Research on Tap: Understanding and Improving our Urban Climate

January 28, 2019

Boston University Office of the Vice President and Associate Provost for Research

BOSTON UNIVERSITY

Are Cities Getting Greener?

Lucy R. Hutyra

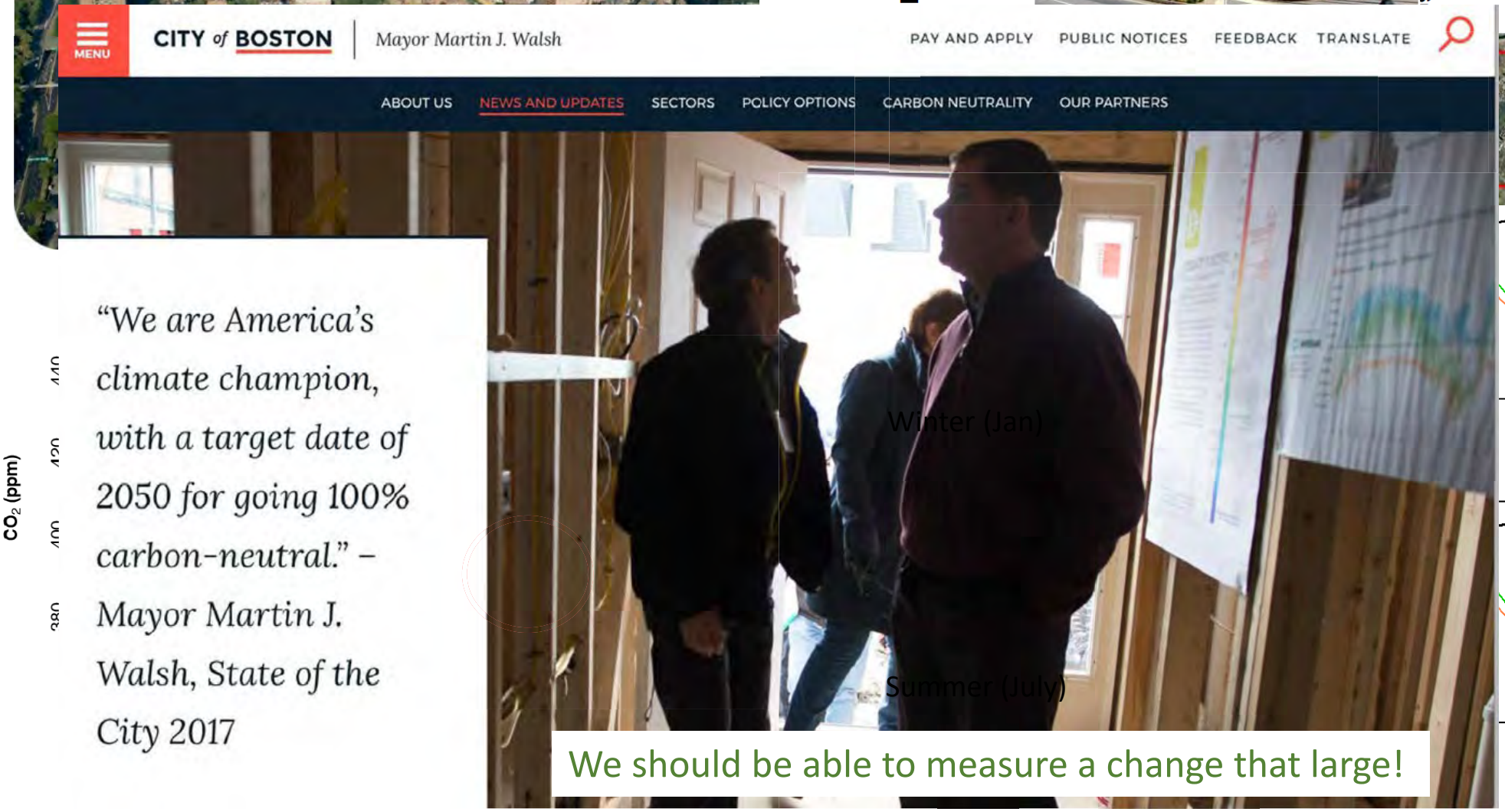
Associate Professor
Department of Earth & Environment, CAS

BOSTON UNIVERSITY

Why cities matter?

- 3% of global land cover; >50% of the population
- 2.5 fold expansion in area by 2050; 70% of population forecast to become urban
- 70% of energy-related CO_2 emissions
- The combination of large, concentrated GHG fluxes and rapid change makes cities key for climate action
- Cities tend to be near rivers and coast → epicenter for climate adaption & mitigation
- Cities are our “first responders” for climate action -> C40 cities, conferences of mayors, etc.

CO_2 in cities – are cities getting greener?



CO_2 (ppm)

We should be able to measure a change that large!

The Health Argument for Climate Action

Patrick Kinney

Beverly Brown Professor
Environmental Health, School of Public Health

BOSTON UNIVERSITY

A Case-Only Study of Vulnerability to Heat Wave–Related Mortality in New York City (2000–2011)

Jaime Madrigano,[1] Kazuhiko Ito,[2] Sarah Johnson,[2] Patrick L. Kinney,[3] and Thomas Matte[2] ***2015***

Index Components:

(+) % of homes on public assistance
(+) % of non-Hispanic black residents
(+) % of deaths at home
(+) Surface temperature
(-) % of trees

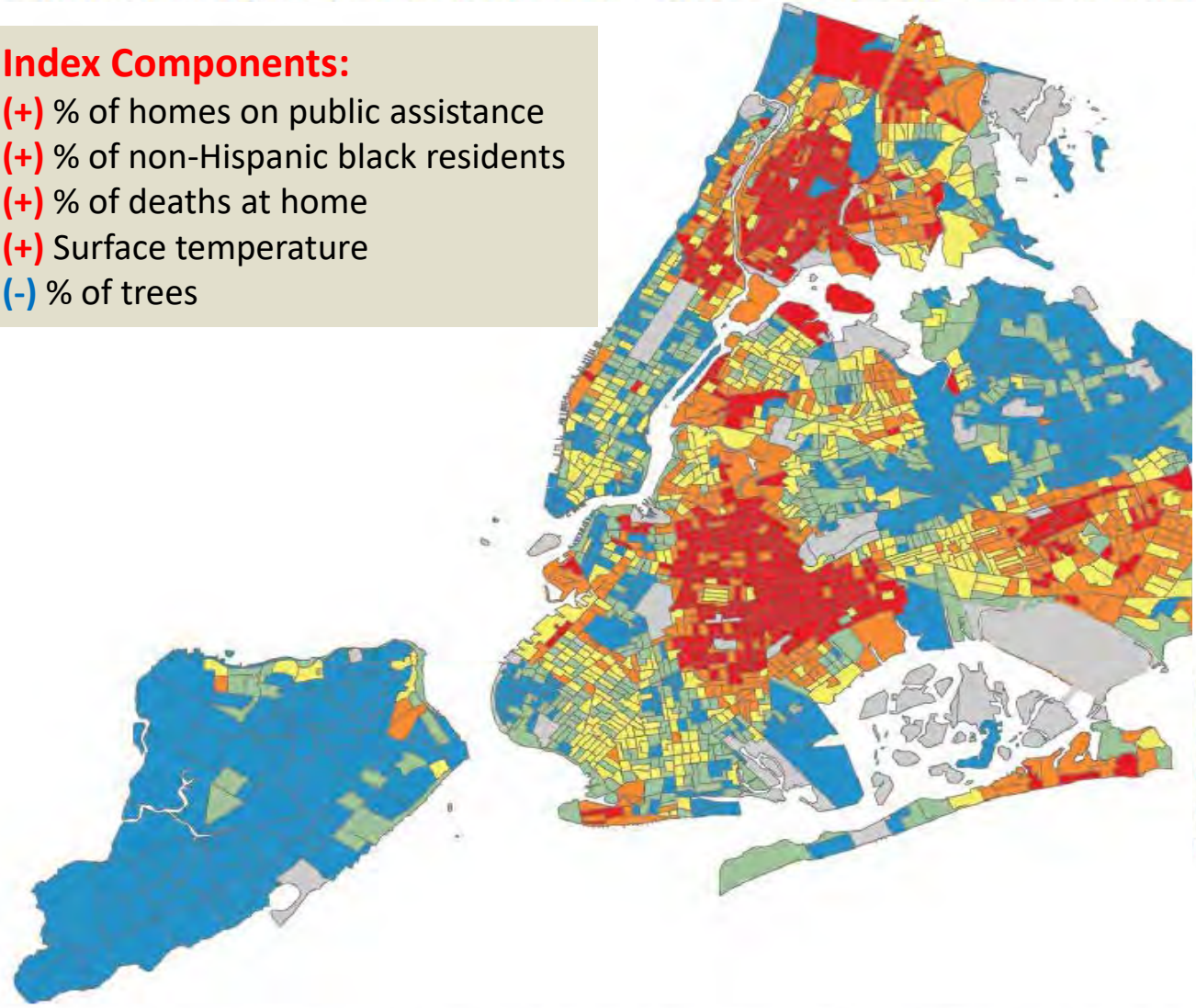


Figure 1. NYC census tracts according to composite heat vulnerability index. The index is composed of *z*-scores of the following variables: (+) proportion of homes receiving public assistance, (+) proportion of non-Hispanic black residents, (+) proportion of overall deaths occurring in the home, (+) relative surface temperature, (–) proportion of trees. A higher composite index score indicates a residential area with a higher risk of heat-related mortality.

