



Using Satellite Remote Sensing to Monitor Heat

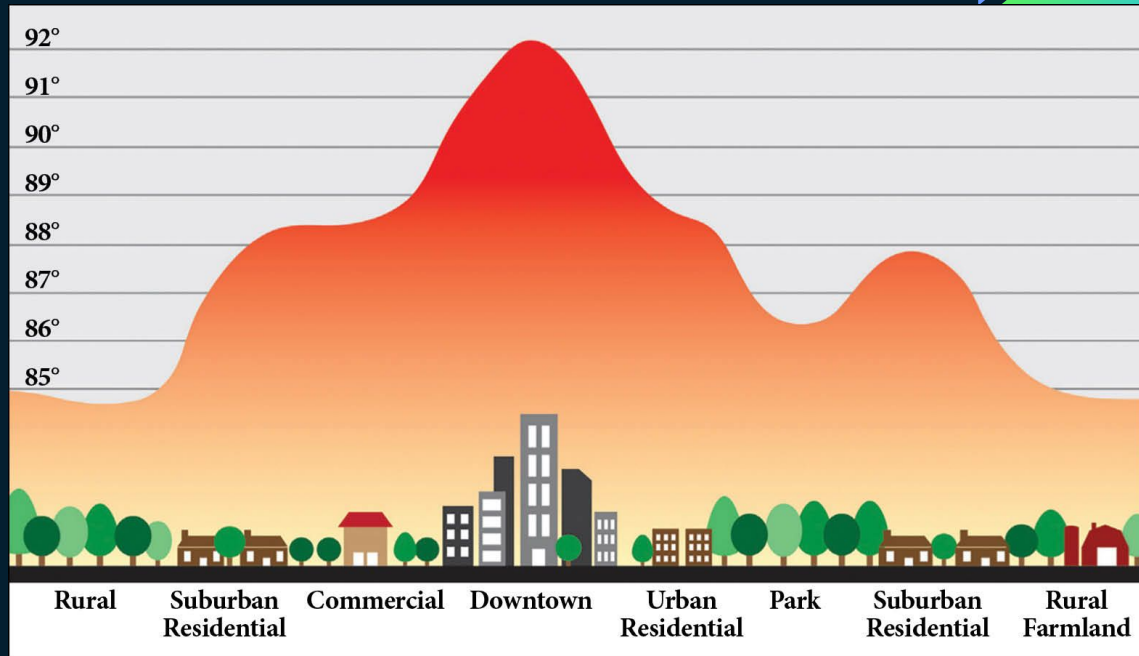
Liz Duran
SIO 135/236



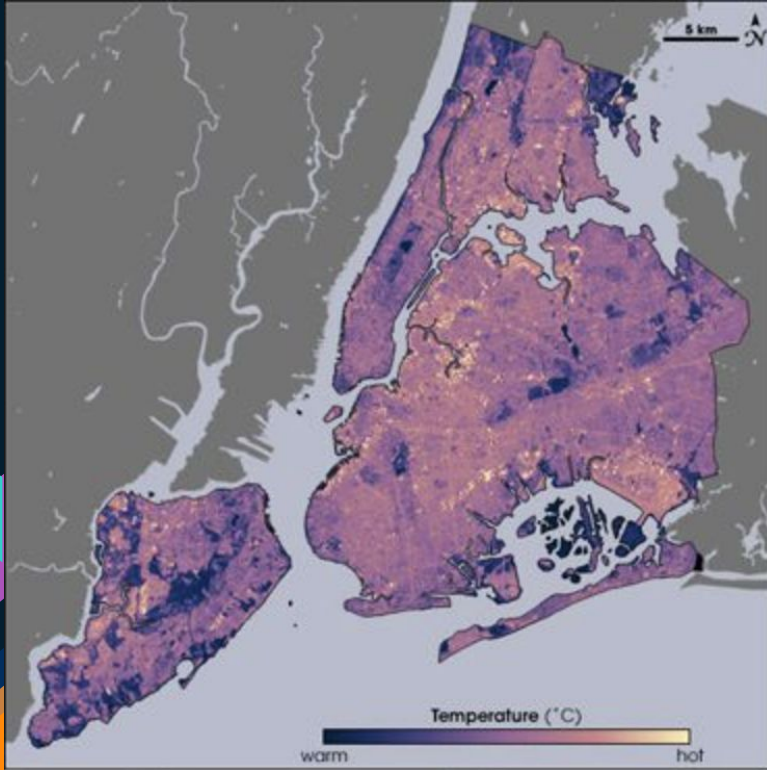
1. What is an Urban Heat Island?

