

Informing Lighting Designs Through a Comprehensive Review of Light Pollution Impacts

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Abstract : In recent years, increasing concern has been shown towards the issue of light pollution, especially with the spread of brighter, more blue-rich LED bulbs. Much research has been conducted in order to study the effects of artificial light at night, and many adverse impacts have been discovered, such as circadian disruption, degradation of the night sky, and interference of the processes and behaviors of plants and animals. Despite a plethora of information in the literature regarding the numerous effects of this type of pollution, there does not appear to be a complete summary of these impacts, including their magnitudes, which would facilitate the balancing of risks and benefits in the design of an exterior lighting system. This paper provides a comprehensive review of the known impacts of light pollution, divided into four categories - human health, night sky, plants, and animals; additionally, it includes a synopsis of what likely remains unknown at this point in time. This review will attempt to showcase the relative significance of different impacts within each category, as well as their sensitivity to changes in lighting specifications (brightness, color temperature, shielding, and mounting height). Methods to be employed in this research include an extensive literature review and the gathering of expert knowledge and opinions. The findings of this review will be used to inform the creation of an optimized lighting design for the Missouri University of Science and Technology campus. It is hoped that future research will explore the known impacts of light pollution further, as well as search for what still remains to be found regarding the consequences of artificial light at night.

Keywords : comprehensive review, impacts, light pollution, lighting design, literature review

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