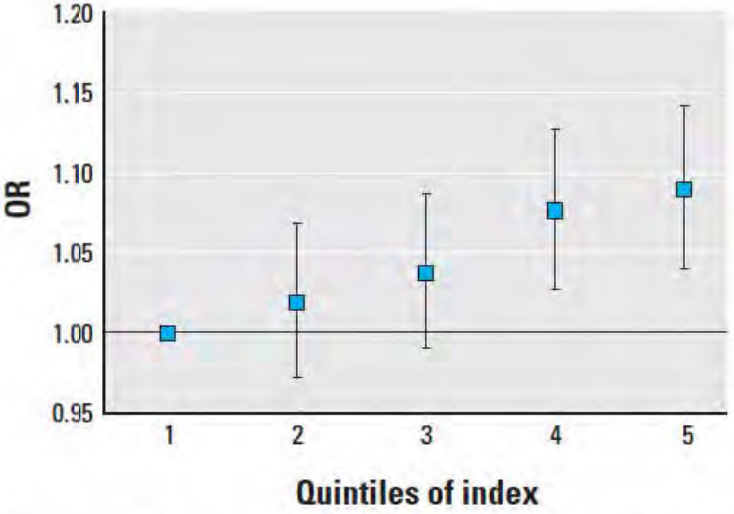
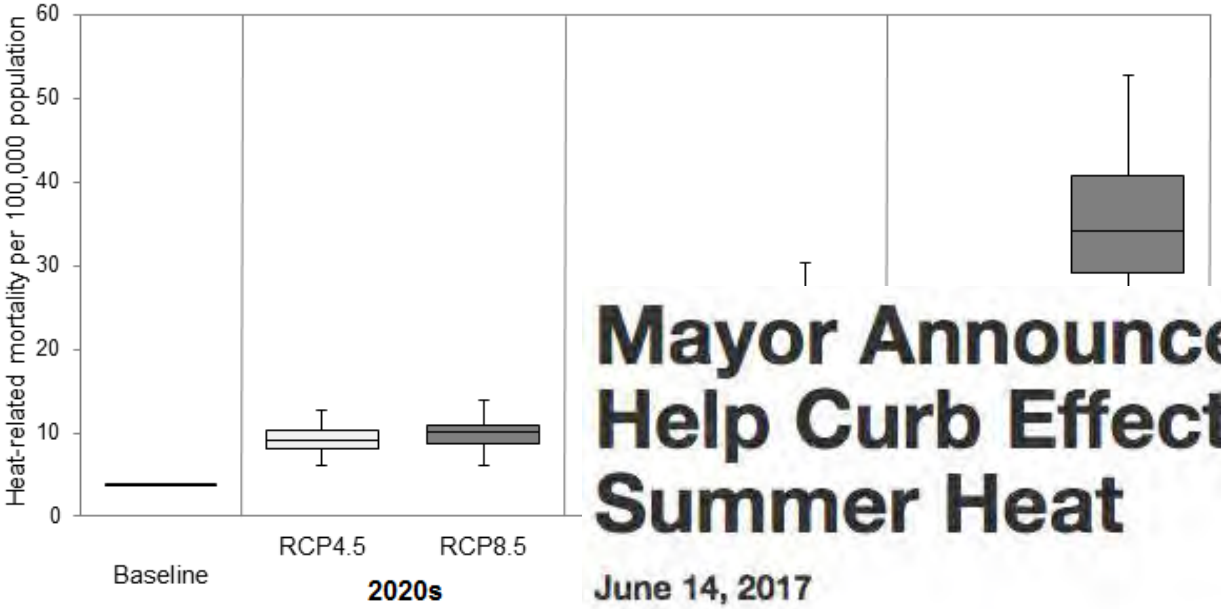


Figure 2. Relative odds of dying during or immediately following a heat wave by quintile of composite index. The ORs (and 95% CIs) are generated from a multinomial logistic regression model regressing the composite index on heat wave days.

Baseline and projected annual heat-related deaths per 100,000 in New York City.

(From: Petkova, Horton, Bader and Kinney, 2013.)



Pat Kinney
BU SPH
pkinney@bu.edu

Mayor Announces Program to Help Curb Effects of Extreme Summer Heat

June 14, 2017

Launches new $106 million Cool Neighborhoods NYC program, expanding the Administration's aggressive climate resiliency agenda

NEW YORK—Before the hottest days of the summer arrive, Mayor de Blasio is announcing the launch of *Cool Neighborhoods NYC*, a new $106 million program designed to curb the effect of extreme heat, and protect against the worst effects of rising temperatures from climate change. This comprehensive city program will involve proactive and reactive measures in heat-sensitive neighborhoods to help mitigate the threat to public health from the urban heat island effect exacerbated during summer months.

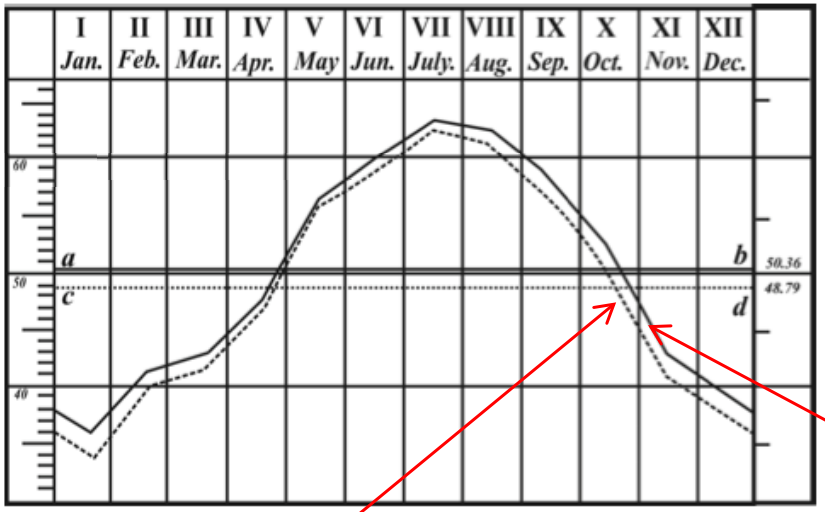
Urban Heat Island

Dan Li

Assistant Professor
Department of Earth and Environment
College of Arts and Sciences