Urban Heat Island (UHI)

- › Mainly caused by land surface modification
- › Increases air pollution and Carbon Dioxide
- › Water Quality suffers
- › Detrimental to human health



Mitigating the UHI Effect

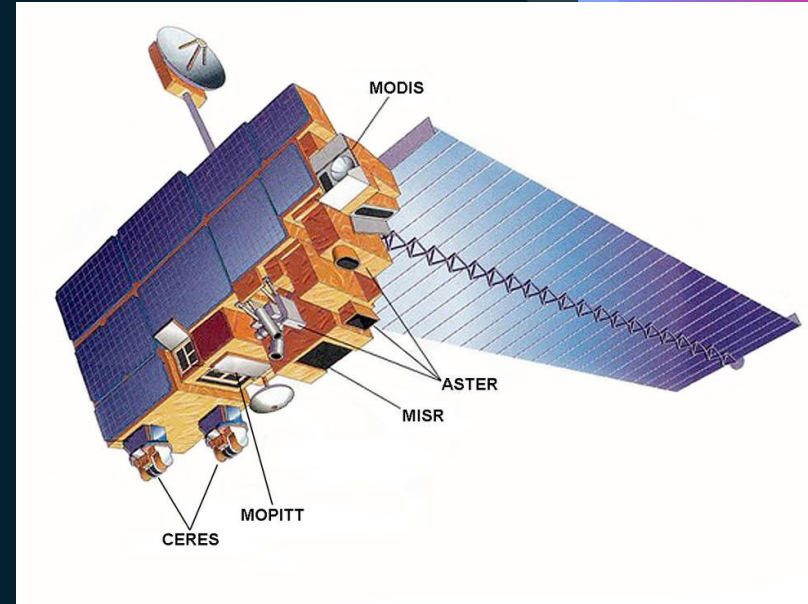


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Terra's MODIS: NDVI

- › Moderate Resolution Imaging Spectroradiometer (MODIS)
 - › 1 of the 5 sensors on board of the Terra Satellite
- › Normalized Difference Vegetation Index (NDVI)
 - › 16-day intervals
 - › Continuation of NOAA's AVHRR NDVI products
- › Countless Applications for NDVI
 - › Agriculture
 - › Drought Indicator
 - › Forestry
 - › Heat

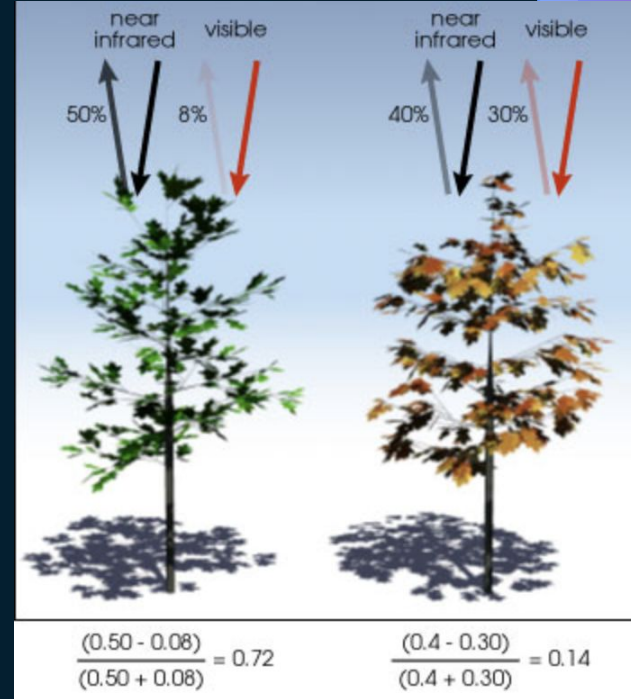


Courtesy of NASA

NDVI

- › Values between -1 and +1
- › Chlorophyll strongly absorbs visible light for photosynthesis
- › Leaves strongly reflect NIR
- › Calculated through the formula:

