

2023 ICM

Problem E: Light Pollution



Photo Credit: K. Blyman

背景

光污染是指任何过度或不当使用人工光源的现象。我们所称的一些光污染现象包括光侵扰、过度照明和光混杂。这些现象在大城市的太阳下山后最容易观察到，但也可能发生在更偏远的地区。

光污染改变了我们对夜空的观感，对环境产生影响，并影响我们的健康和安全。例如，植物的成熟可能会延迟或加速，野生动物的迁徙模式可能会受到影响。过度的人工光可能会干扰我们的昼夜节律，导致睡眠质量下降，可能出现身体和心理健康问题。人工光引起的眩光可能会导致一些机动车事故。

社区官员或当地组织可以实施干预策略，以减轻光污染的负面影响。然而，人工光既有积极的影响，也有负面的影响，对不同地点产生不同的影响。例如，为避免上述光污染的负面影响，一些社区选择低照度的社区，但这可能会导致犯罪率增加。光污染的影响可能取决于诸如地点的发展水平、人口、生物多样性、地理和气候等因素。因此，评估影响程度和任何干预策略的潜在影响必须针对特定地点进行量身定制。

要求

COMAP的照明控制任务（ICM）正在努力提高人们对光污染影响的认识，并制定干预策略以减轻这些影响。为支持这项ICM工作，您的任务是解决在不同地点测量和减轻光污染影响，包括人类和非人类问题。具体而言，您应该：

- 开发一个广泛适用的度量标准，以识别特定地点的光污染风险水平。
- 应用您的度量标准，并解释其结果，包括以下四种不同类型的地点：
 - 受保护的地理位置，
 - 农村社区，
 - 郊区社区，
 - 城市社区。

• 描述三种可能的干预策略以应对光污染。讨论实施每个策略的具体行动以及这些行动对光污染效应的潜在影响。

- Choose two of your locations and use your metric to determine which of your intervention strategies is most effective for each of them. Discuss how the chosen intervention strategy impacts the risk level for the location.
- Finally, for one of your identified locations and its most-effective intervention strategy, produce a 1-page flyer to promote the strategy for that location.

Your PDF solution of no more than 25 total pages should include:

- One-page Summary Sheet.
- Table of Contents.
- Your complete solution.
- One-page promotion flyer.
- Reference List.

Note: The ICM Contest has a 25-page limit. All aspects of your submission count toward the 25-page limit (Summary Sheet, Table of Contents, Report, One-page promotion flyer, Reference List, and any Appendices). You must cite the sources for your ideas, images, and any other materials used in your report.

Glossary

Artificial Light: Any non-naturally occurring source of light.

Circadian Rhythms: The natural 24-hour sleep-wake cycle on which humans and other organisms operate.

Glare: Excessive brightness that decreases one's ability to see.

Intervention Strategies: Policies and/or actions that could be taken to disrupt the negative impacts of light pollution.

Light Clutter: Excessive grouping of lights.

Light Trespass: When light enters unintended areas.

Over-Illumination: Lighting at an intensity higher than what is needed for an activity or location.

Protected Land: Areas that governments or private entities protect from development due to their ecological, cultural, and/or natural importance.

Rural Community: A community located in one of the least densely populated parts of a country or region, and not easily accessible from an urban community.

Suburban Community: A community located in a moderately densely populated part of a country or region, or easily accessible from an urban community.

Urban Community: A community located in one of the most densely populated parts of a country or region.