BOSTON UNIVERSITY

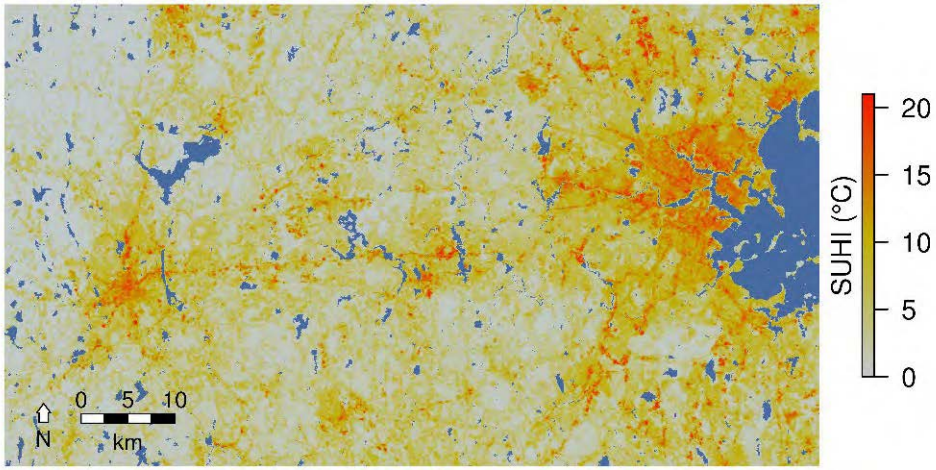
Howard (1833) The climate of London



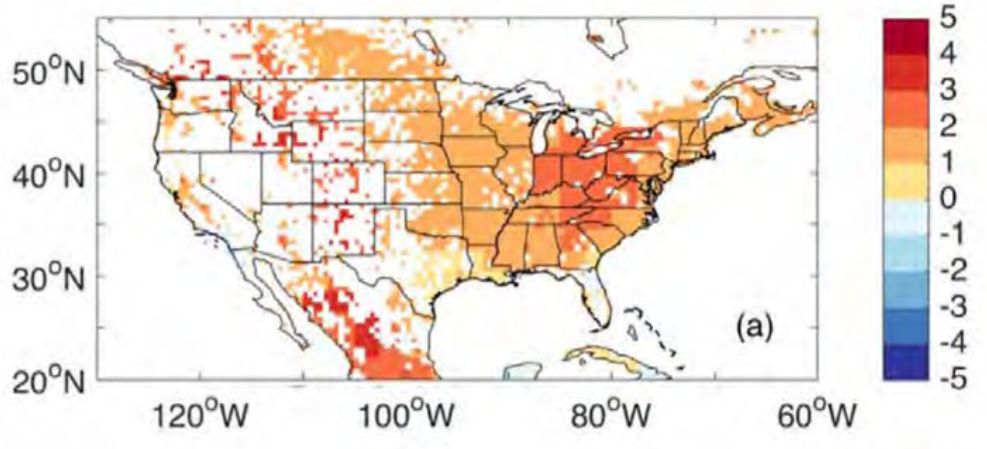
Rural temperature

Urban temperature

Luke Howard
1772-1864



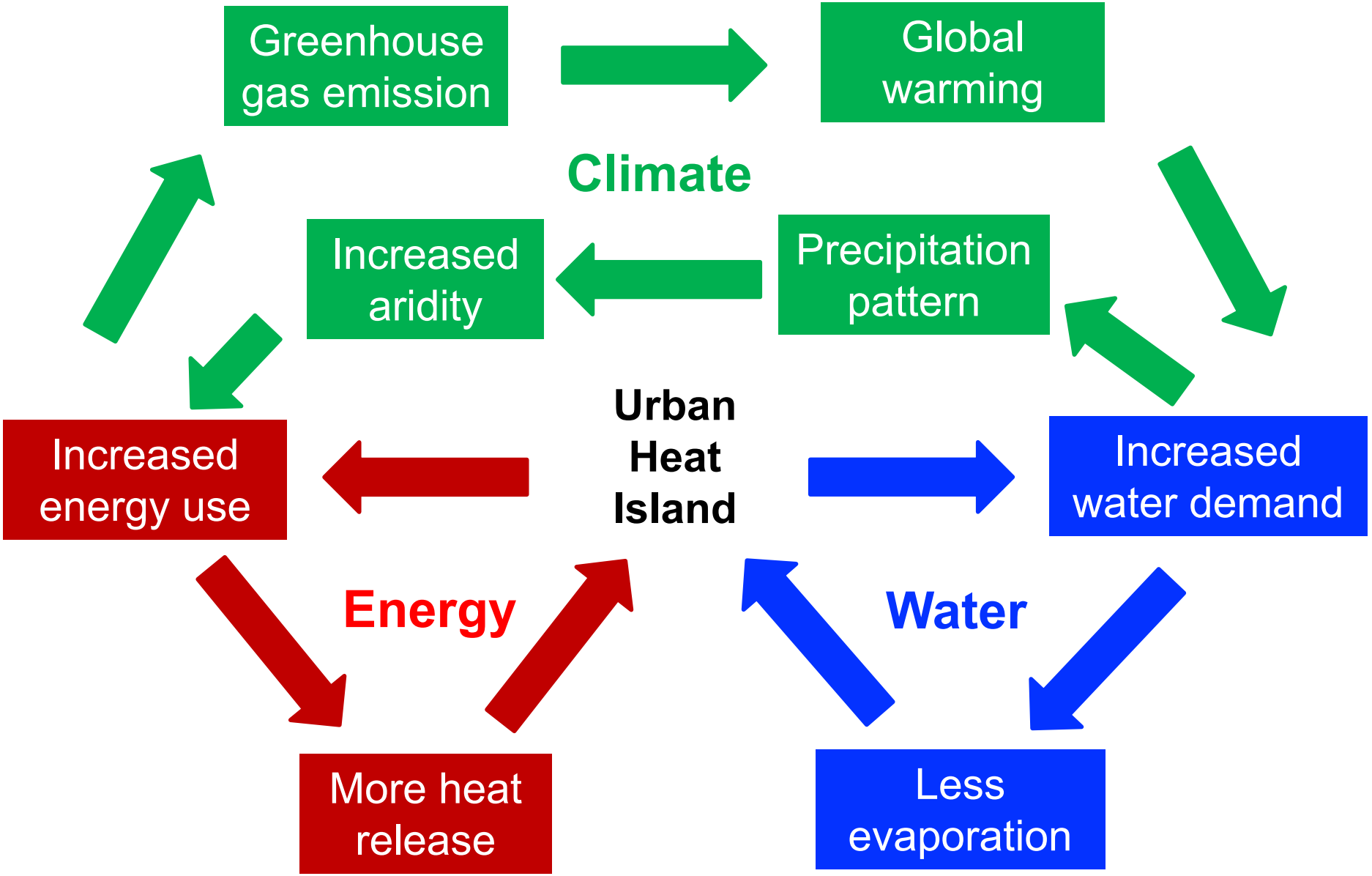
Wang et al. (2017)



Gu and Li (2018)

BOSTON UNIVERSITY

Water-Energy-Climate Feedback



Public Health Benefits of Climate Solutions

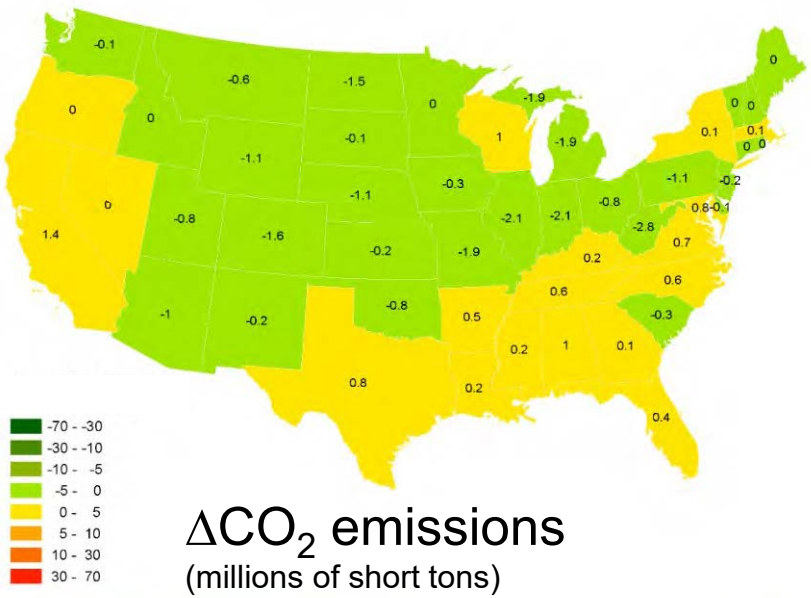
Jon Levy

Professor and Chair
Department of Environmental Health, School of Public Health

BOSTON UNIVERSITY

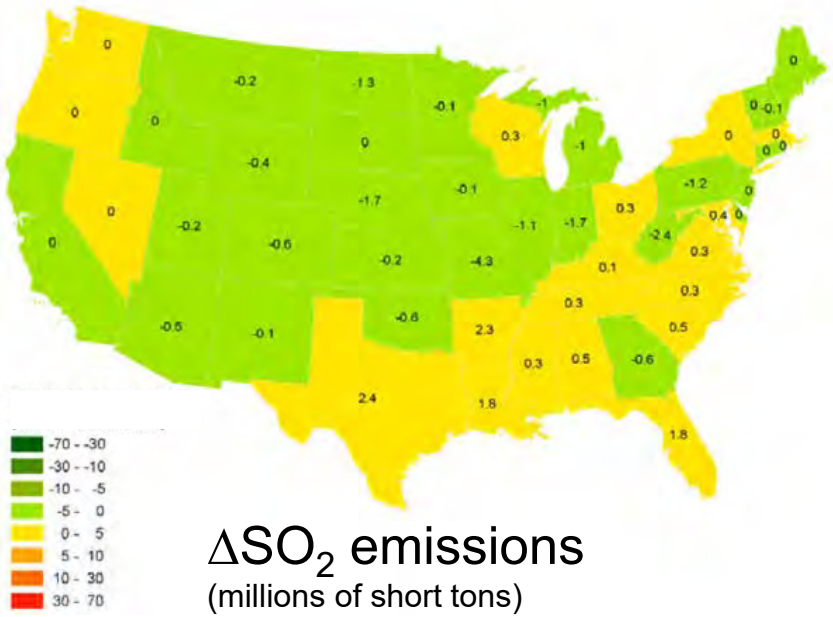
ACE vs. no policy

(Keyes et al. 2019)



ΔCO_2 emissions

(millions of short tons)

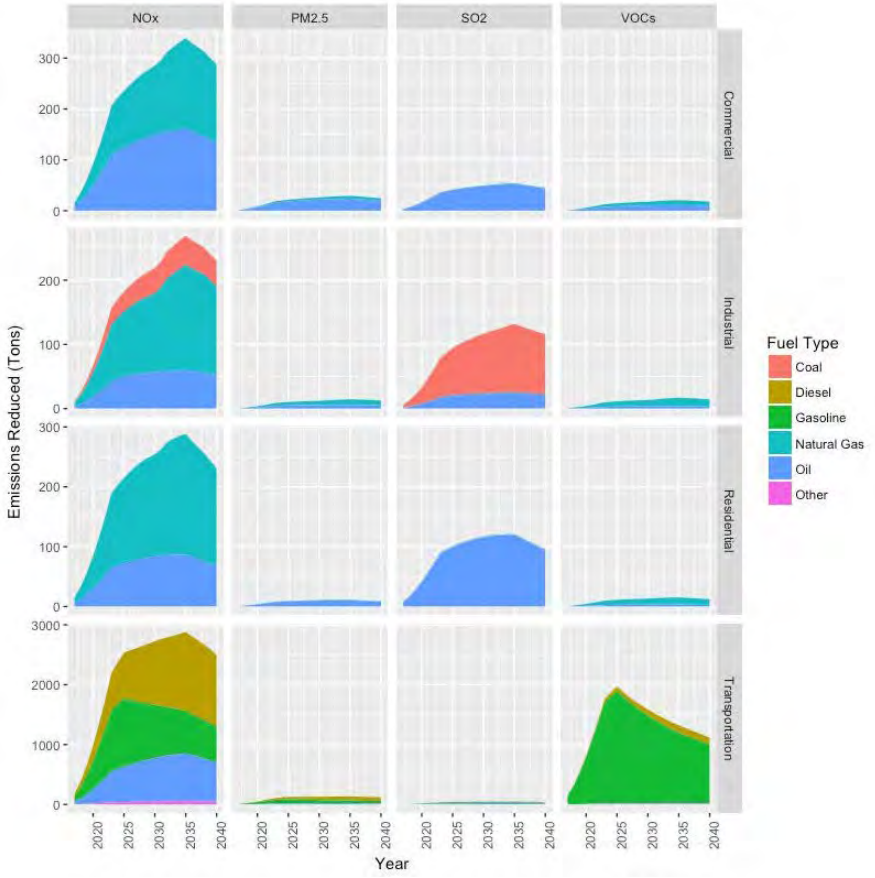


ΔSO_2 emissions

(millions of short tons)

