Identification of Dark Ecological Corridors

Challenge Provider: Bristol City Council

Bristol is the largest city in South West England and has a population of approx 463'400 who collectively speak at least 91 different languages. The city has a bold vision to build partnerships to take on challenges such as poverty, public health and wellbeing and sustainable inclusive growth.

The city, having declared climate and ecological emergencies, is taking actions to meet ambitious targets for reducing climate change and recovery of nature. Bristol City Council's (BCC) role evolved from primarily providing services to empowering others to collaborate to get things done. The council is coordinating with partners to further understand the current ecological network and opportunities to enhance it. This is a key action in the Bristol One City Ecological Emergency Strategy.

Context

Artificial Light at Night (ALAN) is increasingly recognised as a major threat to global biodiversity. It alters the amount, quality and connectivity of available habitats for species. Light pollution causes habitat fragmentation by making areas harder to pass through and thus creating spatial barriers, evolutionary changes, and distorting normal growth patterns among other negative effects. Species are affected differently by lighting depending on when their feeding and mating seasons occur.

One of the most affected species are horseshoe bats, as they are sensitive to light and ALAN can in fact reduce their feeding area and their activity greatly. As a solution, dark ecological corridors and spaces can be created inside the city so bats can thrive and move around between different areas. Public lighting systems today enable temporarily activating elements of the dark ecological network. The BCC plans to install a Central Management System (CMS) within the next two years that will allow the implementation of dimming regimes in certain locations.

Further Background Information

- Challéat, S., et al., 2021. Grasping darkness: the dark ecological network as a social-ecological framework to limit the impacts of light pollution on biodiversity. Ecology and Society 26(1):15. - https://www.ecologyandsociety.org/vol26/iss1/art15/ES-2020-12156.pdf
- Schirmer, A.E., et al., 2019. Mapping behaviourally relevant light pollution levels to improve urban habitat planning. Scientific Reports 9, 11925 - https://rdcu.be/cDGyW
- Hiding from the light - https://www.batcon.org/article/hiding-from-the-lights/

- Artificial light reduces foraging opportunities in wild least horseshoe bats - https://pubmed.ncbi.nlm.nih.gov/34265558/
- Protecting bats in waterside development June 2018 ba306_bath_bats_and_lighting_guide_10_june_2018.pdf (bathnes.gov.uk)

Goal

The goal of this challenge is to reduce the impact of ALAN on the bats in the city of Bristol and therefore reduce its adverse effect on the ecosystem. The output of this challenge is to be applied to the decision making on which lighting needs to be turned off by using the CMS.

Sustainable Development Goal

GOAL 15: Life on Land
Target 15.5: Protect biodiversity and natural habitats

Outcome

Create an optimization algorithm that connects the natural habitats (feeding/ roosting/ breeding sites) of the bats together. The algorithm needs to take into consideration safety for pedestrians and/or road users. The algorithm also should be scalable to account for future restrictions, other species, and potentially to even be used in other cities.

Available Resources

All the data resources can be found here: https://wdl-data.fra1.digitaloceanspaces.com/bristol/2022_05_30_bristol_datasets.zip

As a reminder, you can also use any data that is open, free and legally available. It is also highly recommended to use the OpenStreetMaps data with regard to understanding residential areas, business areas and others.

The resources are provided either by the Bristol Regional Environmental Records Centre (BRERC) or the Bristol City Council (BCC).

The following list of resources is available for you to use:

- Records of bats that were recently spotted (within the last 10 years) were obscured to 1km in resolution for security purposes. Bat records older than 10 years are provided at full resolution, except for records that identify roosts - these are also provided at 1km resolution. (BRERC)
- Data on the occurrence of moths (a major food source for bats) in Bristol. (BRERC)

- BRERC West of England Habitat GIS Map which includes Priority Habitats, potential Priority habitats and other habitats Note: **This dataset can only be used to produce a new product/tool in a controlled setting and the BRERC mapping cannot be published as open-source data.** (BRERC)
- BRERC Green Alleys GIS (produced as part of BRERC project for Green Capital. **Same open source constraints as above.** (BRERC)
- Wildlife Corridors dataset contains sites which help to link up and buffer Sites of Nature Conservation Interest (SNCIs) and the City Green Belt. (BCC)
- OS Open data green space (BCC)
- Public lighting data – location of street lights and type of lights (BCC)
    - Note: Whilst we can map locations of lights we do not know the Lux value of the lighting which influences the level and spill of lighting.

The description of the datasets can be found in the data dictionary.

You can also access the open data portal of Bristol: https://opendata.bristol.gov.uk/pages/homepage/

Tips

- For some locations it may not be possible to determine if street lighting is present. In other places, it might be difficult to assess the light level.
- Use OpenStreetMaps data to highlight commercial and residential area differences in lighting and evaluate which sites might need a certain level of nighttime lighting.
- The type of the lamp might in some cases indicate the level of Lux (illuminance).

Submissions

Deadline: Tuesday, 14th of June 23h59 AoE (Anywhere on Earth)

Don't forget that you will need to submit the solution report (notebook template with the link below) and executive summary (markdown template below). You also need to submit a **3-minute** video summary, this time with a focus on the technical aspects of your solution.

Solution report template: https://bit.ly/wdl_2022_jupyter_template
Executive summary template: https://bit.ly/wdl_2022_exec_sum