$$\text{NDVI} = \frac{(\text{NIR} - \text{Red})}{(\text{NIR} + \text{Red})}$$



Case Studies

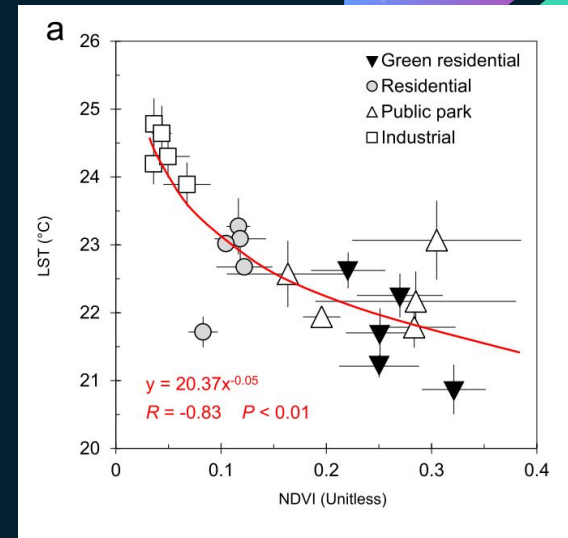
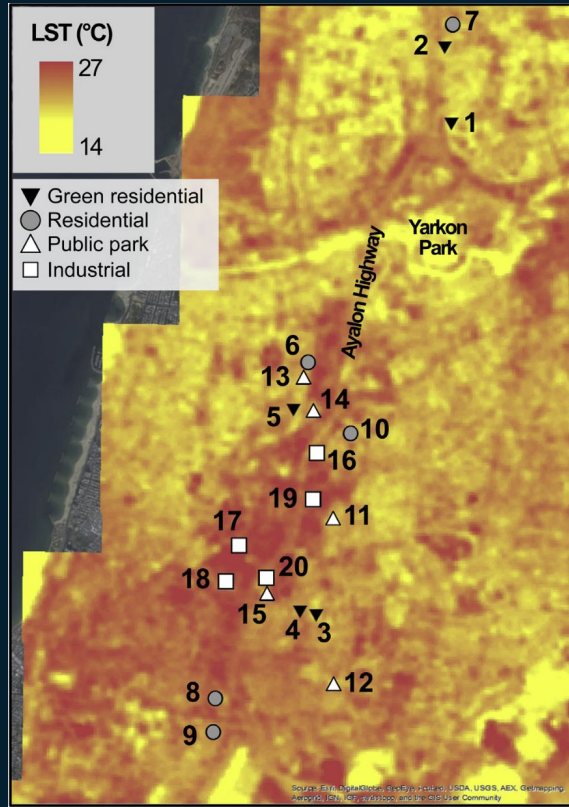
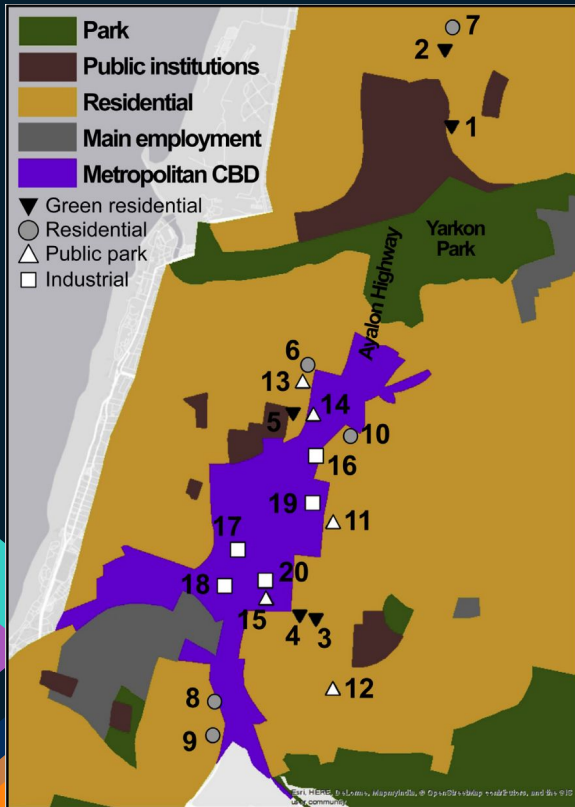


