municipalities should encourage no greater than 2700K CCT for outdoor lighting, and lower if possible. 2700K CCT is readily commercially available for about the same cost as higher CCT lighting. Luminous intensity (brightness) is another metric that should be stipulated in municipal codes and minimized to the extent possible.
4. Consider special outdoor light codes or actions that further reduce blue light emissions for lighting in proximity to natural areas.
5. Schools should consider incorporating automatic night time blue light filters into laptops provided to students for home use.

Residential and business lighting

1. Transition to LEDs with 2700K CCT or lower indoor and outdoor lighting at night. Higher CCT lighting should be considered for indoor lighting during the day to simulate the spectral characteristics of sunlight and help maximize human productivity for businesses. Use Energy Star⁴ rated LEDs that include the “Lighting Facts” label.⁵

³ <http://www.darksky.org>

⁴ <https://www.energystar.gov/>

⁵ <http://www.lightingfacts.com/>

2. Municipalities may want to consider incentives for homeowners (and businesses) to encourage transition to <2700 CCT outdoor lighting. These could be as simple as a letter of thanks that includes a waterproof sticker to apply at the doorway to a building.
3. Use software and apps for automatically minimizing blue light output from computer monitors, tablets, and smart phones, etc. at night.
4. Do not use “bug zappers.” These lights have high ultraviolet (UV) and blue light output, kill many useful insects, and attract insects from afar to the vicinity of your residence.
5. Porch, deck, and front door lights with low UV and blue light emissions minimize insect attraction and thereby lead to a more comfortable outdoor experience for people.

Further reading

American Medical Association. 2016. CSAPH Report 2-A-16. Human and Environmental Effects of Light Emitting Diode (LED) Community Lighting. American Medical Association.

http://darksky.org/wp-content/uploads/bsk-pdf-manager/AMA_Report_2016_60.pdf

Christensen et al. 2016. Direct Measurements of Smartphone Screen-Time: Relationships with Demographics and Sleep. PLoS One. 2016; 11(11): e0165331.

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0165331>

Holzman D.C. 2010. What's in a color? The unique human health effect of blue light. Environ Health Perspect [Internet]. 118(1):A22-7.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2831986/>