Carbon fee-and-rebate in MA

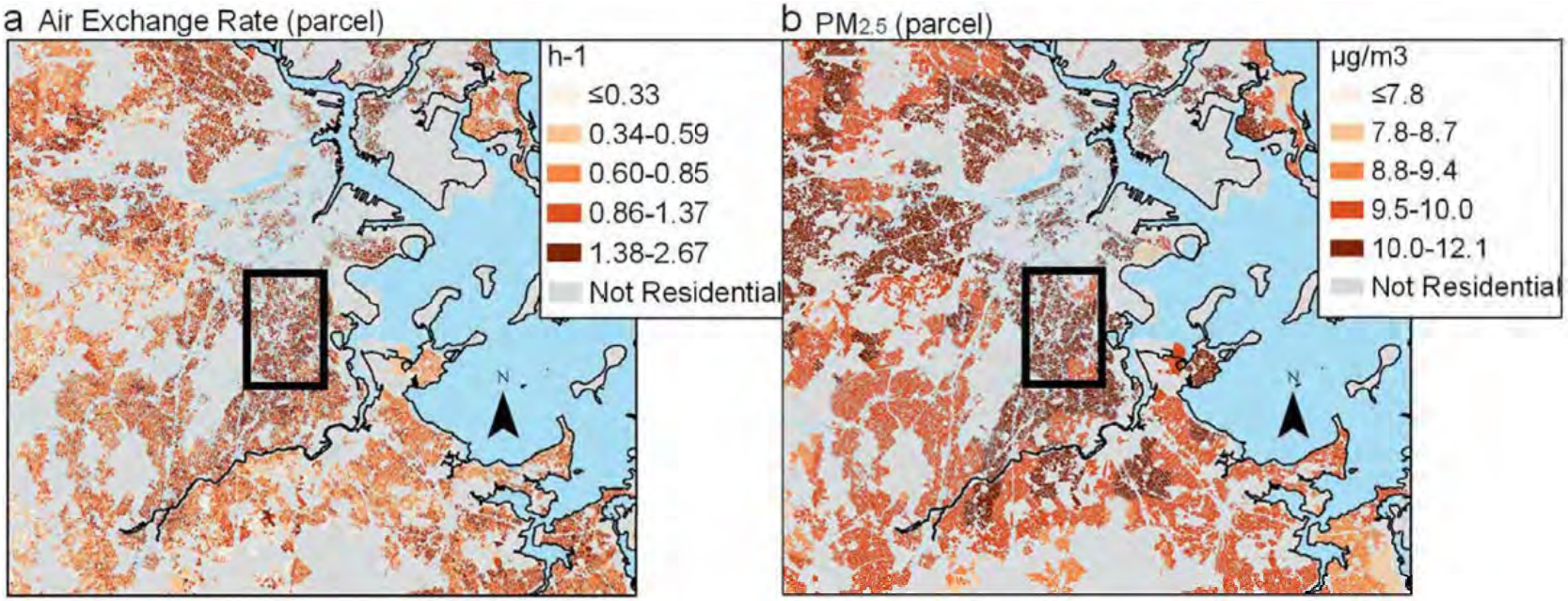
(Buonocore et al. 2018)

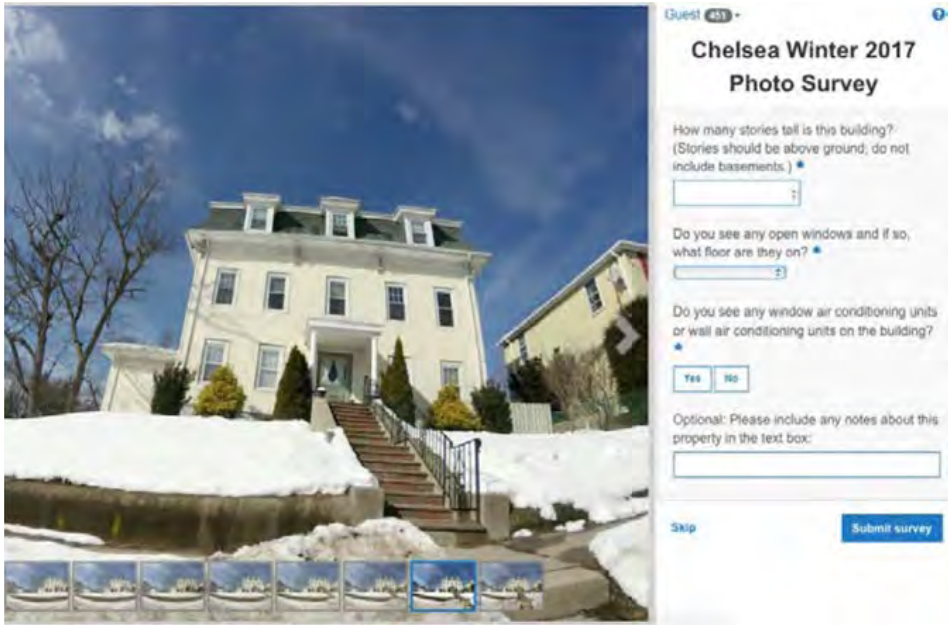


Benefit Type	Benefits (95% CI)
Total Lives Saved	340 (82-590)
Value of Health Benefits, Discounted at 3% per year	$2.0 billion ($0.45-$3.5 billion)
Total Reductions in CO_2 emissions	33 million metric tons
Value of Climate Benefits, Discounted at 3% per year	$1.3 billion

