

LIGHT POLLUTION

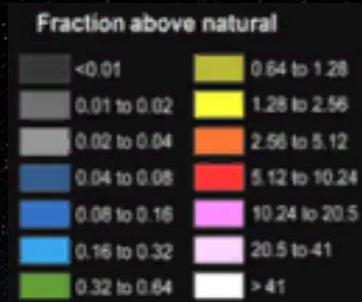
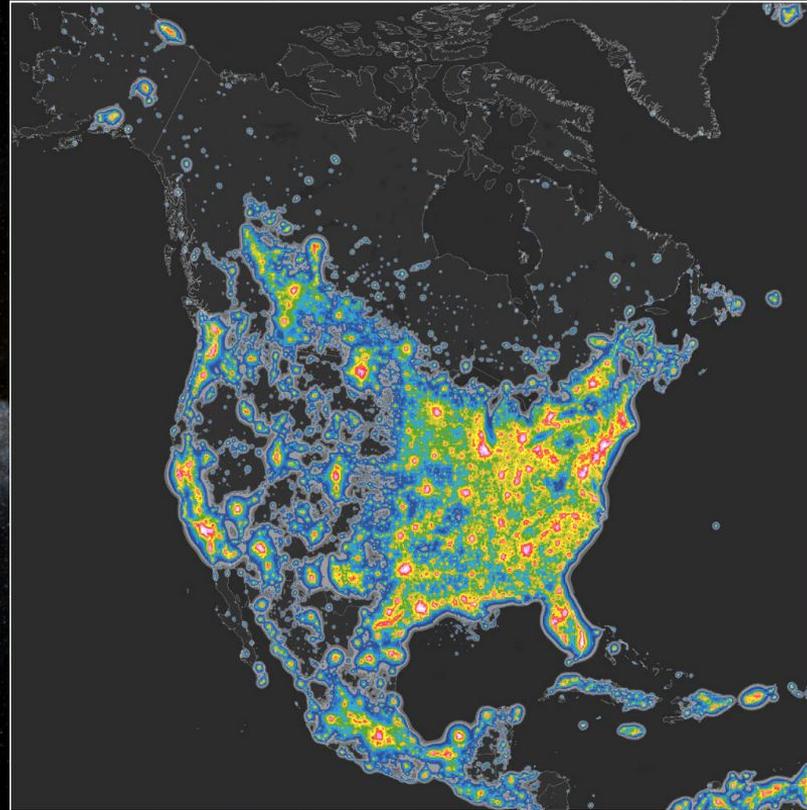
Group 19: Janine Rumpool, Sem Bakker, Nienke Dik,
Marleen de Ruijter, Emilie van Eps & Eva te Walvaart



Night sky

A decorative pattern at the bottom of the page consisting of a series of vertical bars of varying heights and shades of teal, creating a stylized horizon or skyline effect.

Fraction Artificial/Natural Light Visualized using the Bortle Scale (USA, 2016)



Source: 'The new world atlas of Artificial Night Sky Brightness' Published on science.org

Fraction
Artificial/
Natural
light:

0.00

Sources

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Story

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Tendency to leave the light on when leaving a room with average visible lights



This interactive story map visualizes the average visible lights over the whole world and the tendency to leave the light on when leaving a room. You can interact by moving the slider left to right. There are several scenes you can click through. Clicking on the country allows you to see the values of sometimes, hardly ever and never.



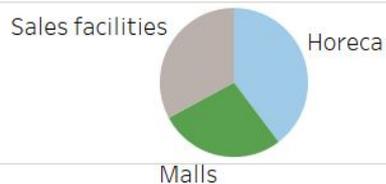
Total amount of light emission by different facilities

Category

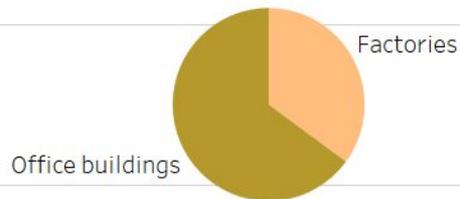
Infrastructure



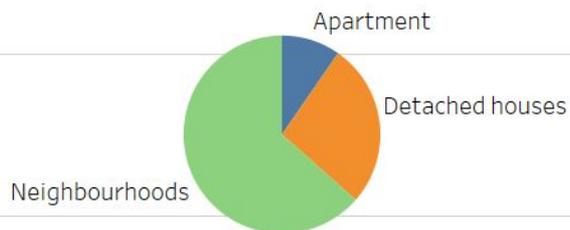
Entertainment



Business



Residential



Public

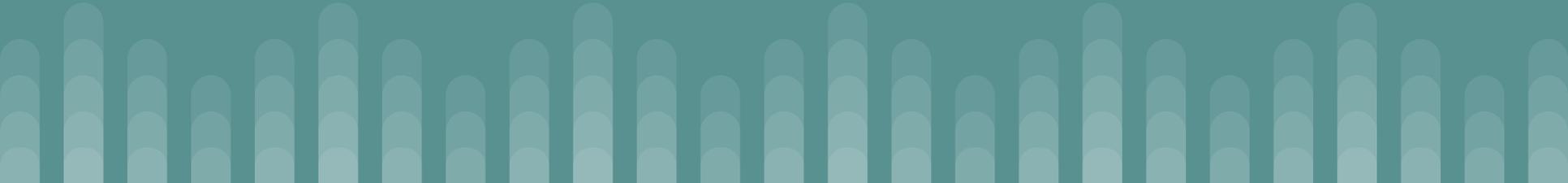


Zone type

- (All)
- Apartment
- Detached houses
- Factories
- Horeca
- Malls
- Neighbourhoods
- Office buildings
- Parking areas
- Parks
- Public facilities
- Religious facilities
- Roads
- Sales facilities
- Sport facilities
- University facilities

Total amount of light in nW/cm²: 3455

Human health

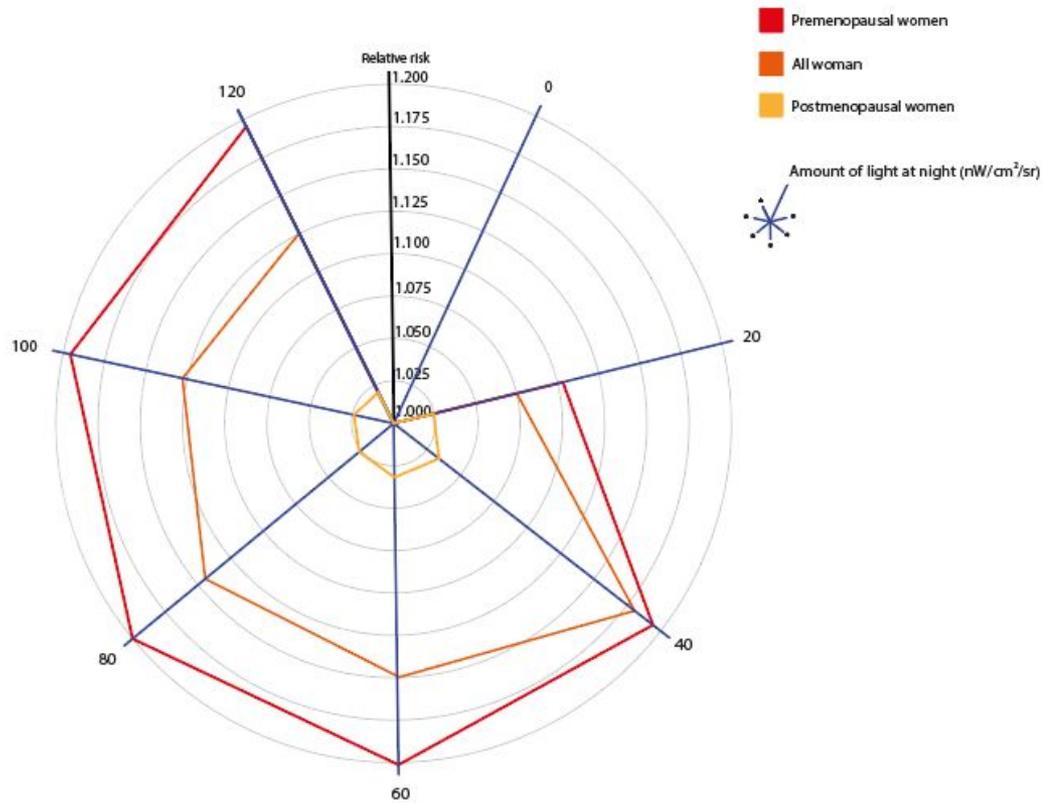


The Impact of Nighttime Light Exposure on Breast Cancer Risk among Pre and Postmenopausal Women



Source: International Journal of Health Geographics

Type: Risk radar



Relative risk
 Measure comparing the likelihood of breast cancer occurrence between individuals exposed to a certain amount of light at night and those not exposed, focusing on pre and postmenopausal women. A value greater than 1 indicates an increased risk, while a value less than 1 suggests a reduced risk. For example, a relative risk of 1.1 indicates that women exposed to light at night have a 1.1 times (10%) higher risk of developing breast cancer compared to those not exposed.

