

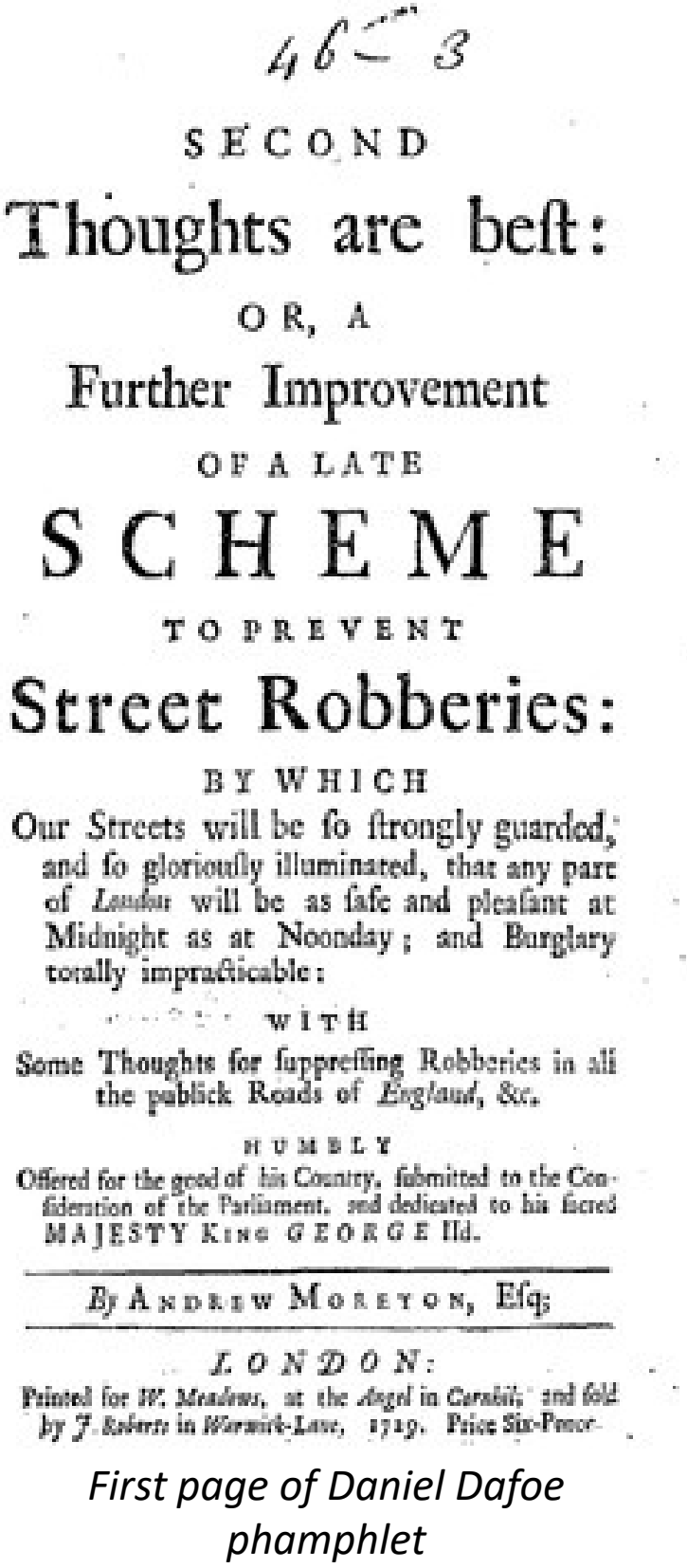
Impact of Tree Coverage on London Crime Rates - Predictive Model and Planning Tool



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Introduction

London’s history has seen many periods of increased criminal activity, which became one of the elements of nowadays’ popular culture (vide Sherlock Holmes, Jack the Ripper, Taboo, Hooligans, Gangs of London, etc.). It was described already back in 1729, in pamphlet by Daniel Defoe. It presents a dissatisfied middle-class old man extremely concerned about the increase in criminality around the 1720s. However, the current situation may also be considered as highly undesirable, for example, the number of murders significantly increased in the recent years.



Model (GWR)

Table 1: Results of OLS and GWR Experiments

Dependent Variable	Independent Variable	OLS Training Set R ²	GWR Training Set R ²	GWR Calculated Validation Set R ²	Mean % Canopy Cover Coefficient	Calculated Ave. % Change in Crime due to 10% Increase in Canopy Cover
$\ln \left(\frac{Burglary}{Population} \right)$	Population Density Public Transport Accessibility Curio Canopy Percentage	0.222	0.583	0.437	-0.001	-0.338
$\ln \left(\frac{Theft}{Population} \right)$	Population Density Public Transport Accessibility Percent Owner Occupied Homes Curio Canopy Percentage	0.453	0.629	0.557	-0.017	-2.843
$\ln \left(\frac{Criminal\ Damage}{Population} \right)$	Population Density Percent Owner Occupied Homes Curio Canopy Percentage	0.405	0.637	0.596	-0.011	-1.790
$\ln \left(\frac{Violence}{Population} \right)$	Population Density Percent Owner Occupied Homes Curio Canopy Percentage	0.542	0.724	0.715	-0.018	-3.013

Objectives

Our objective is to provide a reliable analytical solution that could help authorities in London to reduce law violation levels. In particular, we would like to:

- (1) Analyze crime rates on the neighborhood level in Greater London,
- (2) Build a model to find an association between crime rates and tree canopy cover,
- (3) Create an analytical tool for London landscape planners aiming to decrease crime rates.