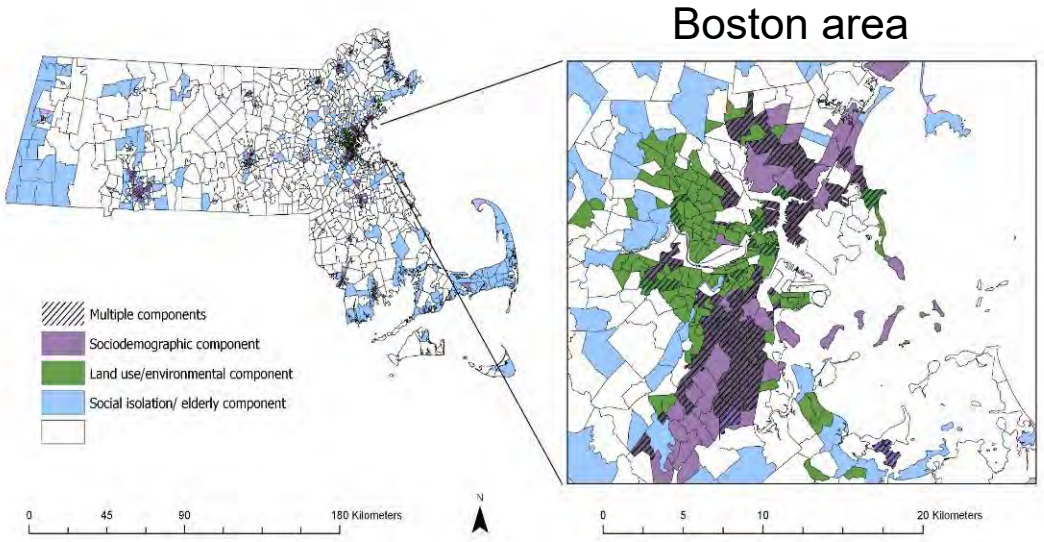
BOSTON UNIVERSITY

Research on Tap: *Understanding and Improving our Urban Climate*





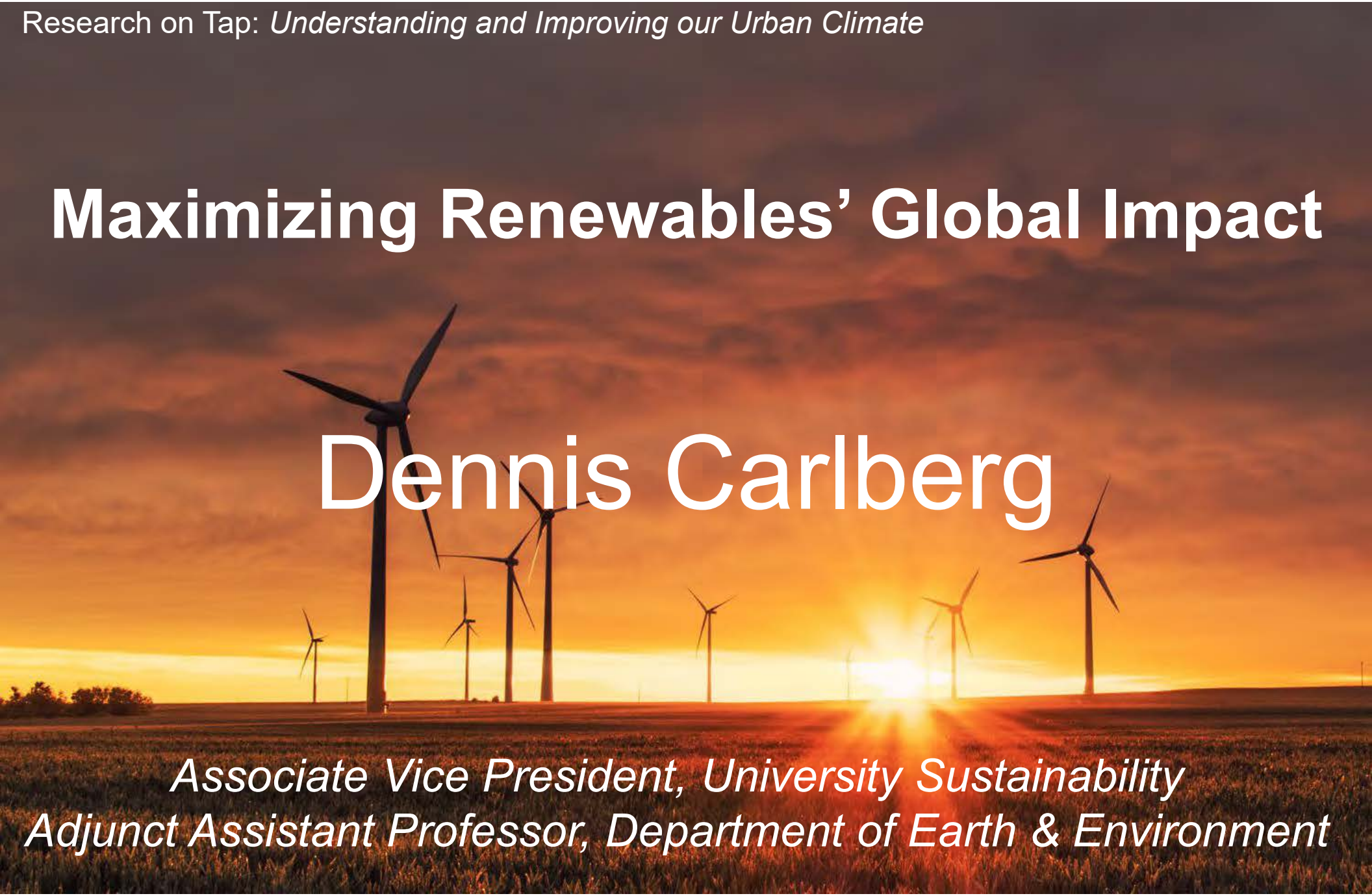
Heat Vulnerability Index Components, 2011



Rosofsky et al., 2018; Petropoulos et al., in prep; Heidari et al., in prep

BOSTON UNIVERSITY

Maximizing Renewables' Global Impact



Dennis Carlberg

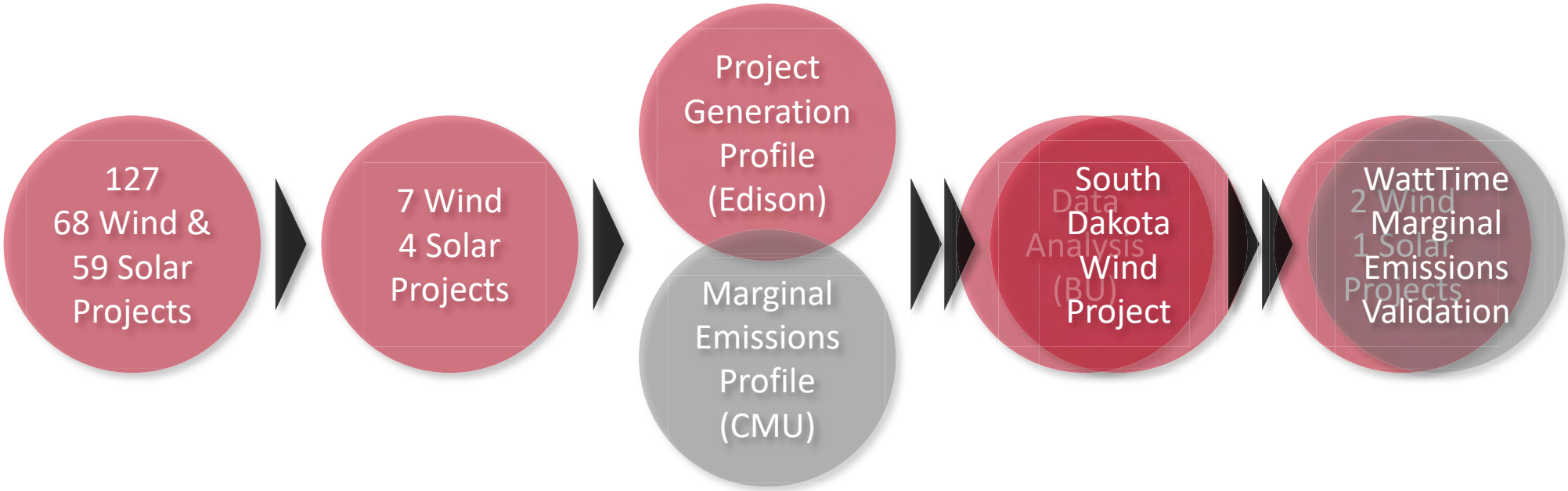
Associate Vice President, University Sustainability
Adjunct Assistant Professor, Department of Earth & Environment

Boston University Office of the Vice President and Associate Provost for Research

BOSTON UNIVERSITY

Credit: karsten-Wurth

Process



Economic & eGrid Screen

Marginal Emissions Screen

LOI / Term Sheet to REPA Contract

Economics & Risk Screen

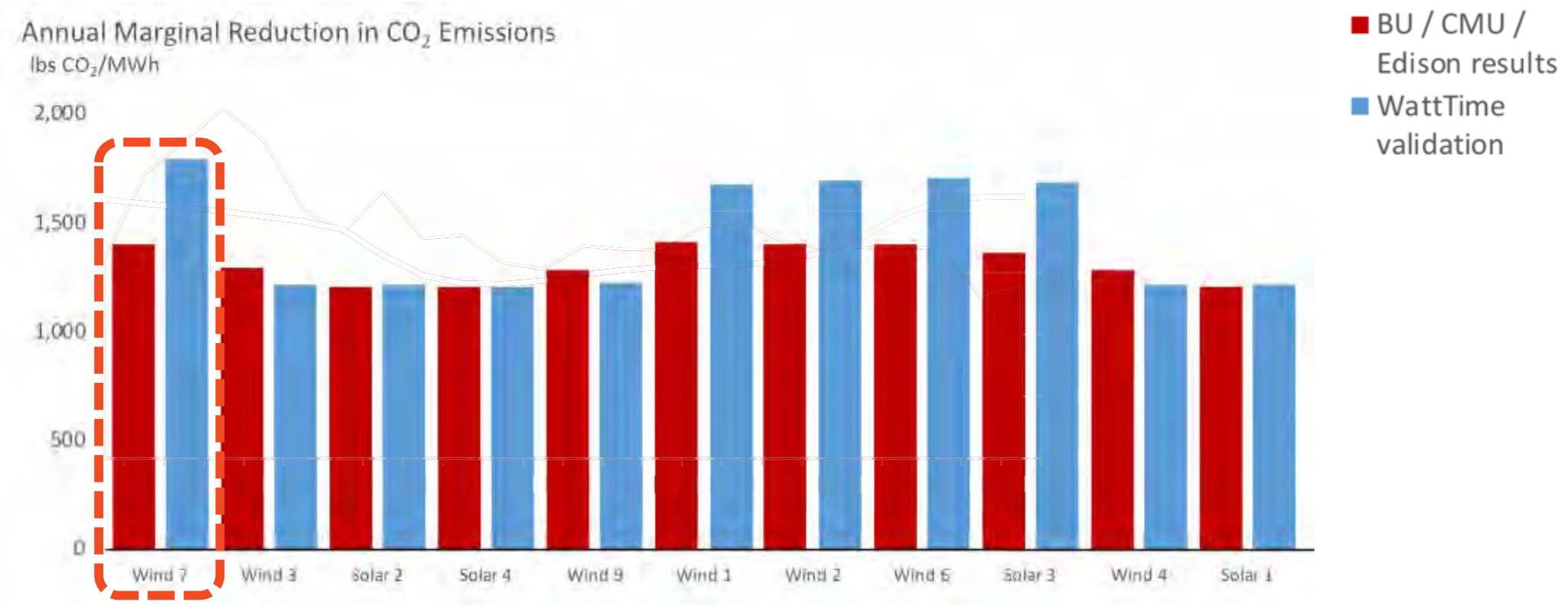
Criteria Due Diligence

Team Interviews

Alignment of Generation with Marginal Emissions

Next Steps

1. Pilot impact-based accounting > recommendations to WRI
   - Boston University
   - WattTime (UC Berkeley, Rocky Mountain Institute)
   - Azevedo Lab (Carnegie Mellon University/Stanford University)
   - Green Ribbon Commission (BU, MIT, Harvard)
   - AASHE peers
2. Education & Research with ENGIE