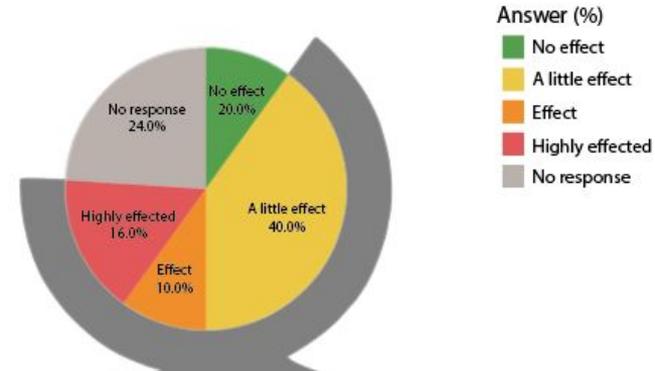
Question: How strongly do you feel affected by excessive artificial lighting outside of your residence?



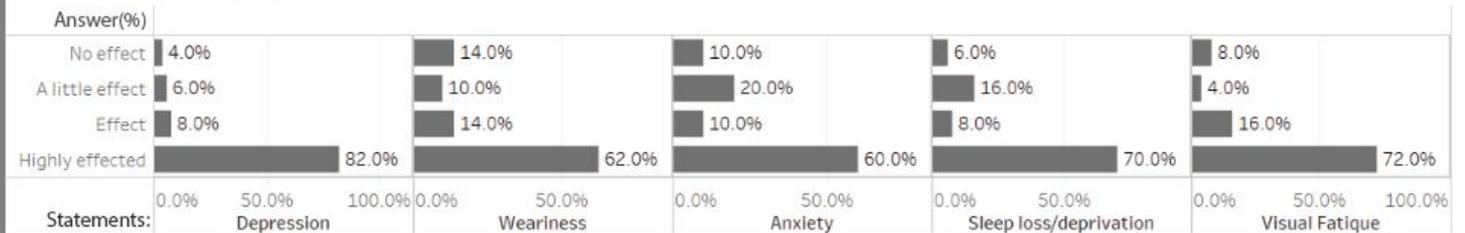
Source: University of malaya

Title of paper: Light Pollution and Its Effect on the Environment

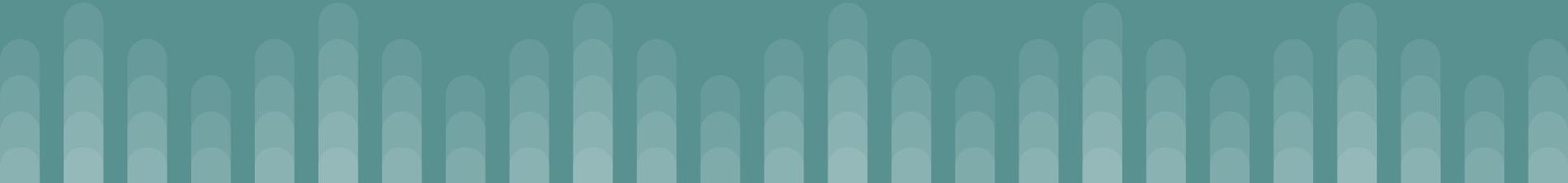
Type: Risk radar



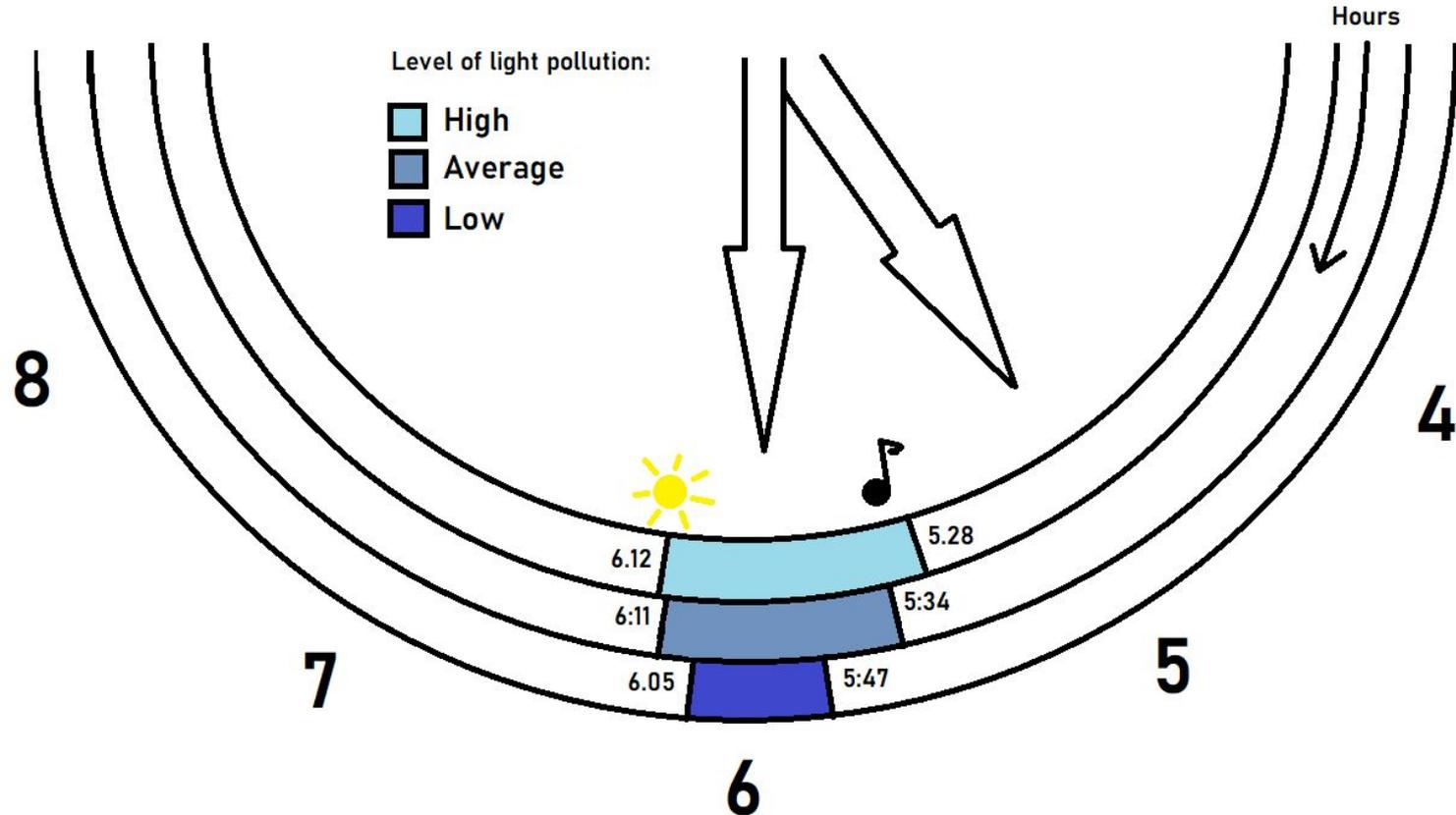
Question: If you do feel affected, please rate the following statements on a scale of 0 to 4, where 0 is No effect whatsoever and 4 is Highly affected



