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Proposed City of Los Angeles Sign Ordinance Would Eviscerate Lighting Ordinance and Is Technically Flawed

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The Los Angeles Department of City Planning has forwarded to the Planning and Land Use Committee of the City Council a draft ordinance to modify citywide sign regulations (dated October 5, 2011). I have reviewed this proposal and offer some specific comments regarding its potential environmental impacts. My comments concentrate particularly on lighting from signs because the effect of artificial night lighting on living organisms is one of my areas of scientific research (Longcore 2010; Longcore & Rich 2004; Rich & Longcore 2006). This research interest extends beyond ecosystems to human health; the mechanisms that apply to humans are the same as found in other organisms (Chepesiuk 2009), and my current work as a research professor at the University of Southern California includes a research proposal with international collaborators on the human health effects of exposure to light at night.

Proposed Sign Ordinance Would Eviscerate Lighting Ordinance

The City of Los Angeles has an ordinance that protects residents from intrusive glare and unwanted illumination from off-site sources. The Municipal Code (Section 93.0117) reads, in relevant part:

No person shall construct, establish, create, or maintain any stationary exterior light source that may cause the following locations to be either illuminated by more than two footcandles (21.5 lx) of lighting intensity or receive direct glare from the light source:

1. Any exterior glazed window or sliding glass door on any other property containing a residential unit or units.
2. Any elevated habitable porch, deck or balcony on any other property containing a residential unit or units.
3. Any ground surface intended for uses such as recreation, barbecue, or lawn areas on any other property containing a residential unit or units.

EXCEPTIONS: This subsection shall not apply to:

1. Any frosted light source emitting 800 lumens or less.

2. Any other light source emitting more than 800 lumens where the light source is not visible to persons on other residential property.

This ordinance regulates two elements: glare and illumination. “Glare” is light that is visible directly from a light source, when there is a straight line between the receiving surface and the source of the light. “Illumination” is different in that it is a measurement of the amount of light that is incident on a surface. It is a measurement of “luminous flux” that is usually measured in Watts per square meter or lux (which is weighted by the sensitivity of the human eye). Illumination can occur without glare and glare can occur with negligible illumination. Municipal Code Section 93.0117 regulates both glare and illumination.

The proposed sign ordinance contains the following limitation on illumination:

No sign shall be arranged and illuminated in a manner that will produce a light intensity of greater than 0.3 foot candles above ambient lighting, as measured at the property line of the nearest residentially zoned property. Digital displays shall also be subject to the illumination limitations of Section 14.4.19 of this Code.

The proposed sign ordinance also stipulates that it will prevail over other conflicting sections of the Code:

If the provisions of this article are different from, more restrictive than or more permissive than any other provisions of this Code related to signs, then *the provisions of this article shall prevail and supersede those provisions* (emphasis added, Section 14.4.3.F).

Although the City’s lighting ordinance is not explicitly about signs, it would apply to lights on signs and to digital displays. The new sign ordinance would thereby (a) allow lights on signs to increase the illumination at a residential property by 0.3 foot-candles (3–6 times the brightness of the full moon) and to exceed the 2 foot-candle limit in the Code and (b) completely exempt signs from the glare portion of the lighting ordinance. A literal reading of the lighting ordinance would mean that no window, deck, porch, or balcony of a residential property should be able to “see” the lights of a sign or digital display (which would constitute “direct glare”). Although this ordinance is routinely violated (it can be enforced with repeated complaints to the Department of Building and Safety), adoption of the sign ordinance would supersede this protection for Los Angeles residents.

Furthermore, the illumination limits in the proposed sign ordinance would be measured only at the property line, not at every potentially impacted window, patio, balcony, or sliding glass door, as is the case under the lighting ordinance. So a new sign could cause direct glare at a bedroom window and increase illumination beyond the 2 foot-candle limit (which is already extremely bright, well over 40 times the brightness of the full moon) and yet if the view of the sign were blocked at some point on the property line of the nearest property, the sign could still be in compliance with the new sign ordinance. The new illumination limits introduced in the sign ordinance are extremely ill-conceived and substantially weaken the protections currently in place for residents.