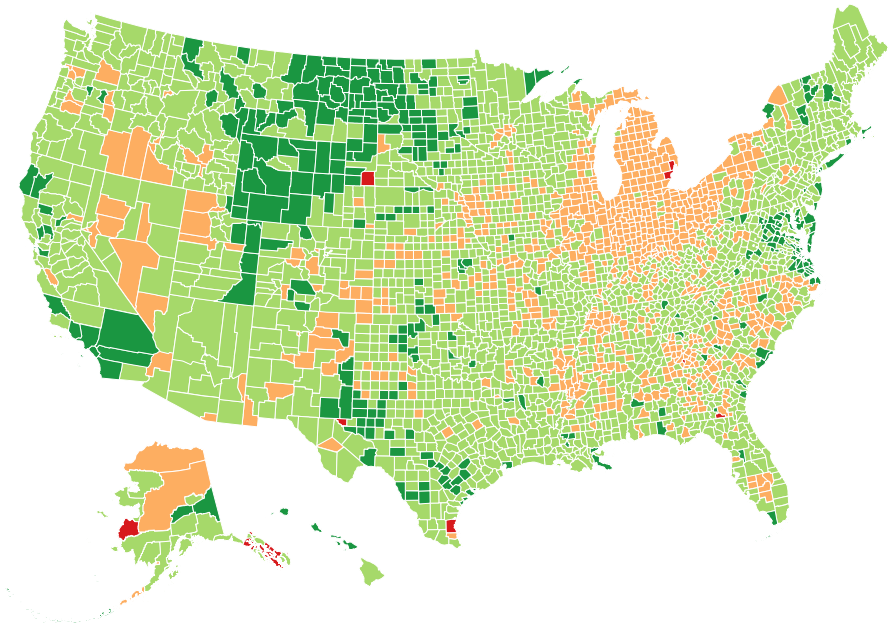


Neighborhood Defenders: Participatory Politics and America's Housing Crisis

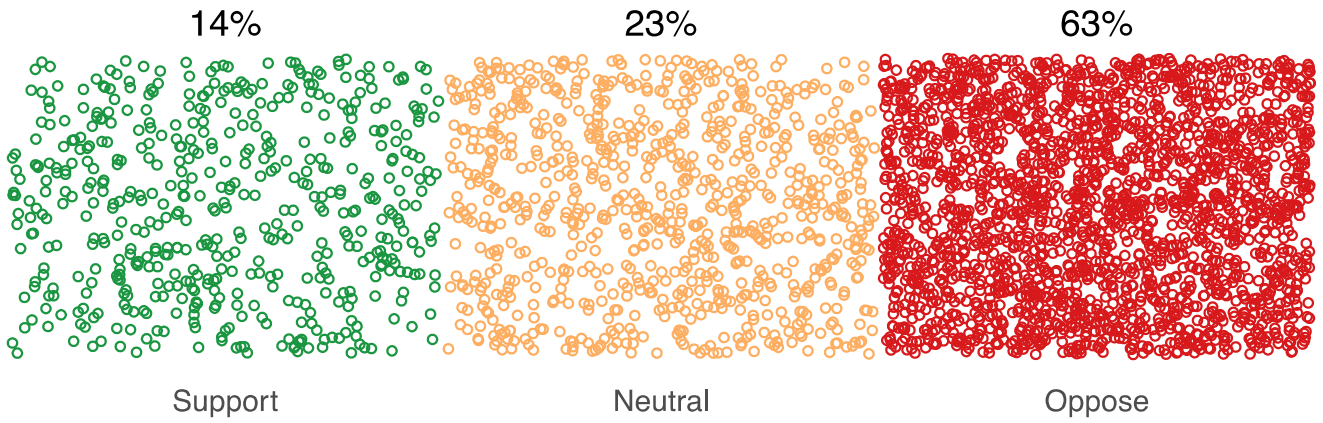
Katherine Levine Einstein

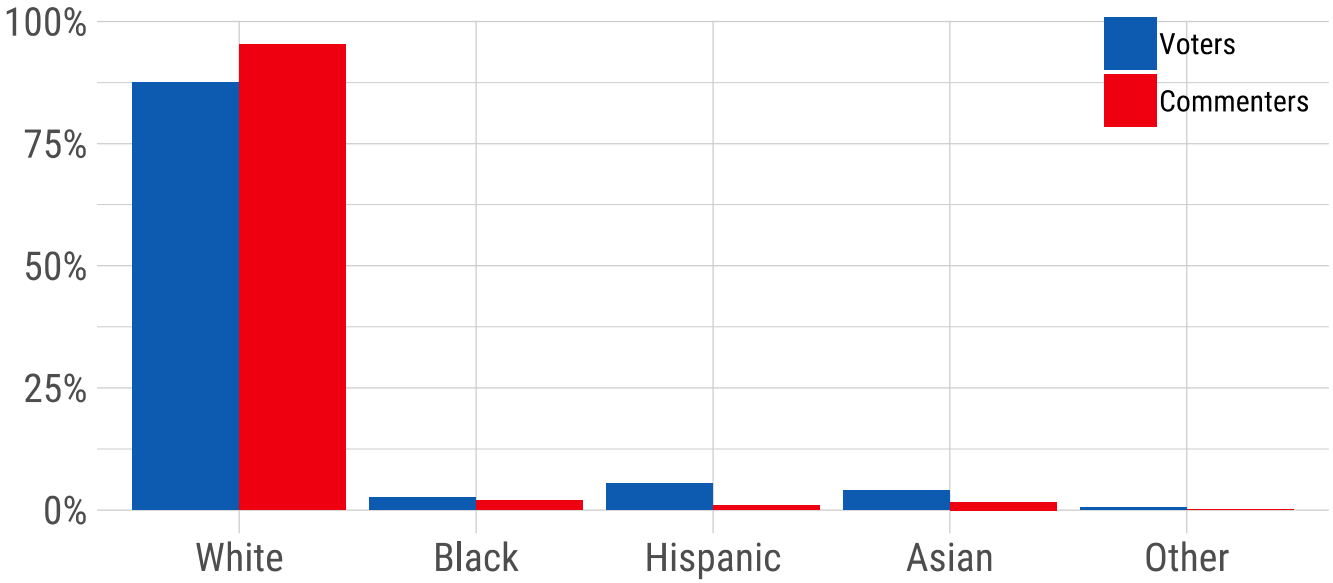
Political Science, College of Arts and Sciences