Animals on land

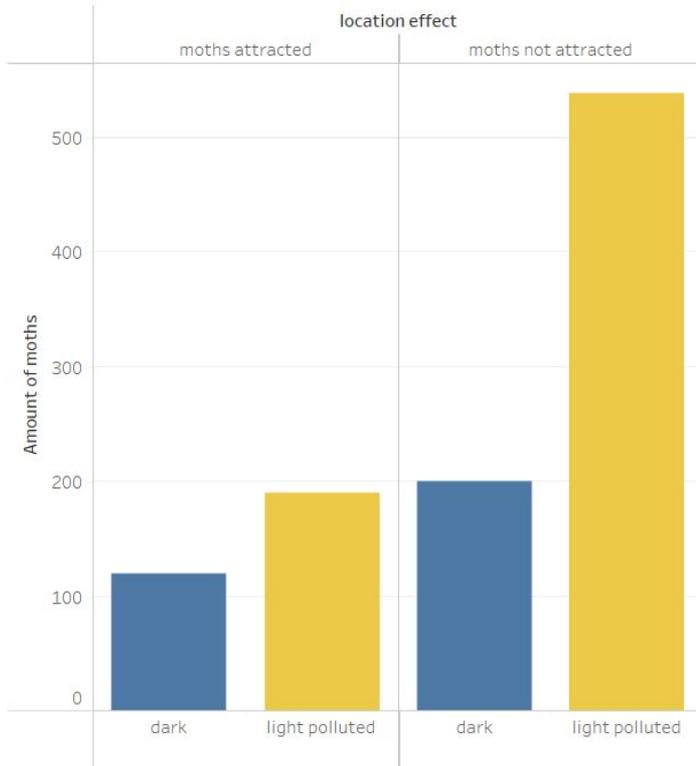


Time between first bird song and sun rise

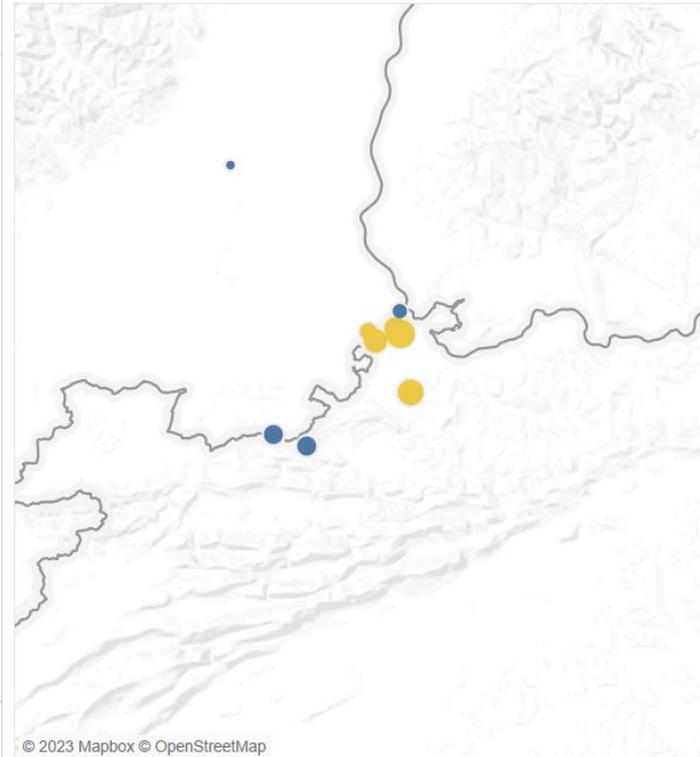


Artificial light at night drives earlier singing in a Neotropical bird. In each site, the time when the first song of the Saffron Finch was recorded. Then, the maximum levels of artificial light at night were measured during a 1-min using smartphone apps.

Flight-to-light behaviour of moth populations



Overview of measuring places



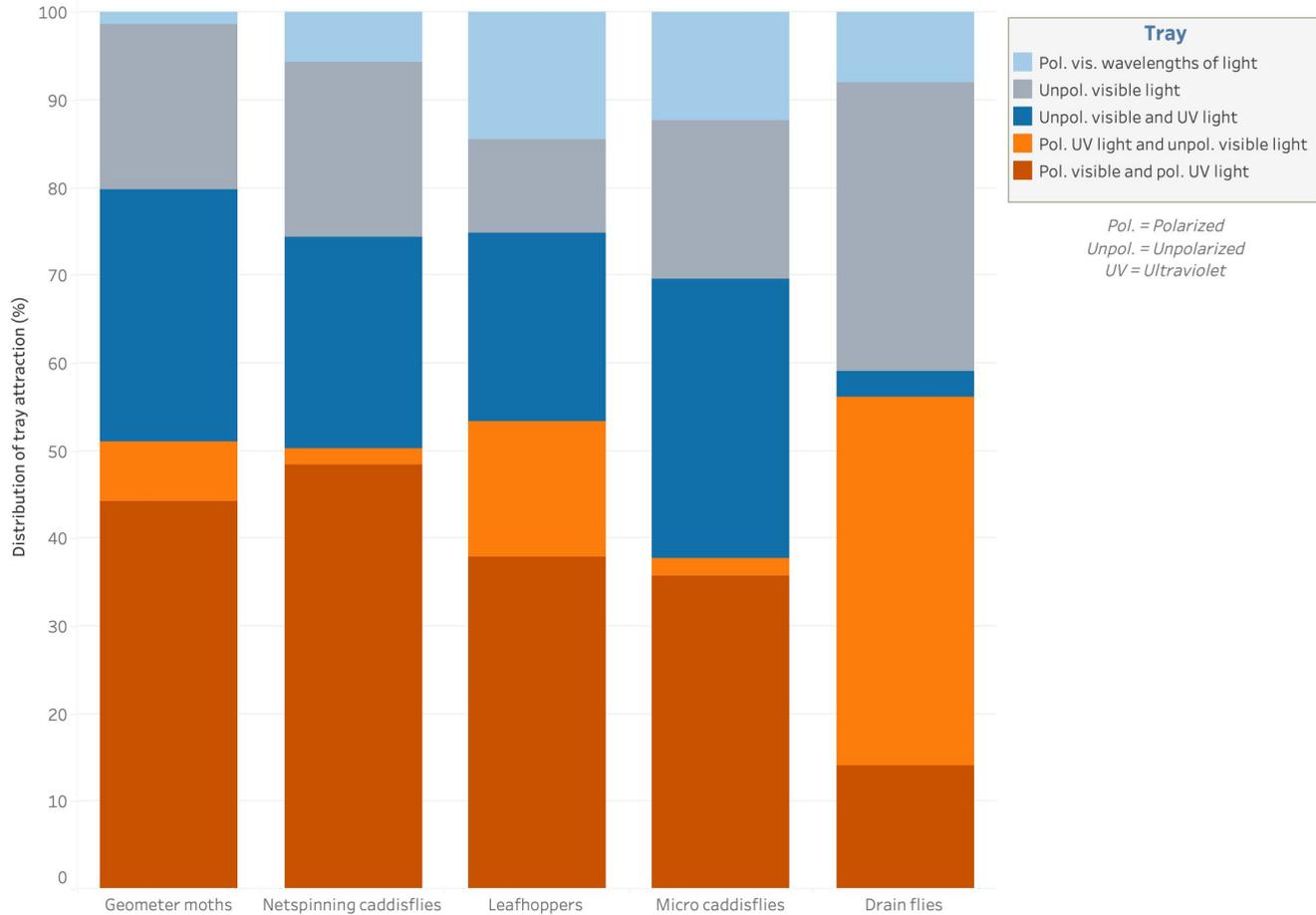
A big consequence of light pollution is the generally fatal attraction of nocturnal insects to artificial light sources. Moths from urban populations have a significant reduction in the flight-to-light behaviour compared with rural populations. The reduced attraction to light sources of 'city moths' may lead to reduced mobility which negatively affects foraging and colonization.