Draft Ordinance Is Technically Deficient

The draft ordinance does not fully take into account that the perception of brightness by the human eye is relative. The same amount of light produced against backgrounds of differing brightness will appear differently. Consequently, the idea that brightness levels developed for digital displays at the Wilshire Grand project would be appropriate throughout the entire City is without merit. Digital displays are by definition causing direct glare to anyone who sees them, since the sign “works” by directing light at the viewer. For residential neighborhoods, only a frosted bulb of 800 lumens is allowed as glare under the lighting ordinance, which is roughly equivalent to 63 candelas. (Candelas are a measure of light emitted in a particular direction and weighted by the sensitivity of the human eye that is used in the draft sign ordinance to measure light from digital displays.) Under the draft sign ordinance, the digital displays would be allowed to emit 600 candelas per square meter of the sign. Digital displays are currently found on commercial boulevards that immediately abut residential neighborhoods that are far darker at night than the area surrounding the Wilshire Grand. Using the standards from one district of the City to develop one-size-fits-all illumination levels reveals a basic ignorance of the way light is perceived by humans that should not be enshrined into law.

The draft ordinance also uses the concept of “ambient illumination” as a baseline from which additional light from signs would be measured. This is a problematic provision; this term is not defined in the ordinance and there are many ways that one could go about measuring “ambient illumination.” Illumination at any given point in space differs depending on the direction that one measures the light (up, down, north, south, etc.), and it changes by the hour of the night and the amount of cloud cover (Buchanan 2006; Kyba et al. 2011; Moore et al. 2006). To suggest such use of such a baseline without defining what it means reveals the gross technical insufficiency of the proposed ordinance.

Additional Light From Signs Allowed Under Ordinance Threatens Public Health

The proposed sign ordinance provides avenues by which the total amount of outdoor night lighting in the City will be increased, including the amount of light experienced at residential properties. This is obvious that outdoor lighting will increase, since the ordinance now allows out-of-kind mitigation for additional signage. Such increases in artificial night lighting require review under the California Environmental Quality Act, as impacts to the aesthetic environment and as threats to public health and wildlife.

Exposure to light at night (LAN) can result in physiologically inadequate sleep and curtailed sleep duration. LAN and resulting disruption of circadian rhythms are implicated in adverse effects for human health, including increased risk of breast cancer (Hansen 2001a; Hansen 2001b; Kloog et al. 2008a; Kloog et al. 2011; Schernhammer et al. 2006; Stevens 1987; Stevens & Rea 2001) and prostate cancer (Kloog et al. 2009; Pukkala et al. 2006). The mechanism for this relationship has been well established in the laboratory (Blask et al. 2005). Exposure to LAN, particularly that containing blue wavelengths (those that appear bright white or “cool” white), suppresses the body’s production of the pineal neurohormone melatonin, which is produced at night under dark conditions (Arendt 2005). The hormone melatonin is “oncostatic,”

meaning that when it is present in the proper concentration it keeps cancers from growing. When melatonin is suppressed, cancer cells can grow unimpeded.

A group of scientists from the University of Haifa recently published scientific articles that illustrated the impacts of LAN on cancer rates in populations (Kloog et al. 2008a; Kloog et al. 2008b; Kloog et al. 2009; Kloog et al. 2011). They found that after controlling for other factors, high breast cancer rates in Israel were correlated with high levels of outdoor LAN (Kloog et al. 2008a; Kloog et al. 2008b). This pattern held true for majority and minority populations throughout the country. Analysis of patterns within cities also showed elevated breast cancer risk from exposure to high levels of outdoor night lighting (Kloog et al. 2008a).

The international health community has officially recognized the role of LAN in causing cancer by identifying shift work as a potential carcinogen, with exposure to LAN as the mechanism for this effect (Straif et al. 2007).

Sleep is necessary for restoring physiological and biological processes (Bennington & Heller 1995), in consolidating memory (Drosopoulos et al. 2007), and maintaining a healthy metabolism (Taheri et al. 2004). LAN from the outdoors can interrupt these processes and result in adverse health outcomes.

The proposed sign ordinance would increase the visual disturbances created by lighted signs and digital displays in the City, and the proposed limitations on brightness would be insufficient to avoid increases in illumination or glare at residential properties. Digital advertising displays could produce direct glare and illumination that exceed current limits and disrupt sleep of residents and still be in compliance with the new sign ordinance. This significant adverse impact requires review under the California Environmental Quality Act.

