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Living Environmental Laboratory for Lighting — A comprehensive study of interactions of artificial lighting and wildlifes

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Artificial light at night (ALAN) has become a major concern in recent years due to its impact on the health of human beings and the ecosystems. As a result, there is a surge of light pollution research not only on night sky brightness, but also on assessments of impacts on both ecology and society.

We have set up an interdisciplinary project in Hungary since September 2017, to not only study the impacts of change in lighting technology on patterns of ALAN (with emphasis on the areas within and around national parks in Hungary), but also facilitate national and international cooperations in light pollution research. We refer to this project as Living Environmental Laboratory for Lighting (LELL). Specifically, the project covers the following areas:

1. Development of new techniques for night sky radiometry and spectrometry

We are developing techniques for night sky multispectral measurements using commercially available cameras with interchangeable lens, calibrated by high sensitivity spectroradiometer, in order to quantify night sky condition and identify sources of artificial light at high resolution not achievable by systems based on panchromatic sensors or fisheye lenses. In addition, we will compare the results from our ground-based measurements with satellite-based observations.

2. Modeling of night sky patterns in national parks of Hungary

We have developed a Monte-Carlo method of modeling light pollution, which can also be used for investigating effects of aerosols and clouds on the propagation of artificial light.

3. Impact assessments of ALAN through measurements

The public lighting was remodeled to LED-based systems in two areas close to national parks, one of which in the Zselic region in Southwestern Hungary, and another in Bükk in Northern Hungary. Using the techniques above, we are monitoring the change in night sky brightness and color, as well as the impact on flora and fauna.

4. Recommendations on future assessments and mitigations of light pollution

With our experience gain within the duration of this project, we will inform the light pollution research community of standardizing methodologies for monitoring light pollution, as well as giving recommendations for managing public lighting assets to reduce the impacts of light pollution.

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