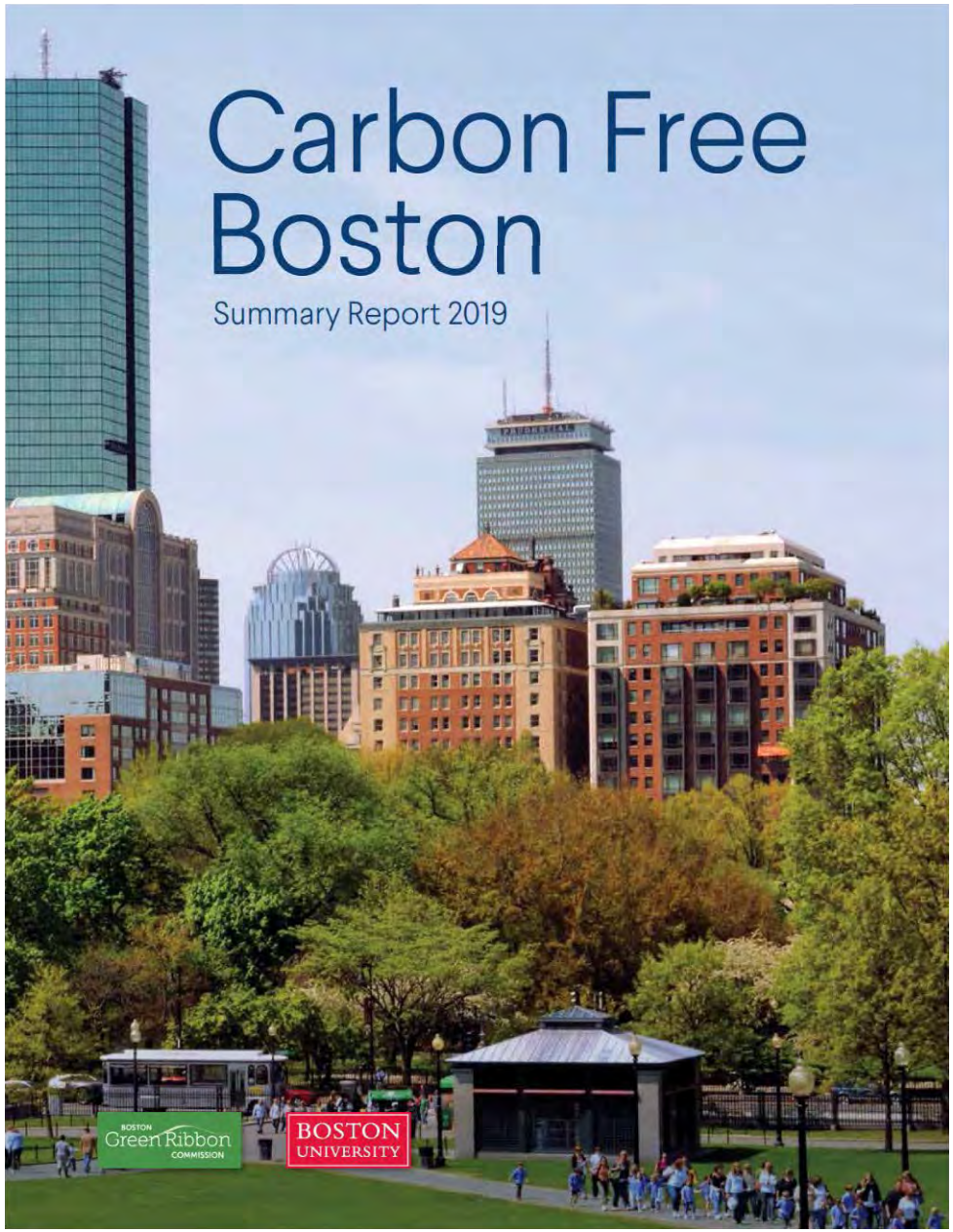
BOSTON UNIVERSITY



Regulations → Create opportunities for resident participation → unrepresentative group of residents stop or delay the construction of new housing