Water

Effect of light pollution on the behaviour of aquatic insects



Ultraviolet polarized light pollution responses by aquatic insects



Saw Kill River in Annandale-on-Hudson, NY

Light pollution in coastal areas





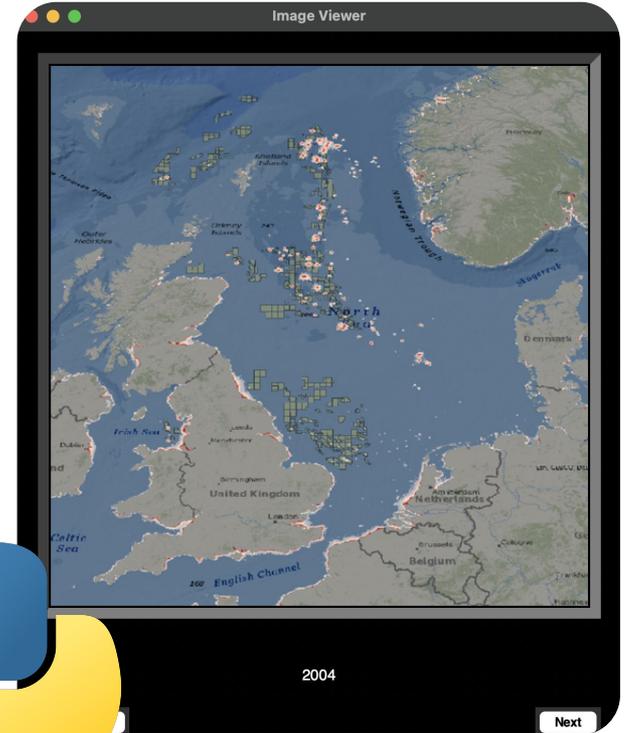
North Sea Transition Authority

Offshore Oil and Gas Activity



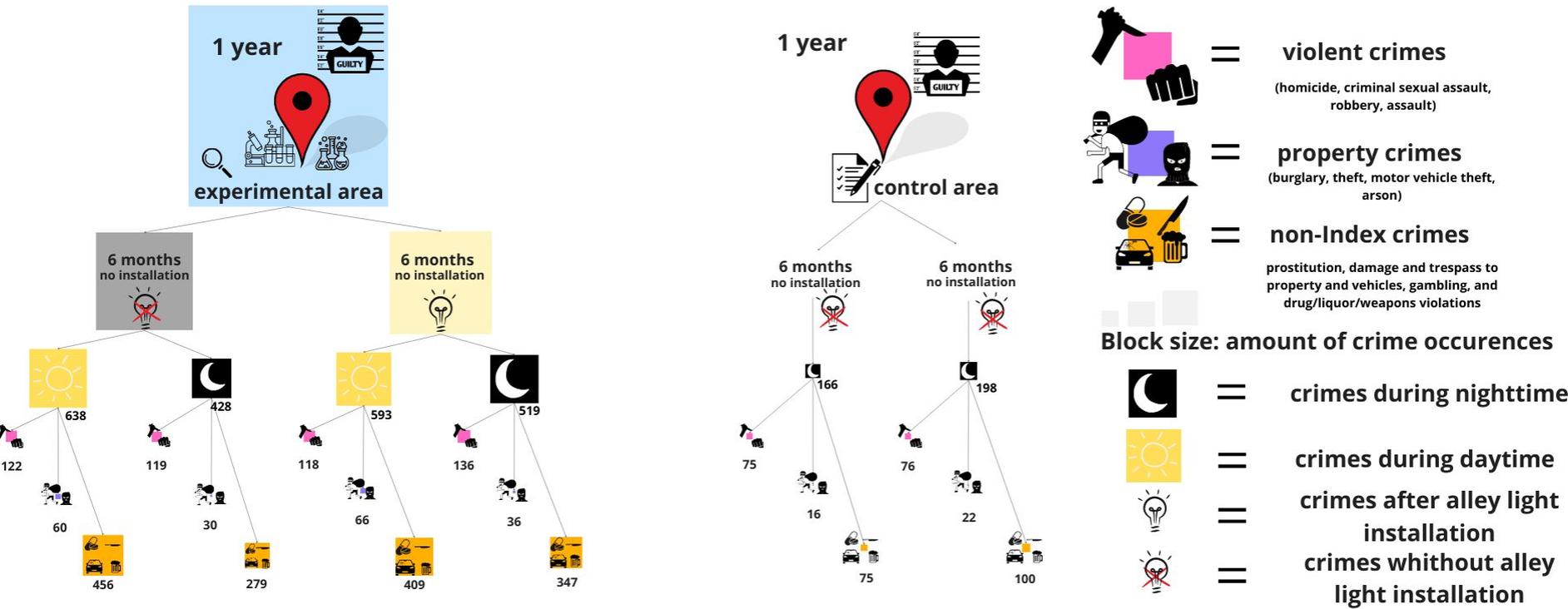
NCEAS

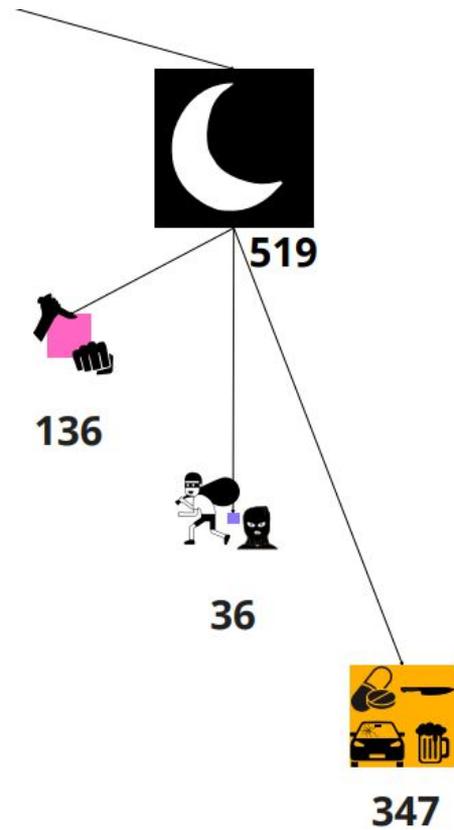
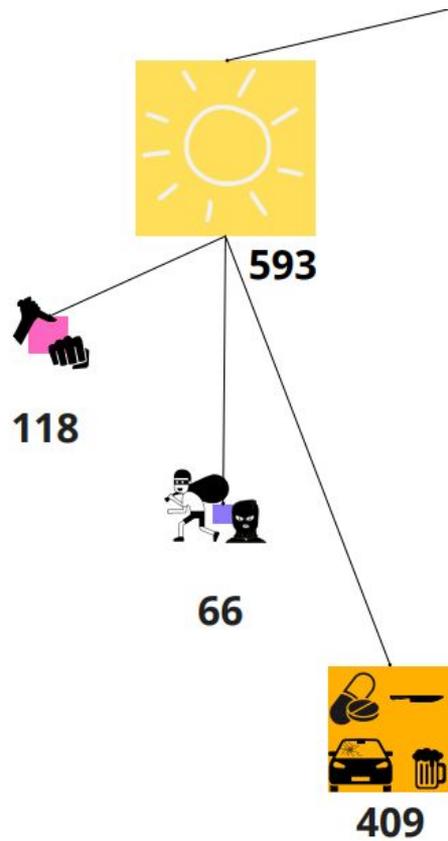
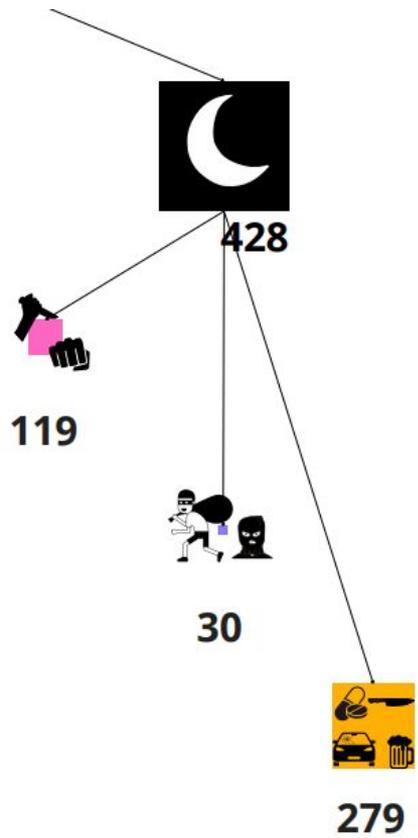
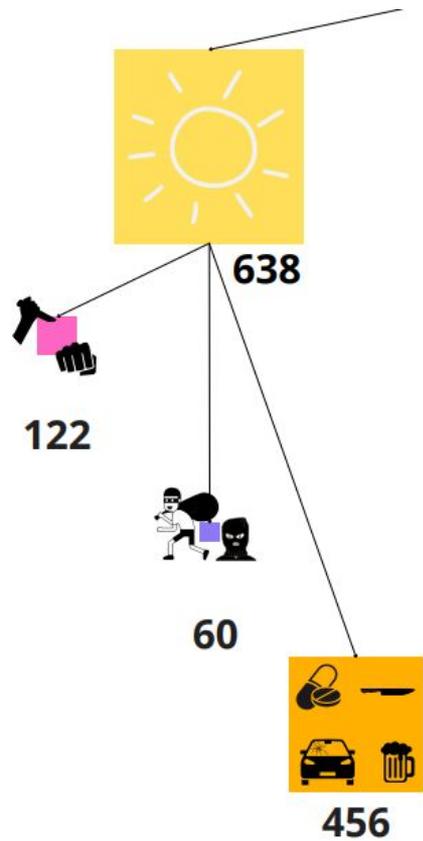
National Center for Ecological Analysis and Synthesis

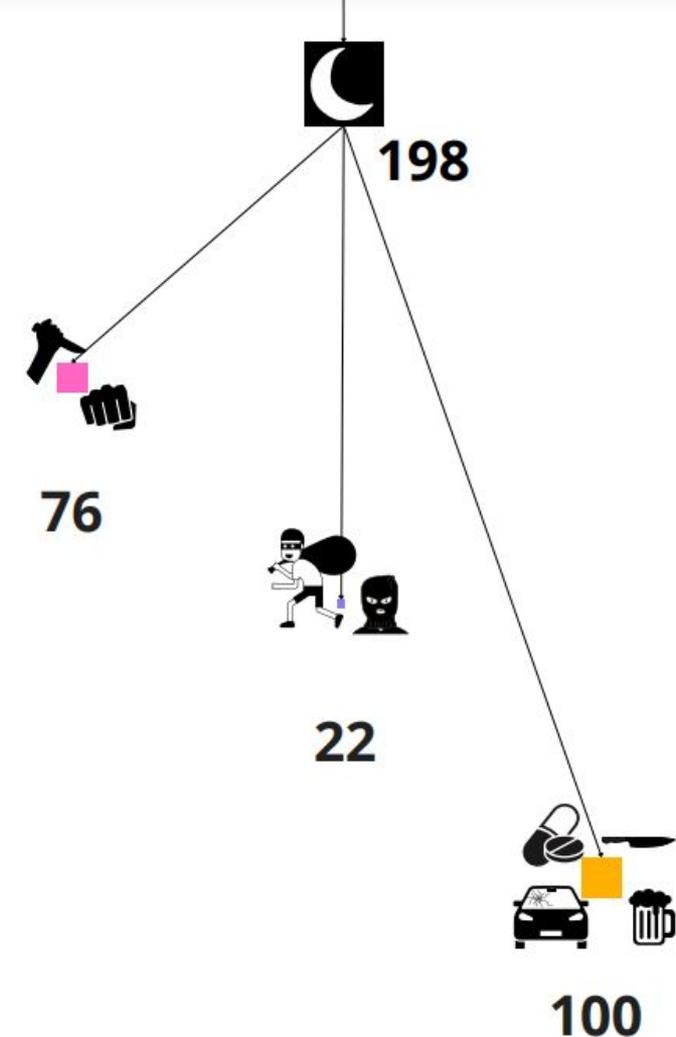
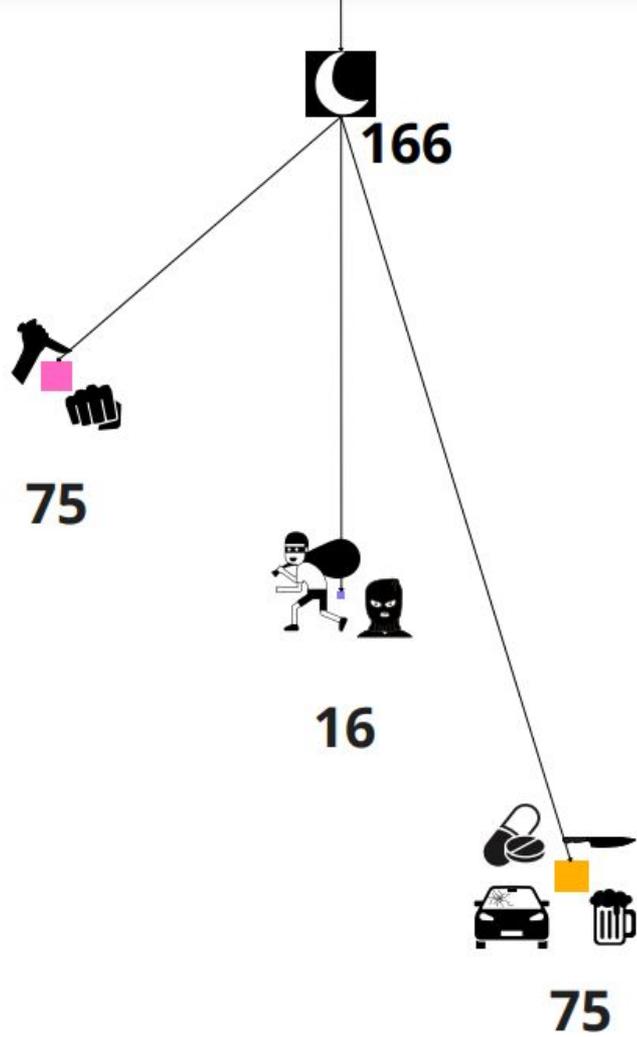


