Summer in the City: Assessing and communicating the Richmond, VA urban heat island effect with citizen scientists

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With a lot of help from a lot of amazing people

@jer_science
Estimated % of adults who think global warming is happening, 2016

Display model output: Global warming is happening

Click on map to select geography, or: Virginia

Counties

National
States
Congressional Districts
Metro Areas

100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Estimated % of adults who discuss global warming at least occasionally, 2016
Underestimation of risk and low preparedness: lacking resilience?
1 Explore Hazards

- Gather a team of people who want to protect local assets.
- Check past weather events and future climate trends.
- List the things you value that could be damaged.

After this exploration, you'll discover if weather and climate represent a hazard to things you value.
Richmond is warming up faster than its rural neighbors
RICHMOND SUMMERS *FEEL* 3°F HOTTER TODAY THAN THEY DID IN THE 1980s

*On average, RVA’s summer dew point temperatures have been increasing. For a given temperature, the heat index (what heat feels like) increases as dew point goes up. So, a 96°F day in 1980 felt like 98°F – today, it feels more like 101°F.*
Projected Change in Number of Days Over 95°F

Projected Difference from Historical Climate

2040-2071

~40 more days over 95°F

In RVA

NCA, 2014
Hottest Days

Getting even hotter in the future

Continued Emissions Increases (RCP 8.5)

Temperature Change (°F)

NCA, 2014
Urban heat island effect
>50°C max
2 Assess Vulnerability & Risks

- Determine which of your assets are exposed to harm.
- Assess each asset’s vulnerability.
- Estimate the risk to each asset.

When your assessment is complete, decide if you can accept the risk that climate presents to your assets.
% of all ED/UCC visits for HRI

Data: VDH ESSENCE
% of all ED/UCC visits for HRI vs RIC Apparent Temperature (°F)

Data: VDH, NOAA
Urban Heat Vulnerability =

[Maps and data visualizations related to urban heat vulnerability]
Urban heat vulnerability within census block combines % tree canopy cover, % impervious surfaces, % families in poverty, and the amount of afternoon warming during a heat event.
City of Richmond Urban Heat Vulnerability

Hoffman et al., in prep

Urban heat vulnerability within census block combines % tree canopy cover, % impervious surfaces, % families in poverty, and the amount of afternoon warming during a heat event.

DATA: RAA

RAA AMBULANCE RESPONSES
VULNERABILITY

City of Richmond Urban Heat Vulnerability

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Hoffman et al., in prep

DATA: RAA

REDLINING MAP (1937)
VULNERABILITY

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REDLINING MAP (1937)
3 Investigate Options

- Consider possible solutions for your highest risks.
- Check how others have responded to similar issues.
- Reduce your list to feasible actions.

At the end of your investigation, you’ll have a list of solutions stakeholders are willing to support.
Heat-related illness interventions?

Reduce exposure
Criteria for a Recommended Standard

Occupational Exposure to Heat and Hot Environments

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health
City of Richmond cooling shelters open Wednesday

POSTED 6:05 PM, MAY 16, 2017, BY VERNON FREEMAN JR., UPDATED AT 06:19PM, MAY 16, 2017

News

Cooling stations open in Richmond through Friday
Changes to city structure?

Reduce *sensitivity*
Utilising green and bluespace to mitigate urban heat island intensity

K.R. Gunawardena a, M.J. Wells b, T. Kershaw a

https://doi.org/10.1016/j.scitotenv.2017.01.158

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Highlights

• The influence of green and bluespace on urban canopy/boundary-layer temperatures.

• Tree-dominated greenspace offers greater heat stress relief when most required.

• Badly designed bluespace, may exacerbate heat-stress during oppressive conditions.

• Boundary-layer cooling is attributed to greenspace increasing surface roughness.

• The influence of geometry and diversity of green/bluespaces requires more research.
4 Prioritize & Plan

- Evaluate costs, benefits, and your team’s capacity to accomplish each action.
- Rank the expected value of each action.
- Integrate the highest-value actions into a stepwise plan.

The result will be a comprehensive plan to implement your favored solutions.
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Hoffman et al., in prep
RICHMOND URBAN HEAT ISLAND CONSORTIUM
Greening Richmond
Preparing Youth for Success
Improving Health and Quality of Life of all Residents
Realizing Racial Equity
Hoffman et al., in prep

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Hoffman et al., in prep
It starts with a park.

Explore four City parks that will benefit from trees grown at Enrichmond’s TreeLab.
5 Take Action

- Move forward with the stakeholders who accept responsibility and bring resources to take action.
- Check to see if your actions are increasing your resilience.

As you move forward, you’ll monitor, review, and report on your project.
“Throwing Shade in RVA”

• https://toolkit.climate.gov/case-studies/where-do-we-need-shade-mapping-urban-heat-islands-richmond-virginia

Students use model homes to investigate differential heating in various surfaces.
We saw significant change in our participants.
We saw significant change in our participants.
Thanks!

• @jer_science

• Check out our recent case study on climate.gov: https://goo.gl/cW1q2u

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