Using citizen science, collective leadership, and low-cost measurements to assess and address extreme heat

David Herring, NOAA Climate Program Office
Jeremy Hoffman, PhD, Science Museum of Virginia
Vivek Shandhas, PhD, Portland State University
Alicia Zatcoff, City of Richmond
Session overview

- A “get to know you poll” of our participants (~5-10 minutes)
- “Did you know?” - all about extreme heat, urban heat islands, population vulnerabilities, and citizen science (~30 minutes)
- Table break-outs (4 x 20 minutes)
- Wrap-up discussion and participant polling (~20 minutes)
Let’s get to know you!

www.menti.com code: 38 81 55
Did you know?
Meet the Challenges of a Changing Climate
Find information and tools to help you understand and address your climate risks.

LEARN HOW TO BUILD RESILIENCE ›

SEE WHAT OTHERS ARE DOING ›

USE THE CLIMATE EXPLORER ›

TOUR THE TOOLKIT ›

Online at https://toolkit.climate.gov
STEPS TO RESILIENCE

Use this framework to discover and document climate hazards, then develop workable solutions to lower climate-related risks. Watch the overview video or click any step to learn more.

1. Explore Hazards
2. Assess Vulnerability & Risks
3. Investigate Options
4. Prioritize & Plan
5. Take Action

Did you know?
Why should we care?
What can we do about it?
Meet the Challenges of a Changing Climate
Find information and tools to help you understand and address your climate risks.

- Learn How to Build Resilience
- See What Others Are Doing
- Use the Climate Explorer
- Tour the Toolkit
Characterizing Local Effects of Extreme Heat

NASA, 2015
Satellite and Ground Based Measurements

<table>
<thead>
<tr>
<th>Traverse</th>
<th>R²</th>
<th>RMSE</th>
<th>Slope</th>
<th>Intercept</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland, OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>0.120</td>
<td>0.882</td>
<td>0.041</td>
<td>14.637</td>
<td>&lt; 2e-16</td>
</tr>
<tr>
<td>Afternoon</td>
<td>0.270</td>
<td>1.225</td>
<td>0.094</td>
<td>28.333</td>
<td>&lt; 2e-16</td>
</tr>
<tr>
<td>Evening</td>
<td>0.316</td>
<td>0.900</td>
<td>0.077</td>
<td>26.635</td>
<td>&lt; 2e-16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traverse</th>
<th>R²</th>
<th>RMSE</th>
<th>Slope</th>
<th>Intercept</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond, VA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>0.296</td>
<td>0.280</td>
<td>0.038</td>
<td>24.972</td>
<td>0.001</td>
</tr>
<tr>
<td>Afternoon</td>
<td>0.615</td>
<td>0.561</td>
<td>0.150</td>
<td>29.249</td>
<td>0.001</td>
</tr>
<tr>
<td>Evening</td>
<td>0.588</td>
<td>0.521</td>
<td>0.131</td>
<td>28.450</td>
<td>0.001</td>
</tr>
</tbody>
</table>
How do we measure it?
Why do we care?
Locations of Kresge Environment-funded Groundwork teams working to build climate resilience through understanding extreme events.

Groundwork Cities:
- Denver
- Elizabeth
- Providence
- Richmond
- Richmond

Made with Google My Maps
Field Campaign with Mobile Sensors
Figure 3: Word Cloud -- the most helpful information during the training

Interest in UHI

Pre n=17
Post n=17
Urban Heat Vulnerability =
City of Richmond 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.

Hoffman et al., in prep
What do we do with the information?
Extreme Heat Impacts

Risks

- Heat related illness and death
- Air pollution and GHG emissions
- High air conditioning costs/energy bills
- Peak energy demand in summertime
Low-income populations and communities of color are more likely to...

- live in areas with less greenspace and are more vulnerable to respiratory and heat related illnesses
- lack access to energy efficient housing and often are disproportionately impacted by high energy bills
- live in neighborhoods that lack convenient access to transit, or safe walking and biking options
- live in housing without air conditioning and are more vulnerable to heat related and respiratory illnesses and death
- be exposed to pollution and airborne allergens and are more vulnerable to asthma and other respiratory illnesses
Richmond 300 Working Groups

- Economic Development
- Transportation
- Land Use
- Housing
- Environment
RVAgreen 2050 = Nexus Climate Action Planning
Climate Vulnerability & Risk Assessment Process
### Social Vulnerability Factors

**Sensitivity**
- Poverty
- Age
- Race
- Gender
- Disabilities
- Chronic health conditions
- Mental health
- Household composition
- Working outdoors
- Public assistance income
- Housing characteristics
- Crime

**Adaptive Capacity**
- Poverty
- Education
- Language
- Social isolation
- Employment
- Transportation access
- Air conditioning
- Housing (shelters, group homes)
Social Vulnerability to Climate Change
Time for Breakouts!
Vivek: Campaign Logistics and Technology

Jeremy: Developing Community Science Collectives

David: Communicating UHIA Needs and Findings

Alicia: You’ve done your UHIA, what’s next?
Open share opportunity!
Debrief questions!

www.menti.com  code: 60 23 09
Thank you for coming!

jhoffman@smv.org
vshandas@pdx.edu
alicia.zatcoff@richmond.gov.com
david.herring@noaa.gov