Potential Expansion of Sign Program to Parks Would Have Significant Adverse Impacts

Although the current version of the sign ordinance does not include provisions that would allow introduction of signs into Los Angeles public parks, language that would enable this could be added as the ordinance moves through the legislative process. Of particular concern would be the introduction of more night lighting into parks. Artificial night lighting has adverse impacts on wildlife, which have been documented at length (see, e.g., Eisenbeis & Hänel 2009; Kempenaers et al. 2010; Longcore & Rich 2004; Perry et al. 2008; Rich & Longcore 2006). These impacts include disruptions of foraging and reproductive behavior, altered circadian rhythms, disrupted predator-prey dynamics, and direct mortality. Any proposal to allow illuminated signs in parks would require review under the California Environmental Quality Act. Furthermore, the current proposal does not provide any mechanism to protect biological resources from additional night lighting. Adverse impacts to biological resources can take place in the middle of an urban area, since migratory birds are attracted to and killed by the lights on tall buildings and other structures (Gauthreaux & Belser 2006; Lebbin et al. 2007; Longcore et al. 2008; Manville 2009).

Qualifications

Land Protection Partners has provided scientific review of environmental compliance documents and analysis of complex environmental issues for local, regional, and national clients for 13 years. Dr. Travis Longcore is Associate Professor (Research) at the USC Spatial Sciences Institute and Associate Adjunct Professor at the UCLA Institute of the Environment and Sustainability. He was graduated *summa cum laude* from the University of Delaware with an Honors B.A. in Geography, holds an M.A. and a Ph.D. in Geography from UCLA, and is professionally certified as a Senior Ecologist by the Ecological Society of America. Longcore has authored or co-authored over 20 scientific papers in top peer-reviewed journals such as *Conservation Biology*, *Current Biology*, *Environmental Management*, and *Frontiers in Ecology and the Environment* and is co-editor of the book *Ecological Consequences of Artificial Night Lighting* (Island Press, 2006).

Literature Cited

- Arendt, J. 2005. Melatonin: characteristics, concerns, and prospects. *Journal of Biological Rhythms* **20**:291–303.
- Bennington, J. H., and H. C. Heller. 1995. Restoration of brain energy metabolism as the function of sleep. *Progress in Neurobiology* **45**:347–360.
- Blask, D. E., G. C. Brainard, R. T. Dauchy, J. P. Hanifin, L. K. Davidson, J. A. Krause, L. A. Sauer, M. A. Rivera-Bermudez, M. L. Dubocovich, S. A. Jasser, D. T. Lynch, M. D. Rollag, and F. Zalatan. 2005. Melatonin-depleted blood from premenopausal women exposed to light at night stimulates growth of human breast cancer xenografts in nude rats. *Cancer Research* **65**:11174–11184.
- Buchanan, B. W. 2006. Observed and potential effects of artificial night lighting on anuran amphibians. Pages 192–220 in C. Rich, and T. Longcore, editors. *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C.
- Chepesiuk, R. 2009. Missing the dark: the health effects of light pollution. *Environmental Health Perspectives* **117**:A20–A27.
- Drosopoulos, S., C. Schulze, S. M. Fischer, and J. Born. 2007. Sleep's function in the spontaneous recovery and consolidation of memories. *Journal of Experimental Psychology: General* **136**:169–183.
- Eisenbeis, G., and A. Hänel. 2009. Light pollution and the impact of artificial night lighting on insects. Pages 243–263 in M. J. McDonnell, A. K. Hahs, and J. Breuste, editors. *Ecology of cities and towns: a comparative approach*. Cambridge University Press, Cambridge.
- Gauthreaux, S. A., Jr., and C. Belser. 2006. Effects of artificial night lighting on migrating birds. Pages 67–93 in C. Rich, and T. Longcore, editors. *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C.
- Hansen, J. 2001a. Increased breast cancer risk among women who work predominantly at night. *Epidemiology* **12**:74–77.
- Hansen, J. 2001b. Light at night, shiftwork, and breast cancer risk. *Journal of the National Cancer Institute* **93**:1513–1515.
- Kempnaers, B., P. Borgstöm, P. Loës, E. Schlicht, and M. Valcu. 2010. Artificial night lighting affects dawn song, extra-pair siring success and lay date in songbirds. *Current Biology* **20**:1735–1739.