Safety

Effect of installation of alley lighting on crimes measured in police district in Chicago



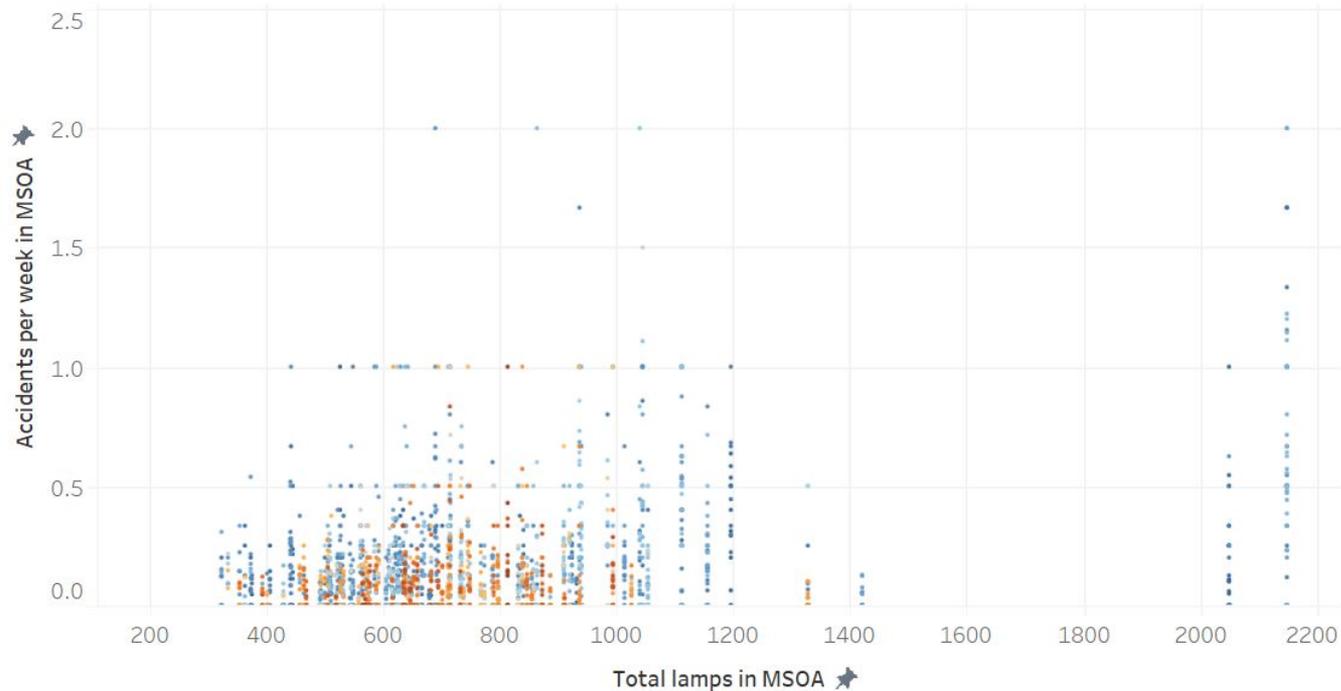




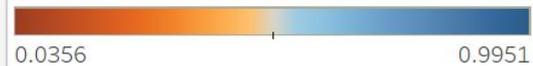
Source: Leeds Beckett University

Type: scatter plot

Accidents per week in MSOAs vs total lamps in area with the percentage of bright lamps



Proportion of Bright Lamps in MSOA's Total Lam...



Caption

Total lamp vs. Accidents per week in MSOA. Color shows details about [amount of bright lamps]/[Total lamp]. This ratio represents the proportion of bright lamps within the MSOA (Middle Layer Super Output Area) in relation to the total number of lamps present in the same MSOA.

MSOA stands for Middle Layer Super Output Area. It is a geographic statistical unit used in the United Kingdom for the reporting and analysis of small-area statistics. MSOAs are designed to have a similar population size, typically ranging from 5,000 to 15,000 residents, and are used for various research, planning, and policy purposes. They are subdivisions of larger administrative areas such as local authorities and are used to provide more detailed insights into specific geographic areas within the UK.

In the scatterplot, we observe that the number of accidents per week in a Middle Layer Super Output Area (MSOA) does not show a clear correlation with the total number of lamps in that MSOA.

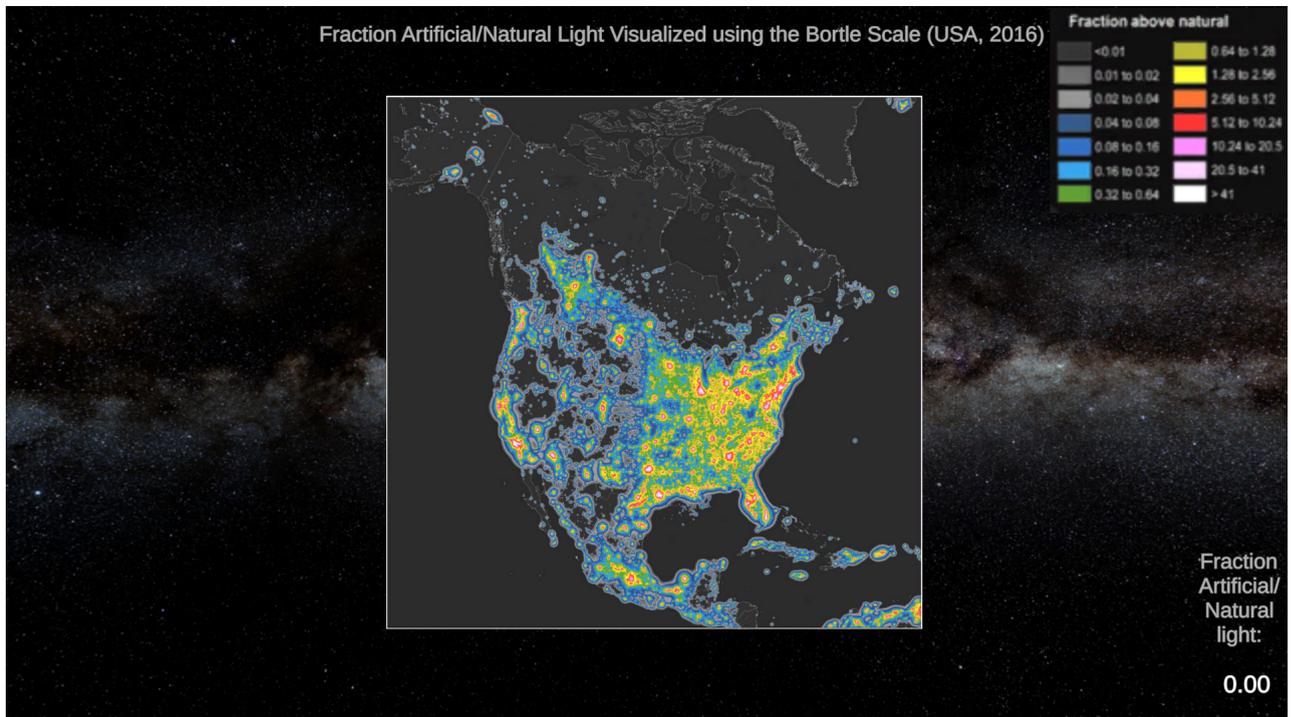
Additionally, when considering the ratio of bright lamps to the total number of lamps within an MSOA, interesting patterns emerge. Lower ratios tend to correspond to lower accident rates, while higher ratios appear for both higher and lower accident frequencies. This suggests that the ratio of bright lamps in a specific area may influence the likelihood of accidents occurring.