Tel Aviv, Israel

The r
from



source:
Rotem-Mindali et al



Seoul, Korea

Urban vegetation and heat-related mortality in Seoul, Korea (J.-Y. Son et al. 2016)

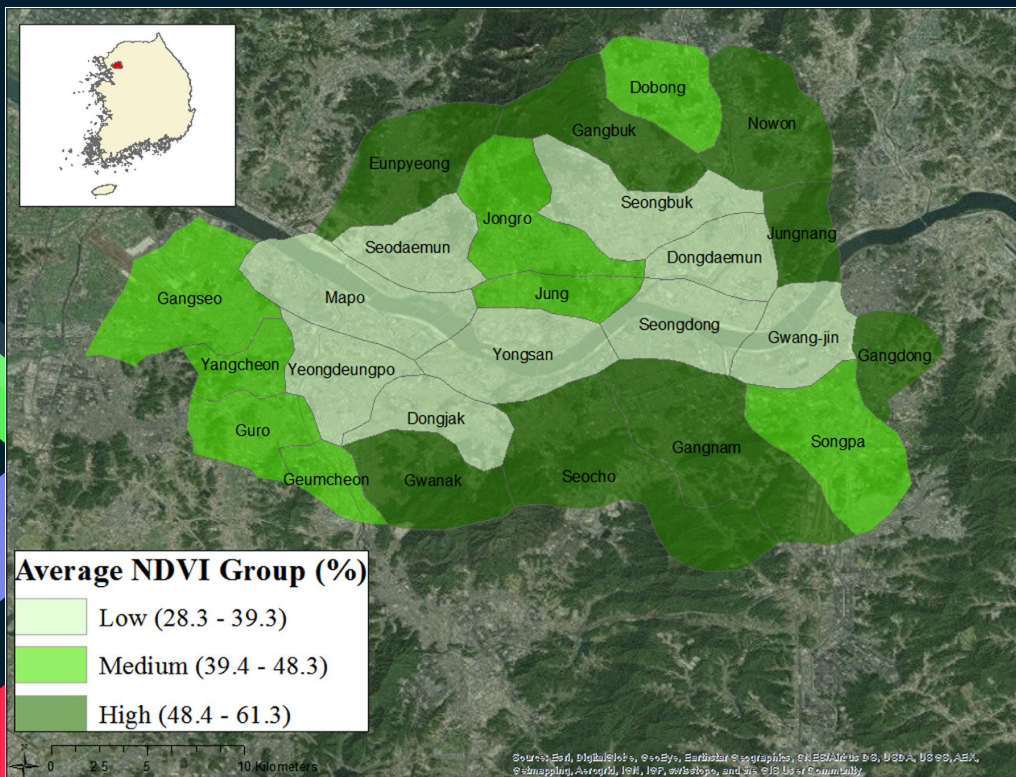
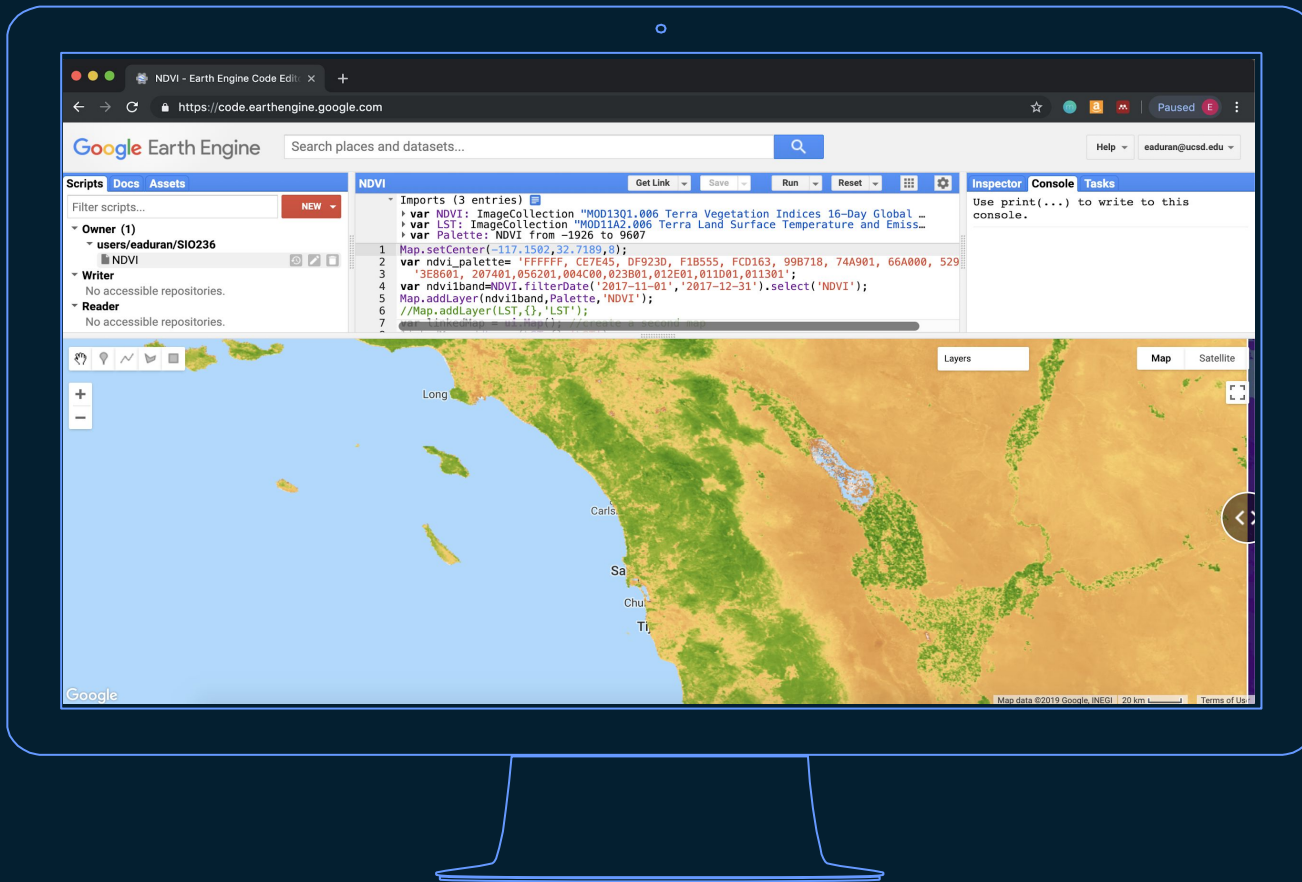