- Kloog, I., A. Haim, and B. Portnov. 2008a. Using kernel density function as an urban analysis tool: Investigating the association between nightlight exposure and the incidence of breast cancer in Haifa, Israel. *Computers, Environment and Urban Systems* **33**:55–63.
- Kloog, I., A. Haim, R. Stevens, M. Barchana, and B. Portnov. 2008b. Light at night co-distributes with incident breast but not lung cancer in the female population of Israel. *Chronobiology International* **25**:65–81.
- Kloog, I., A. Haim, R. Stevens, and B. Portnov. 2009. Global co-distribution of Light at Night (LAN) and cancers of prostate, colon, and lung in men. *Chronobiology International* **26**:108–125.
- Kloog, I., B. A. Portnov, H. S. Rennert, and A. Haim. 2011. Does the modern urbanized sleeping habitat pose a breast cancer risk? *Chronobiology International* **28**:76–80.
- Kyba, C. C. M., T. Ruhtz, J. Fischer, and F. Hölker. 2011. Cloud coverage acts as an amplifier for ecological light pollution in urban ecosystems. *PLoS ONE* **6**:e17307.
- Lebbin, D. J., M. G. Harvey, T. C. Lenz, M. J. Andersen, and J. M. Ellis. 2007. Nocturnal migrants foraging at night by artificial light. *Wilson Journal of Ornithology* **119**:506–508.
- Longcore, T. 2010. Sensory ecology: night lights alter reproductive behavior of blue tits. *Current Biology* **20**:R893–R895.
- Longcore, T., and C. Rich. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* **2**:191–198.
- Longcore, T., C. Rich, and S. A. Gauthreaux, Jr. 2008. Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: a review and meta-analysis. *Auk* **125**:485–492.
- Manville, A. M., II. 2009. Towers, turbines, power lines, and buildings — steps being taken by the U.S. Fish and Wildlife Service to avoid or minimize take of migratory birds at these structures. Pages 1051–1064 in T. D. Rich, C. Arizmendi, D. W. Demarest, and C. Thompson, editors. *Tundra to Tropics: Connecting Habitats and People*. Proceedings of the 4th International Partners in Flight Conference, 13–16 February, 2008. Partners In Flight, McAllen, Texas.
- Moore, M. V., S. J. Kohler, and M. S. Cheers. 2006. Artificial light at night in freshwater habitats and its potential ecological effects. Pages 365–384 in C. Rich, and T. Longcore, editors. *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C.
- Perry, G., B. W. Buchanan, R. N. Fisher, M. Salmon, and S. E. Wise. 2008. Effects of artificial night lighting on amphibians and reptiles in urban environments. *Herpetological Conservation* **3**:239–256.
- Pukkala, E., M. Ojamo, S. Rudanko, R. G. Stevens, and P. Verkasalo. 2006. Does incidence of breast cancer and prostate cancer decrease with increasing degree of visual impairment. *Cancer Causes & Control* **17**:573–576.
- Rich, C., and T. Longcore, editors. 2006. *Ecological consequences of artificial night lighting*. Island Press, Washington, D.C.
- Schernhammer, E. S., C. H. Kroenke, F. Laden, and S. E. Hankinson. 2006. Night work and risk of breast cancer. *Epidemiology* **17**:108–111.
- Stevens, R. G. 1987. Electric power use and breast cancer: a hypothesis. *American Journal of Epidemiology* **125**:556–561.

- Stevens, R. G., and M. S. Rea. 2001. Light in the built environment: potential role of circadian disruption in endocrine disruption and breast cancer. *Cancer Causes & Control* 12:279–287.
- Straif, K., R. Baan, Y. Grosse, B. Secretan, F. El Ghissassi, V. Bouvard, A. Altieri, L. Benbrahim-Tallaa, and V. Coglianò. 2007. Carcinogenicity of shift-work, painting, and fire-fighting. *Lancet Oncology* 8:1065–1066.
- Taheri, S., L. Lin, D. Austin, T. Young, and E. Mignot. 2004. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. *PLoS Medicine* 1:e62.