Conclusion

Group 19 - Light pollution

sub-topic: Night sky

Visualization 1: Fraction Artificial/Natural Light Visualized using the Bortle Scale (USA, 2016)



Link: <https://jampotjuh.itch.io/data-visualization>
interactive?: **yes/no**

Link to paper (source of data and legend):

<https://www.science.org/doi/10.1126/sciadv.1600377>

Link to Bortle scale legend that was used:

<https://idadarksky.tumblr.com/post/96075566733/the-bortle-scale-the-bortle-scale-is-a>

Bortle Scale Visual Representation Image:

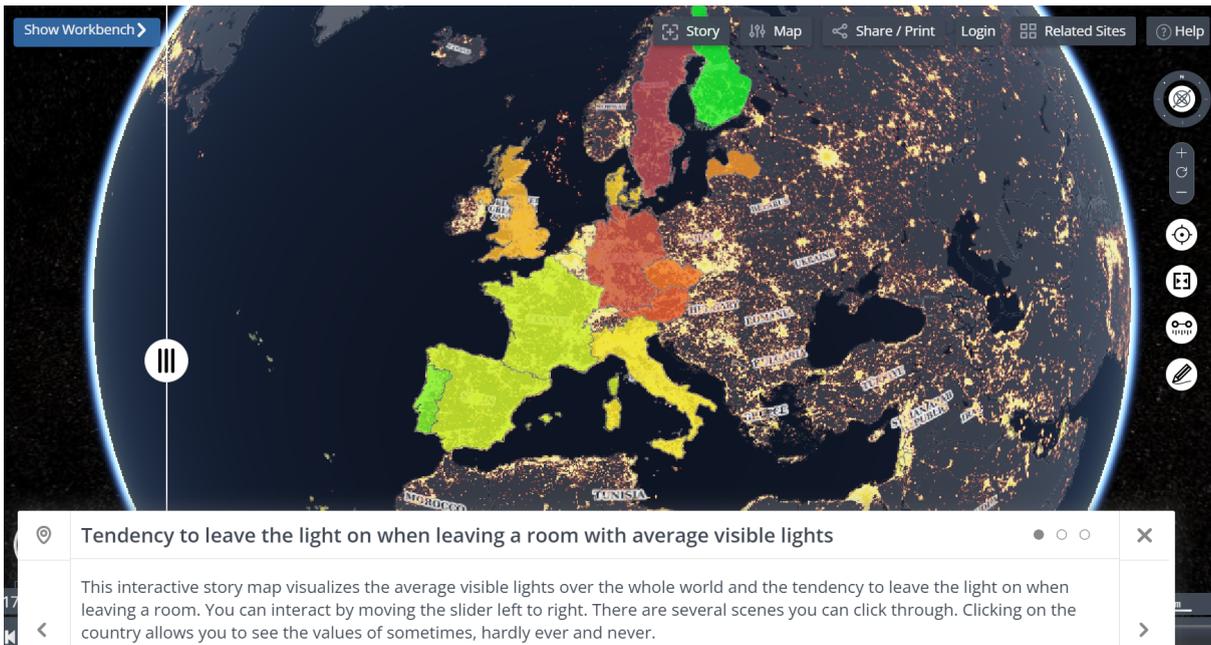
https://www.reddit.com/r/darksky/comments/683565/a_visual_representation_of_the_bortle_scale_used/

Asset: milkyway skybox

<https://assetstore.unity.com/packages/2d/textures-materials/milky-way-skybox-94001>

sub-topic: Sources

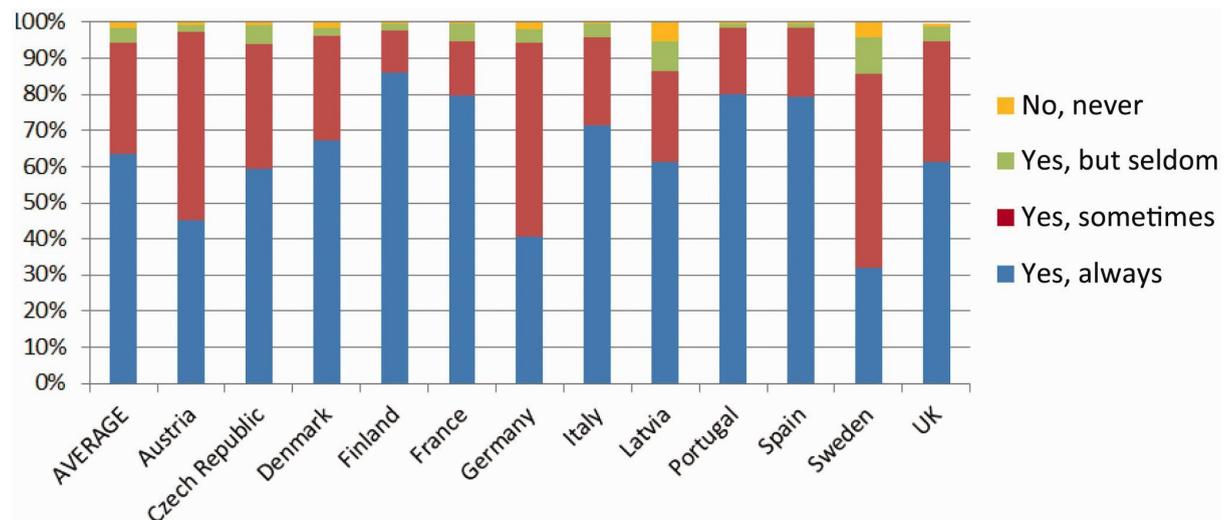
Visualization 2: Tendency to leave the light on when leaving a room with average visible lights



Link to visualization (may not work in full since there is local data as well):

<https://data.apps.fao.org/?share=f-62ef19fb-c7a7-43ec-b818-c0b4d4ed1f26>

Data source:



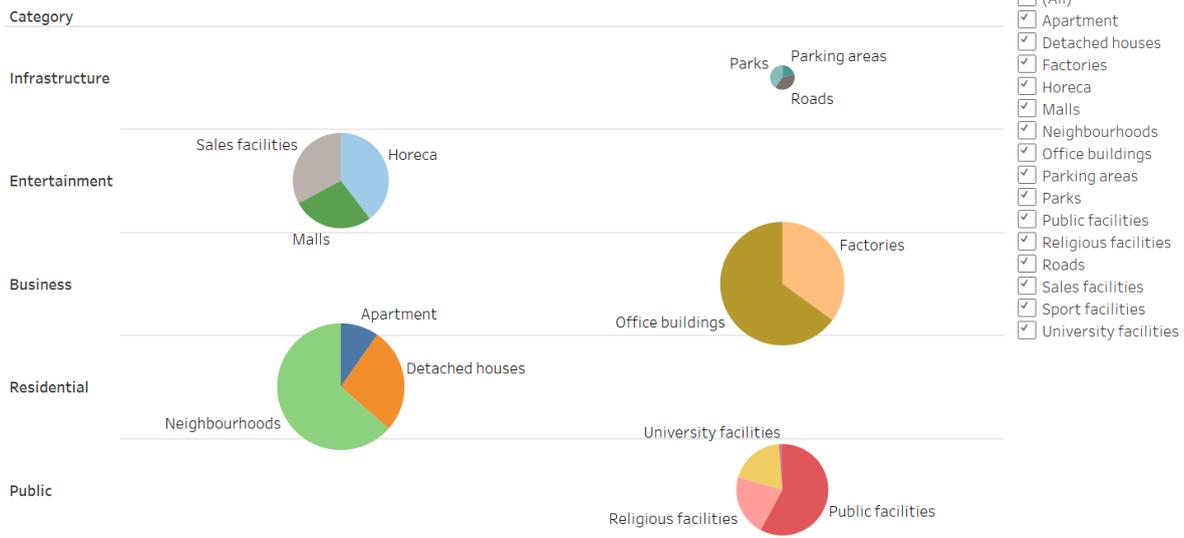
France: [Extinction of light when leaving a room France 2015 | Statista](#)

UK: [UK: tendency to leave lights on 2020 | Statista](#)

interactive?: yes/no

Visualization 3: Total amount of light emission by different facilities

Total amount of light emission by different facilities



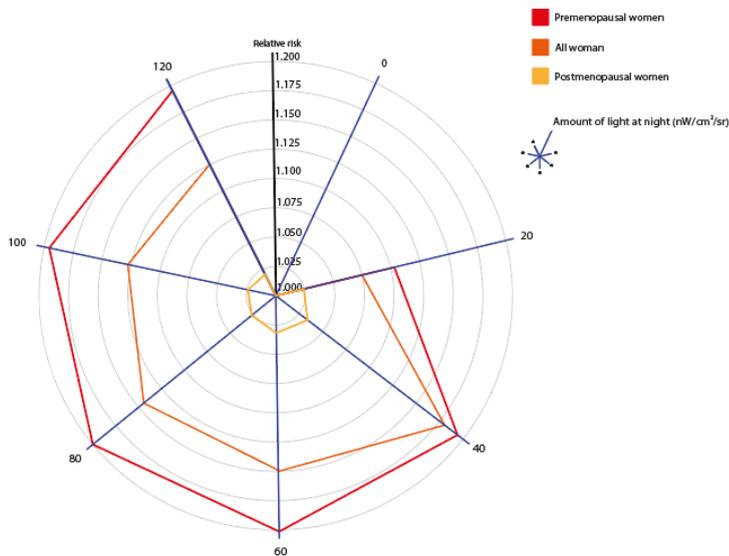
Total amount of light in nW/cm²: 3455

Link to research paper: [Quantifying the influence of urban sources on night light emissions - ScienceDirect](#)
 interactive?: yes/no

sub-topic - Human health

Visualization 4: The impact of nighttime light exposure on breast cancer risk among pre and postmenopausal women.

