

# AI techniques to evaluate the effectiveness of nature-based solutions in reducing surface urban heat islands

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## Background

Urban green infrastructure is increasingly being promoted as a nature-based solution to reduce surface urban heat islands (UHIs) and heat risks in a city environment. In this project we want to evaluate the effectiveness of urban green infrastructure in a city in the Netherlands in reducing UHIs under contrasting climate change scenarios, based on open source data on climate, vegetation and urban characteristics.

## Objective

Develop a scalable data-driven model to predict Land Surface Temperatures (LST) over The Netherlands as a function of climate, vegetation and urban characteristics.

## Methods

- Model development: an extreme gradient boosting (XGBoost) regression model
- Scenario formulation: based on KNMI'14 & tree planting scenario (fig.1)



Fig. 1 Comparison of current tree cover and the targeted tree cover in some neighbourhoods in Rotterdam.

## Results

The model performed adequately in predicting LST and capturing underlying spatial patterns. Our results show that climate change will result in considerable increase in LST in Rotterdam. During very hot days in late July as experienced in recent years, LST is likely to be more than 40 °C as a result of climate change. Tree-planting can cool down these neighborhoods substantially. Fig. 3 shows that tree-planting can reduce LST throughout the summer period.

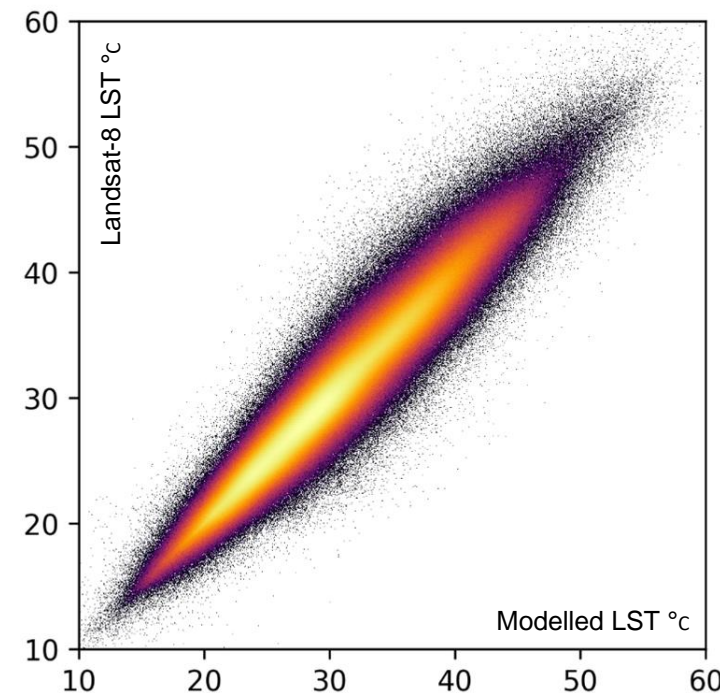


Fig. 2 Scatterplot of the goodness of fit between the Landsat-8 LST and the XGBoost predicted LST.

## Reflection

We demonstrate the applicability of machine learning techniques and open-source data in modelling the effectiveness of tree planting to reduce LST and its consequent effects. Although our approach is replicable in different parts of the world, the utility is limited to the availability of high-quality satellite LST data. Our research shows that the efforts to increase tree cover in urban areas must be part of a broader strategy to promote urban resilience.

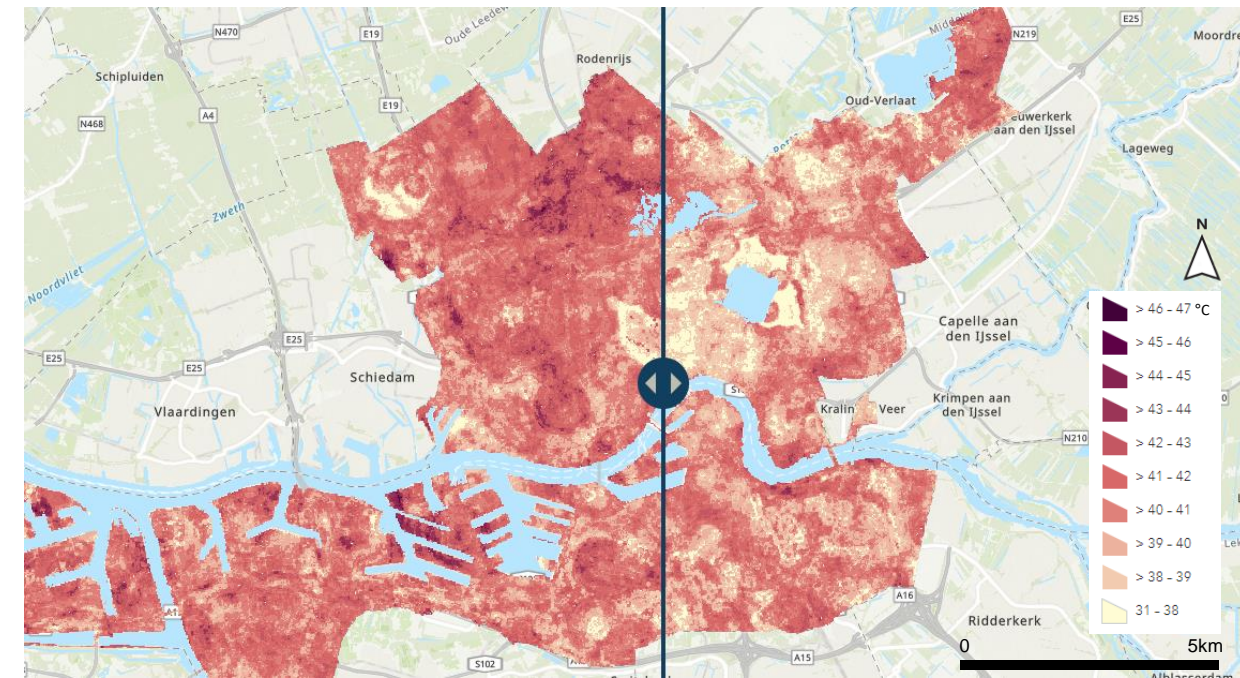


Fig. 3 Comparison between predicted LST under future climate conditions WITHOUT tree planting (left) & predicted LST under future climate conditions WITH tree planting (right)