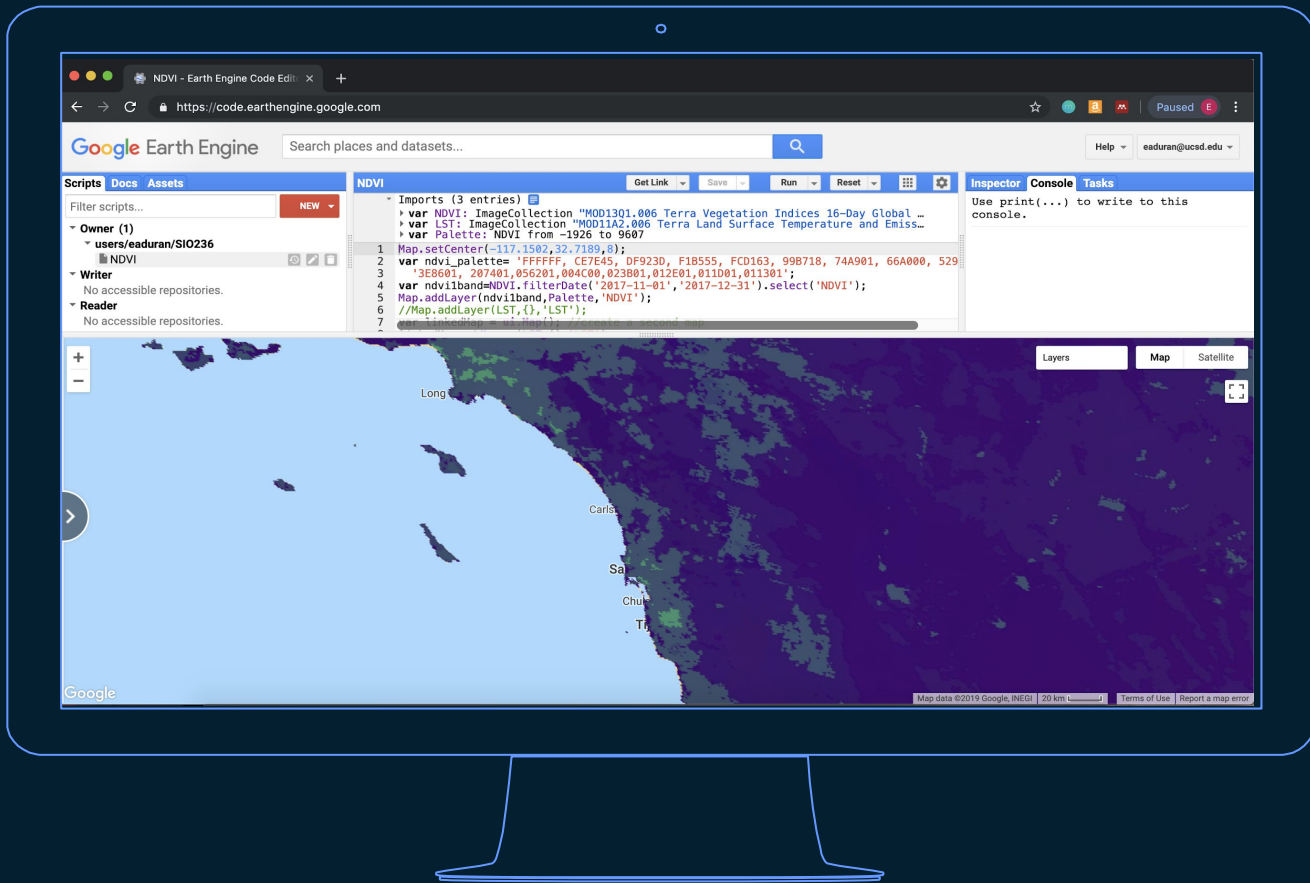
Table 2

Percentage change in risk of total mortality for a 1 °C increase in temperature (lag01) above the threshold (90th (25.1 °C) percentile), by NDVI group.

NDVI level	Estimate (%) (95% CI)
Low (< 39.4%)	4.1 (2.3, 5.9)
Medium (39.4–48.3%)	3.0 (0.2, 5.9)
High (> 48.3%)	2.2 (–0.5, 5.0)

Model included time trend, day of the week, relative humidity, NDVI group, percentage of persons > 65 years, percentage receiving social benefits as a proxy for socioeconomic status (SES), offset term for the population size in each gu, PM₁₀ and O₃ concentrations in each gu level, area of each gu level, interaction term between temperature and NDVI group.





Scripts Docs Assets

Filter scripts... NEW

- Owner (1)
 - users/eaduran/SIO236
 - NDVI
- Writer
 - No accessible repositories.
- Reader
 - No accessible repositories.

NDVI

```
Imports (3 entries)
  var NDVI: ImageCollection "MOD13Q1.006 Terra Vegetation Indices 16-Day Global ...
  var LST: ImageCollection "MOD11A2.006 Terra Land Surface Temperature and Emiss...
  var Palette: NDVI from -1926 to 9607

1 Map.setCenter(-117.1502,32.7189,8);
2 var ndvi_palette= 'FFFFFF, CE7E45, DF923D, F1B555, FCD163, 99B718, 74A901, 66A000, 529
3 '3E8601, 207401,056201,004C00,023B01,012E01,011D01,011301';
4 var ndvilband=NDVI.filterDate('2017-11-01','2017-12-31').select('NDVI');
5 Map.addLayer(ndvilband,Palette,'NDVI');
6 //Map.addLayer(LST,{'LST'});
7 var linkedMap = ui.Map(); //create a second map
```

Inspector Console Tasks

Use print(...) to write to this console.