The Impact of Nighttime Light Exposure on Breast Cancer Risk among Pre and Postmenopausal Women



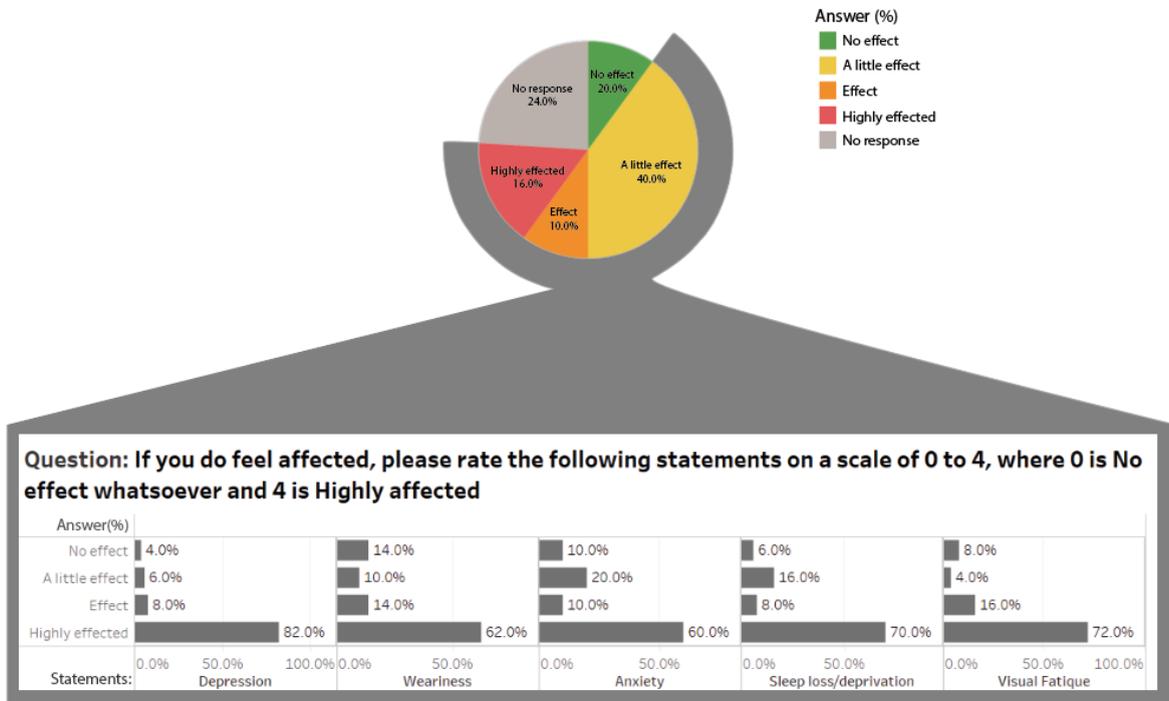
Relative risk:
 Measure comparing the likelihood of breast cancer occurrence between individuals exposed to a certain amount of light at night and those not exposed, focusing on pre and postmenopausal women. A value greater than 1 indicates an increased risk, while a value less than 1 suggests a reduced risk. For example, a relative risk of 1.1 indicates that women exposed to light at night have a 1.1 times (10%) higher risk of developing breast cancer compared to those not exposed.

Link to the paper: <https://ij-healthgeographics.biomedcentral.com/articles/10.1186/s12942-021-00297-7>
 (data was derived from figure 4 of the paper, how this data was derived can be found in the data derived folder in this zip file)

interactive?: yes/no

Visualization 5: Light pollution and its effect on the environment - mental health

Question: How strongly do you feel affected by excessive artificial lighting outside of your residence?



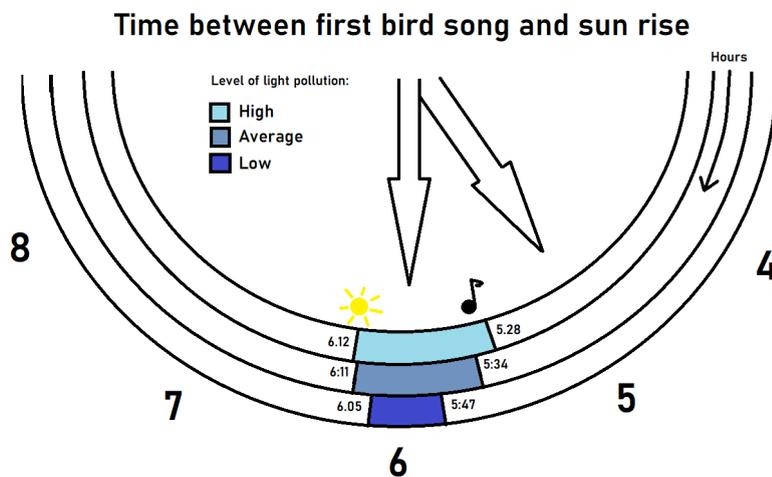
Link:

<https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=9a50f4a53147f457644f9c1d4969996c41d4052b>

interactive?: yes/no

sub-topic - Animals on land

Visualization 6: Artificial light at night drives earlier singing in a Neotropical bird



Artificial light at night drives earlier singing in a Neotropical bird. In each site, the time when the first song of the Saffron Finch was recorded. Then, the maximum levels of artificial light at night were measured during a 1-min using smartphone apps.

Link: Paper:

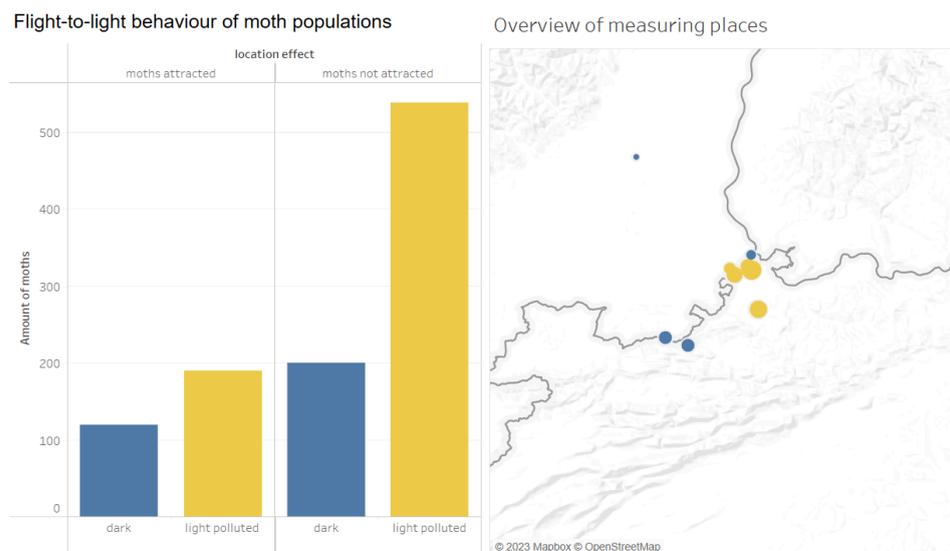
https://www.researchgate.net/publication/359944588_Artificial_Light_at_Night_Drives_Earlier_Singing_in_a_Neotropical_Bird

Dataset:

https://figshare.com/articles/dataset/Data_and_code_Artificial_light_at_night_drives_earlier_singing_in_a_Neotropical_bird/17075150

interactive?: yes/no

Visualization 7: Reduced flight-to-light behavior of moth populations exposed to long-term urban light pollution