Importantly, our analysis will be done, for the first time, on the neighborhood level - the average population of an LSOA (small unit of area) in London in 2010 was only ca. 2000 inhabitants and London is split to more than 4000 such units.

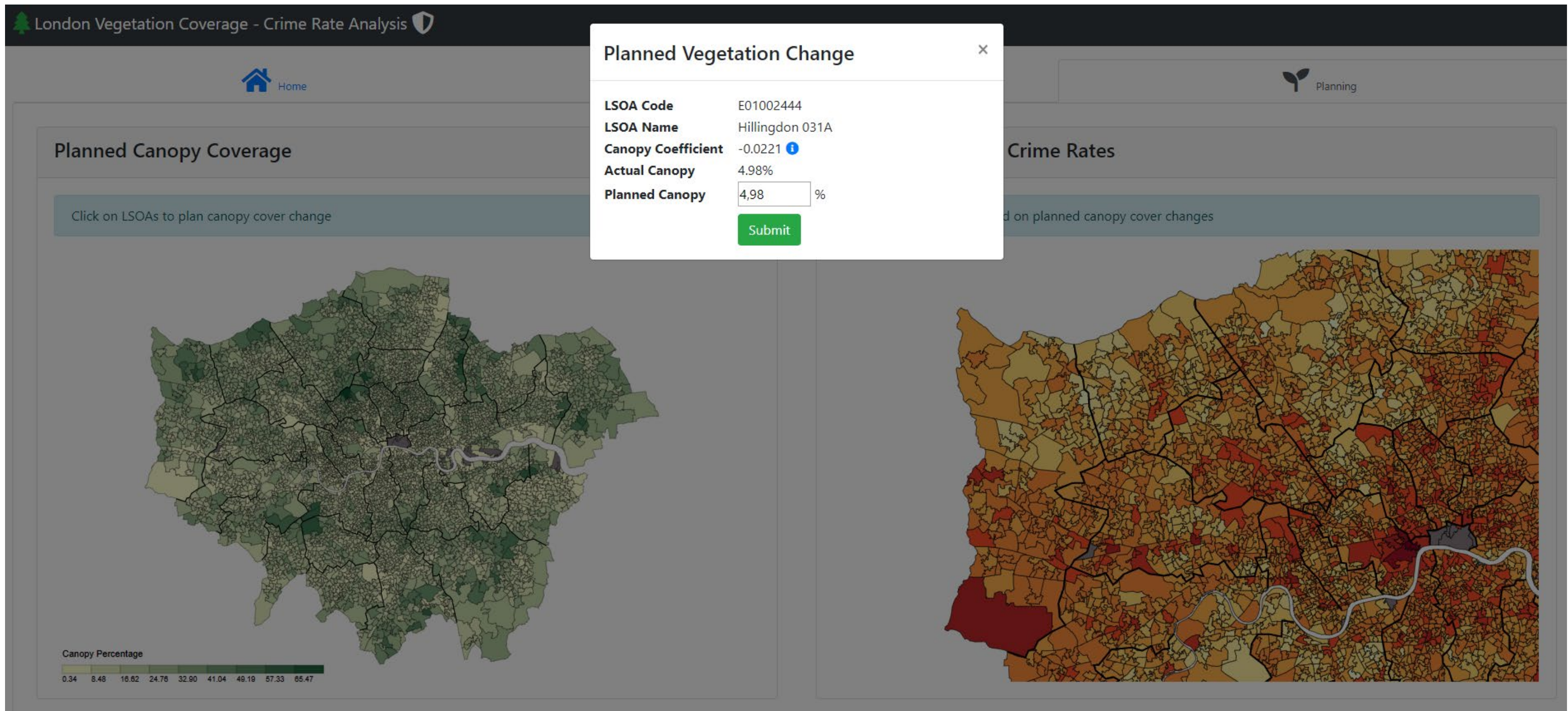
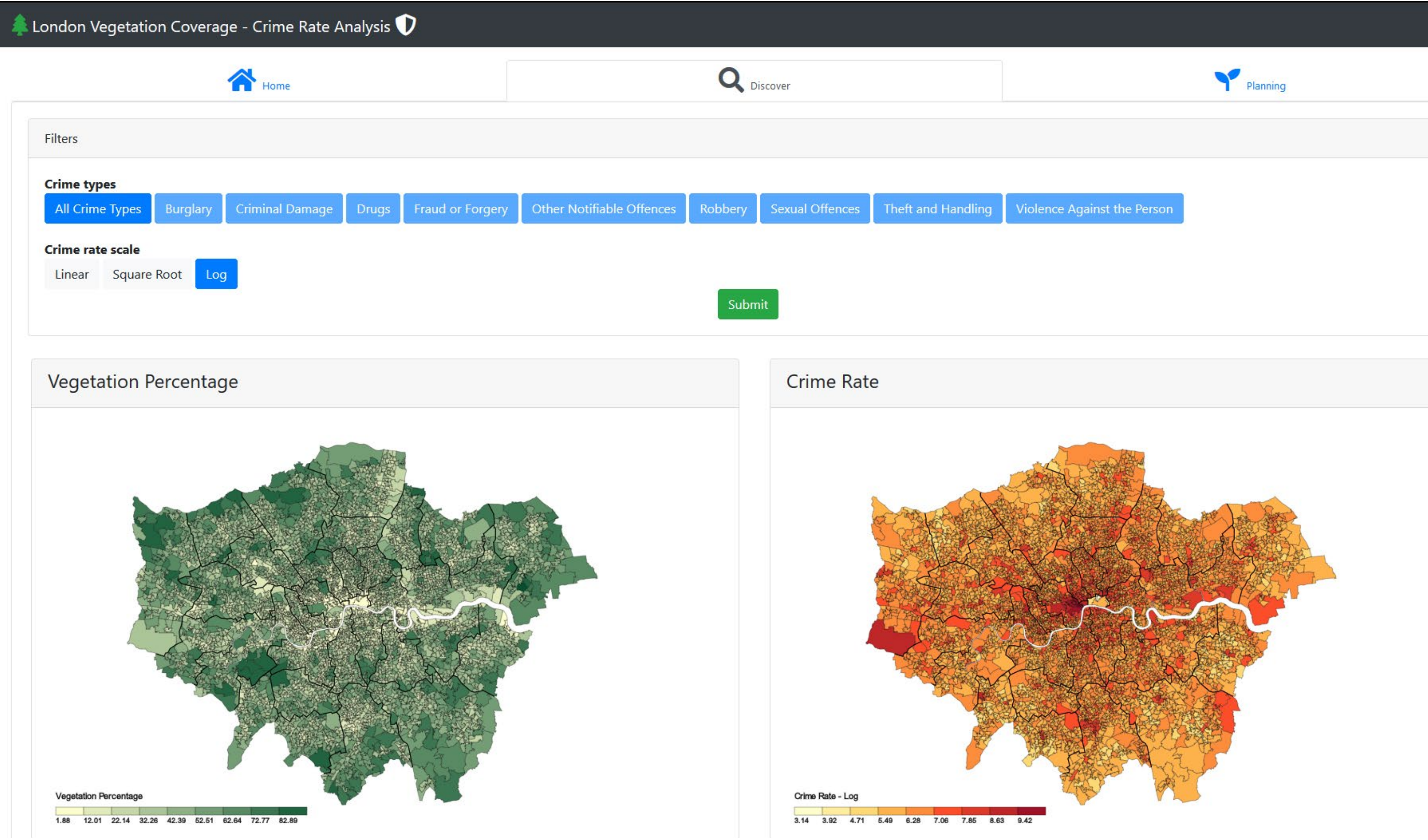
Data

We integrated in our analysis following datasets on LSOA level:

- (1) London Crime Dataset in Google Cloud (Google Cloud BigQuery - 1.1 GB),
- (2) Geographical boundaries for LSOA (TopoJSON file - 2 MB),
- (3) Population Weighted Centroids for LSOA (csv - 5 MB)
- (4) London Vegetation and Tree Canopy Cover (kml - 70 MB)
- (5) Annual Household Income distribution (csv - 1 MB),
- (6) Housing prices for Greater London Area (csv - 86 MB)
- (7) LSOA Atlas: summary of demographic and socio-demographic data (csv - 11 MB)

Datasets 1, 3-7 were transformed and combined using Python. Dataset 2 was used for visualization of LSOA boundaries.

Visualizations and Planning Tool



Conclusions

- 1) We have proven that tree canopy cover is an important feature which should be taken into account when analyzing crime patterns.
- 2) The study adds to the growing number of studies about Crime Prevention Through Environmental Design (CPTED).
- 3) Due to the granularity of spatial analysis, our approach is expected to have a high impact on small communities.
- 4) The study will allow fact-based decisions to be taken by the policymakers. It is essential as there are numerous concerned parties: residents of London, city authorities, landscape planners, police departments, people considering relocation to London.

