

PRESS RELEASE

22 March 2017

Understanding the Benefits of Street Trees through Google Street View

Researchers from the Future Cities Laboratory in Singapore have developed a method to rapidly map the shade provided by street trees using thousands of images from Google Street View.

Despite the known importance of trees in reducing air temperature by providing shade from the sun's radiation, we know almost nothing about the actual extent and distribution of shade provided by trees in cities. Using Google Street View, researchers from the Future Cities Laboratory at the Singapore-ETH Centre have developed a method for measuring the shade provided by urban trees over whole cities.

Given the limited resources available to quantify urban ecosystem services in most tropical cities, we need an approach that uses existing datasets, such as those available online, and that provide cost-effective assessments at a high spatial resolution over large spatial scales. In this respect, researchers at the Future Cities Laboratory (FCL) found their answer in the huge amount of data that is stored in Google Street View.

Tree-lined streets are a common sight in Singapore, and are very much a trademark of the country, as a part of the national greening strategy. While Google Street View is typically used to obtain panoramic images of city streets from known locations, looking directly upward in Google Street View also provides an image of the sky view, including the canopy of trees in the area.

In this study, the researchers analysed almost 100,000 images extracted from Google Street View, covering over 80% of the street network in Singapore. An algorithm was then applied to each image to quantify the green canopy area. Finally, a model of solar radiation was applied to estimate the amount of shade provided by the tree canopy by quantifying the total amount of solar radiation making it to ground level.

The new method allows the researchers to rapidly estimate how much shade trees are providing across the city. The results show that over 70% of the shade in Singapore's streets is provided by vegetation. The researchers found that, on average, the tree canopy intercepted 8% of incoming solar radiation. At some locations, the tree canopy intercepted more than 50% of incoming solar radiation.

"The study shows that trees are extremely important in providing shade in Singapore, and this shade could improve thermal comfort for people. Providing trees to help cool the environment is particularly important in tropical cities like Singapore, which suffers heavily from the urban heat island effect," says Dr Dan Richards, postdoctoral researcher at FCL.

Indeed, Singapore receives an average of 1.8kWh of direct radiation and 3.1kWh of diffuse radiation from the sun. By intercepting solar radiation, trees mitigate the urban heat island effect by reducing the energy stored in concrete and re-radiated during the night.

“In addition to cooling urban microclimates, these trees, which are integrated within dense urban street networks, also provide other ecosystem services,” says Prof Dr Peter Edwards, principal investigator at FCL. “Mapping the provision of ecosystem services by street trees could help city planners to prioritise areas for new planting by identifying streets or street sections with low shading.”

The paper ‘Quantifying street tree regulating ecosystem services using Google Street View’, co-authored by Dr Dan Richards and Prof Dr Peter Edwards, is published in the journal *Ecological Indicator*: <http://www.sciencedirect.com/science/article/pii/S1470160X17300341>. Beyond Singapore, this method can be readily applied in other tropical cities and even in temperate cities by collecting Google Street View photographs during summer.

--- END ---

ABOUT

Future Cities Laboratory

The Future Cities Laboratory (FCL) is a transdisciplinary programme focused on urban sustainability, with the vision to shape sustainable cities through science, by design, and in place. Researchers at FCL pursue this vision through research undertaken in collaboration with government agencies, academic colleagues, industry and civil society partners in Singapore and beyond, in order to provide practical solutions to some of the most pressing problems. FCL is the first programme under the Singapore-ETH Centre, established in 2010 by ETH Zurich – the Swiss Federal Institute for Technology Zurich and Singapore’s National Research Foundation (NRF), as part of the NRF’s CREATE campus.

www.fcl.ethz.ch

Swiss Federal Institute of Technology Zurich (ETH Zurich) *Where the future begins*

Freedom and individual responsibility, entrepreneurial spirit and open-mindedness: ETH Zurich stands on a bedrock of true Swiss values. Our university for science and technology dates back to the year 1855, when the founders of modern-day Switzerland created it as a centre of innovation and knowledge. At ETH Zurich, students discover an ideal environment for independent thinking, researchers a climate which inspires top performance. Situated in the heart of Europe, yet forging connections all over the world, ETH Zurich is pioneering effective solutions to the global challenges of today and tomorrow.

www.ethz.ch/en.html

MEDIA CONTACT

Geraldine Ee

Senior Communications Specialist

Singapore-ETH Centre

Email: ee@arch.ethz.ch

Phone: +65 9856 0166

APPENDIX



Figure 1. Example canopy image taken from Google Street View. © Google 2016.