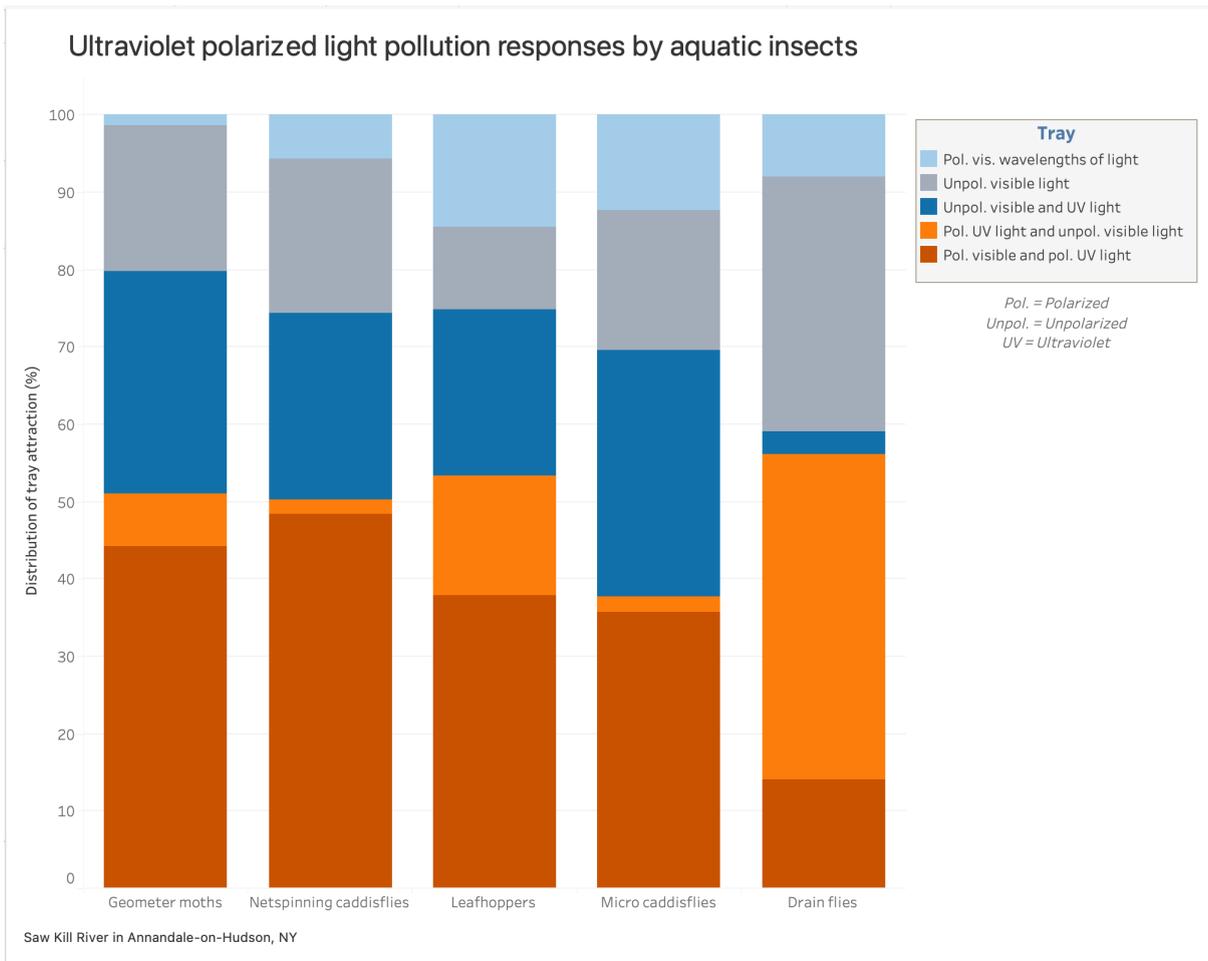
A big consequence of light pollution is the generally fatal attraction of nocturnal insects to artificial light sources. Moths from urban populations have a significant reduction in the flight-to-light behaviour compared with rural populations. The reduced attraction to light sources of 'city moths' may lead to reduced mobility which negatively affects foraging and colonization.

Link: <https://datadryad.org/stash/dataset/doi:10.5061/dryad.v1885>

interactive?: yes/no

sub-topic - water:

Visualization 8: Effect of light pollution on the behavior of aquatic insects



Link:

data: <https://zenodo.org/record/5193705>

paper: <https://datadryad.org/stash/dataset/doi:10.5061/dryad.9p8cz8wgz>

interactive?: **yes/no**

Visualization 9: Light pollution in coastal areas



Link:

data: <https://knb.ecoinformatics.org/view/doi%3A10.5063%2FF1SQ8XQF>

data: <https://www.arcgis.com/apps/webappviewer/index.html?id=f4b1ea5802944a55aa4a9df0184205a5>

paper: <https://doi.org/10.1038/s41598-019-47201-9>

interactive?: **yes/no**

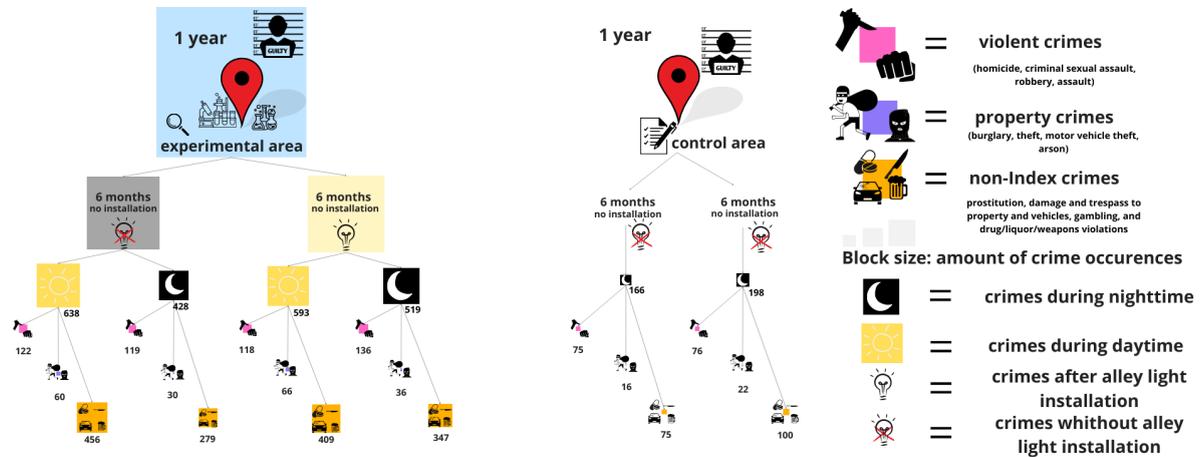
code:

<https://drive.google.com/file/d/1PMZYBxcqYCyhHMHFdaYum6i5d2aqd6XS/view?usp=sharing>

sub-topic - Safety:

Visualization 10:

Effect of installation of alley lighting on crimes measured in police district in Chicago



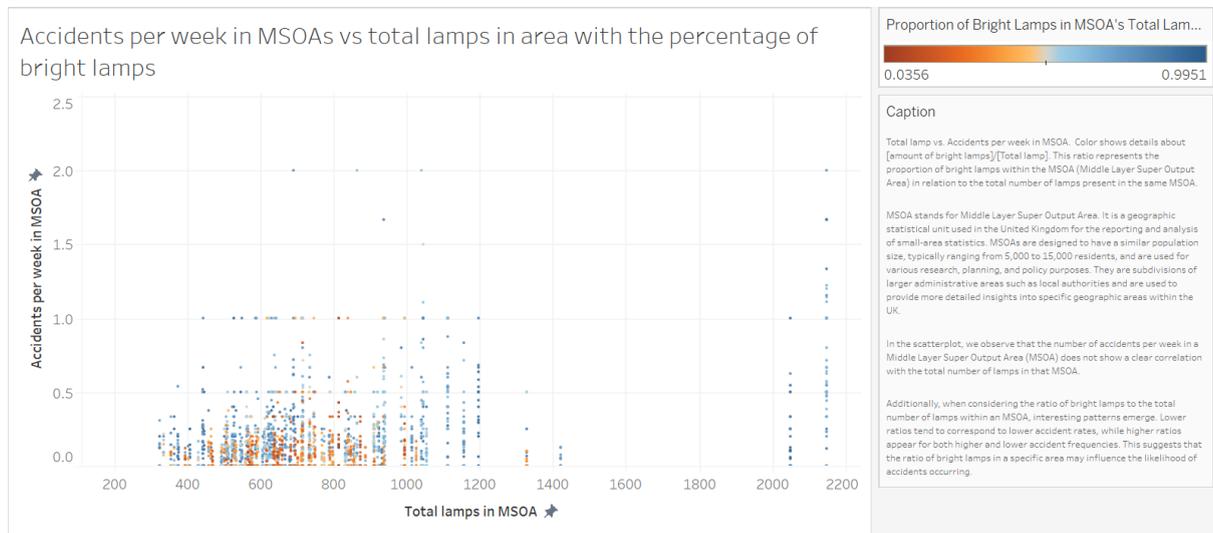
Link:

<https://www.darksy.org/wp-content/uploads/2014/09/Chicago-Alley-Lighting-Project.pdf>

(The data is copied from the data showed in the barcharts)

interactive?: yes/no

Visualization 11:



Link:

https://figshare.com/articles/dataset/Road_traffic_collision_frequency_and_lamp_change_data_for_a_UK_city/12709202/1?file=24063878

interactive?: yes/no

Link to the final presentation:

https://docs.google.com/presentation/d/1iCkGtrYbuwav9wgACWAxAJSNdgWqQcK0ZWzIMy5ZKVA/edit?usp=drive_link

link of the folder with the data derivation:

https://drive.google.com/drive/folders/1gTNDBEliyu03Ht6dGB98_-K7qAQL1i2J?usp=drive_link