14%
23%
63%
Support
Neutral
Oppose

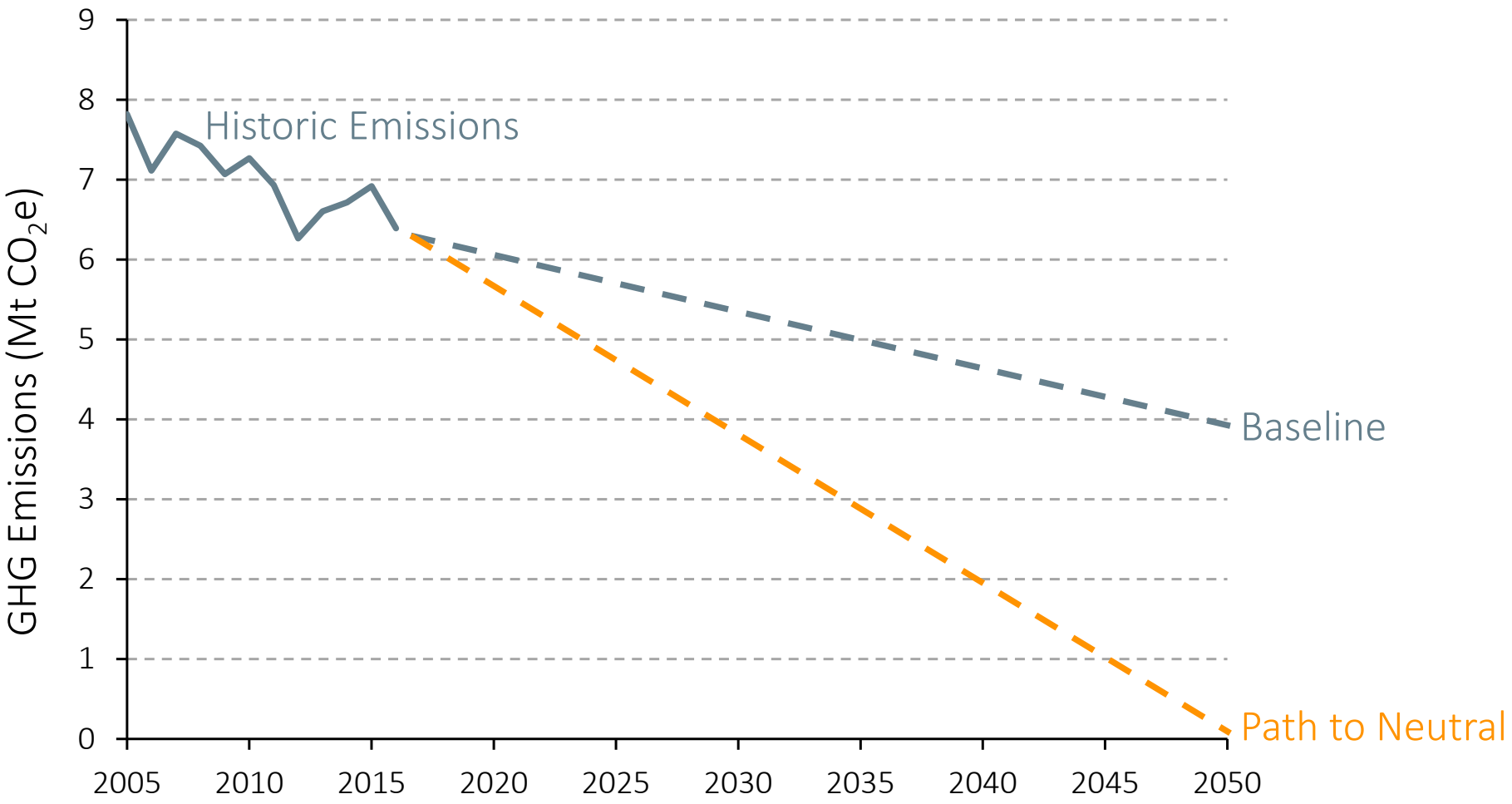

100%
75%
50%
25%
0%
Voters
Commenters
White
Black
Hispanic
Asian
Other



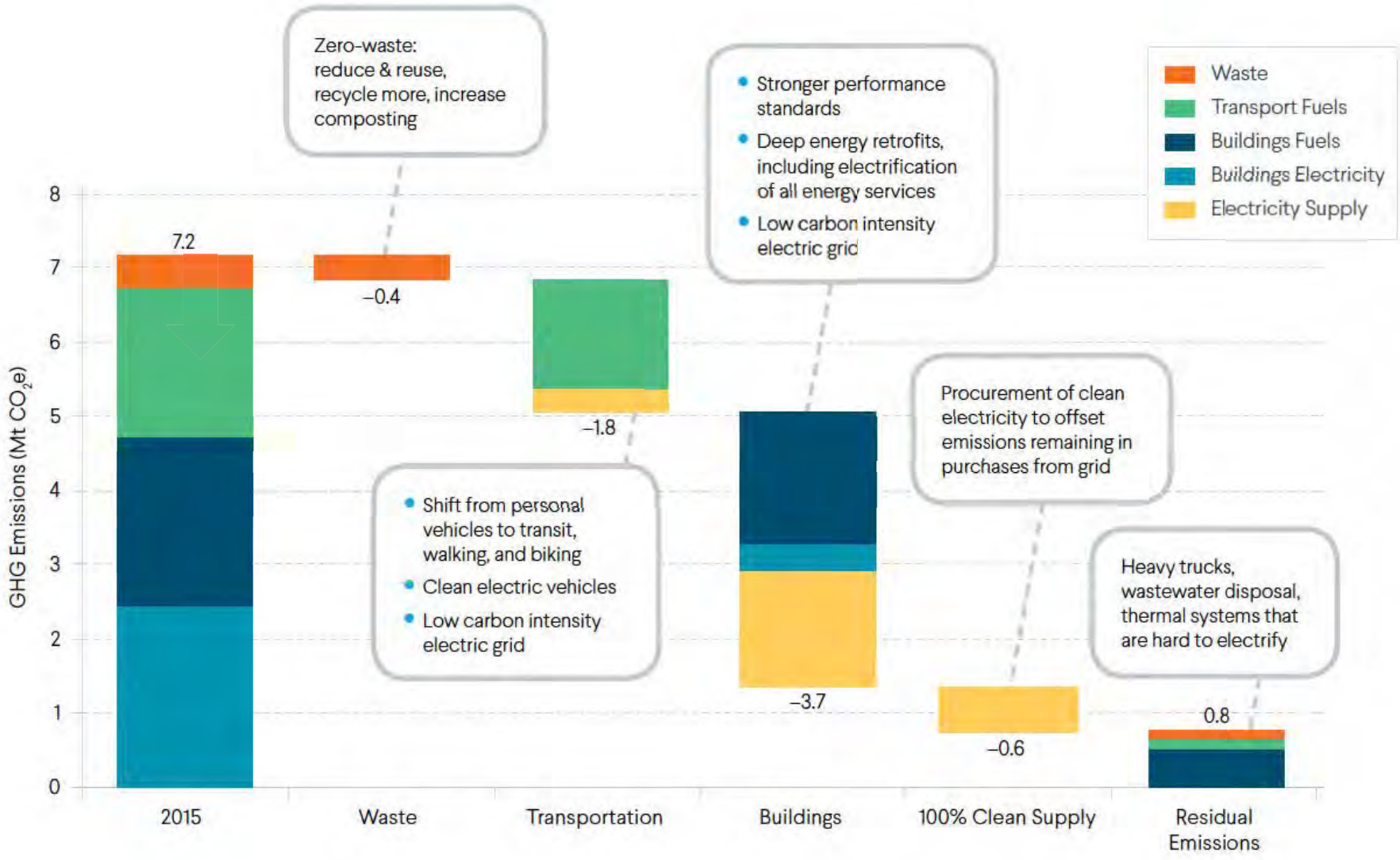
Cutler J. Cleveland

Professor
Earth and Environment, CAS
Institute for Sustainable Energy, Questrom

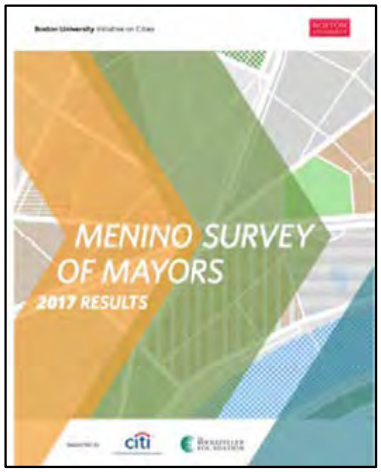
Boston's GHG Emissions

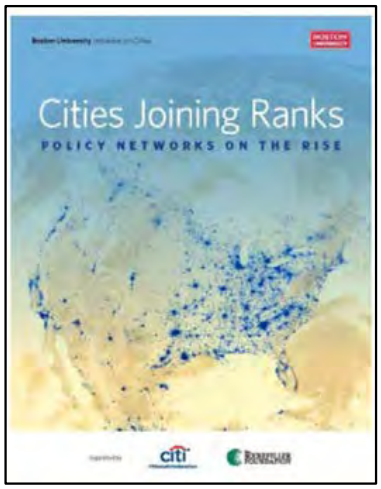


Paths to Carbon Neutrality Reinforcing Strategies Must Be Pursued Together



ity





America's Mayors: Taking Action on Climate?

Katharine Lusk

Executive Director
Boston University Initiative on Cities

citi
CitiCommunityDevelopment.com

The ROCKEFELLER FOUNDATION

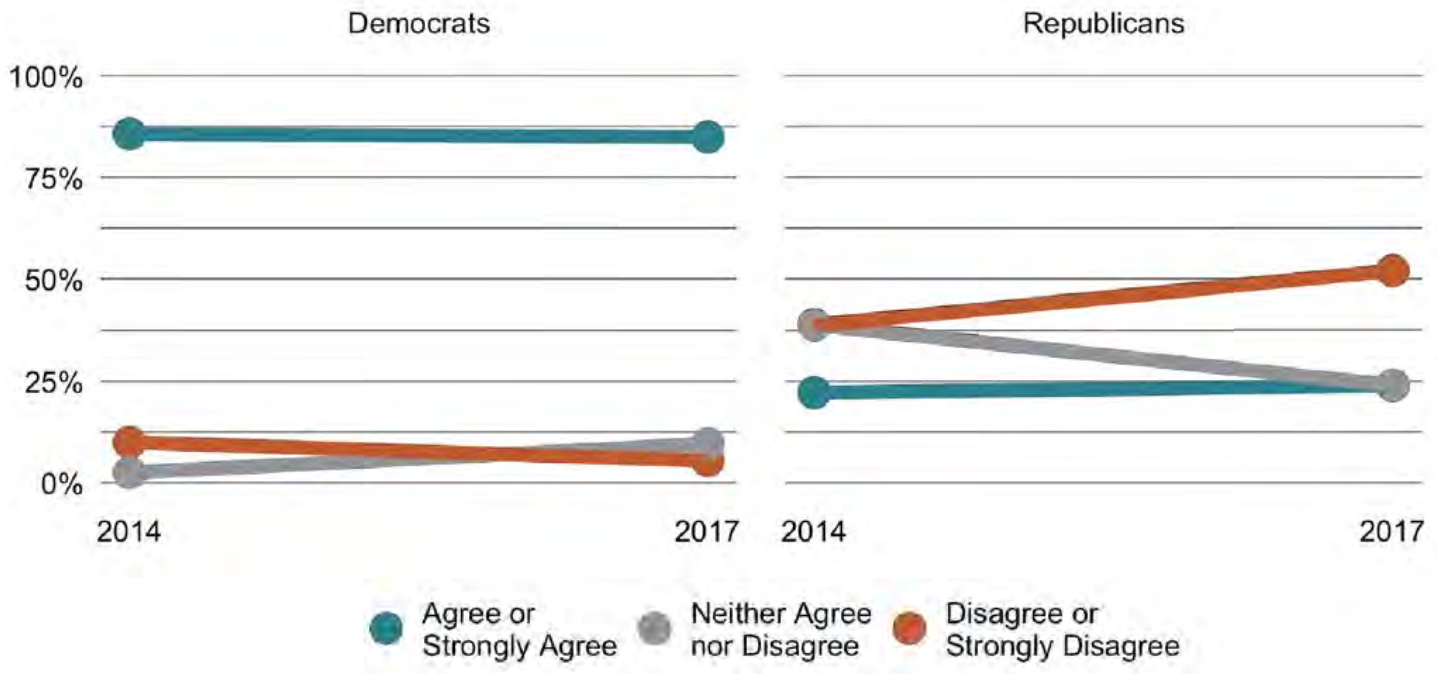
www.surveyofmayors.com

With thanks to Katie Einstein, Max Palmer, David Glick & Nic Gunkel

84% of US mayors believe that climate change is due to human activities

- 95% of Democratic Mayors
- 50% of Republican Mayors

2/3rds of mayors support cities expending resources to take action on climate change



How do they differ? 'Who, Do, Deliver'

	GLOBAL COVENANT of MAYORS for CLIMATE & ENERGY	CNCA	Chicago Climate Charter	C40 CITIES	WE ARE STILL IN	CLIMATE MAYORS	UNDER 2°	ICLEI	100RC	MAYORS FOR 100% CLEAN ENERGY
Pay dues								X		
Participation standards	X			X		X			X	
Commit to a specific, quantified network target	X	X	X				X			
Commit to own, quantified target									X	
Develop plan	X								X	
Report baseline publicly	X	X								
Report progress toward goals	X		X	X						
US Members	**147**	**8**	**58**	**12**	**241**	**412**	**12**	**167**	**24**	**204**

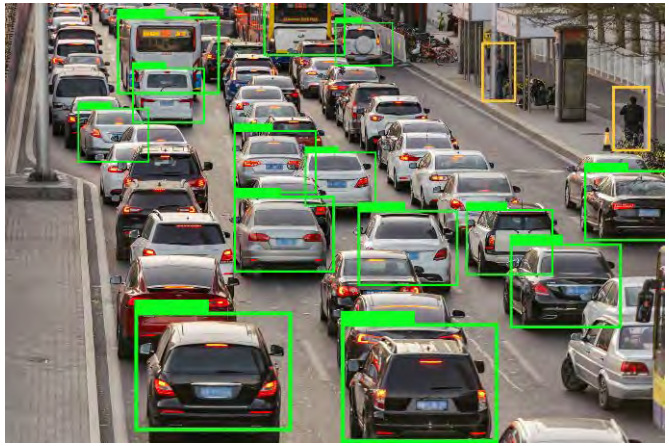
Associating Physical Objects with Virtual Information

Thomas Little

Professor
Electrical and Computer Engineering, College of Engineering

BOSTON UNIVERSITY

Associating physical objects with virtual information



Activity Classification

Tagging

Tracking in Space

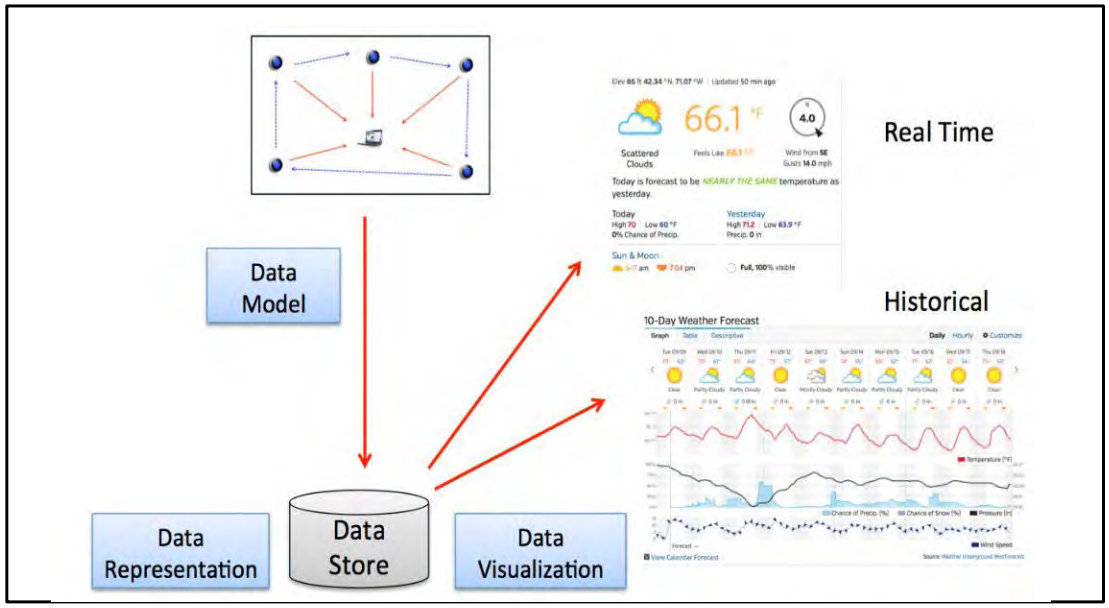
Positioning

People Counting

Mapping from location to information

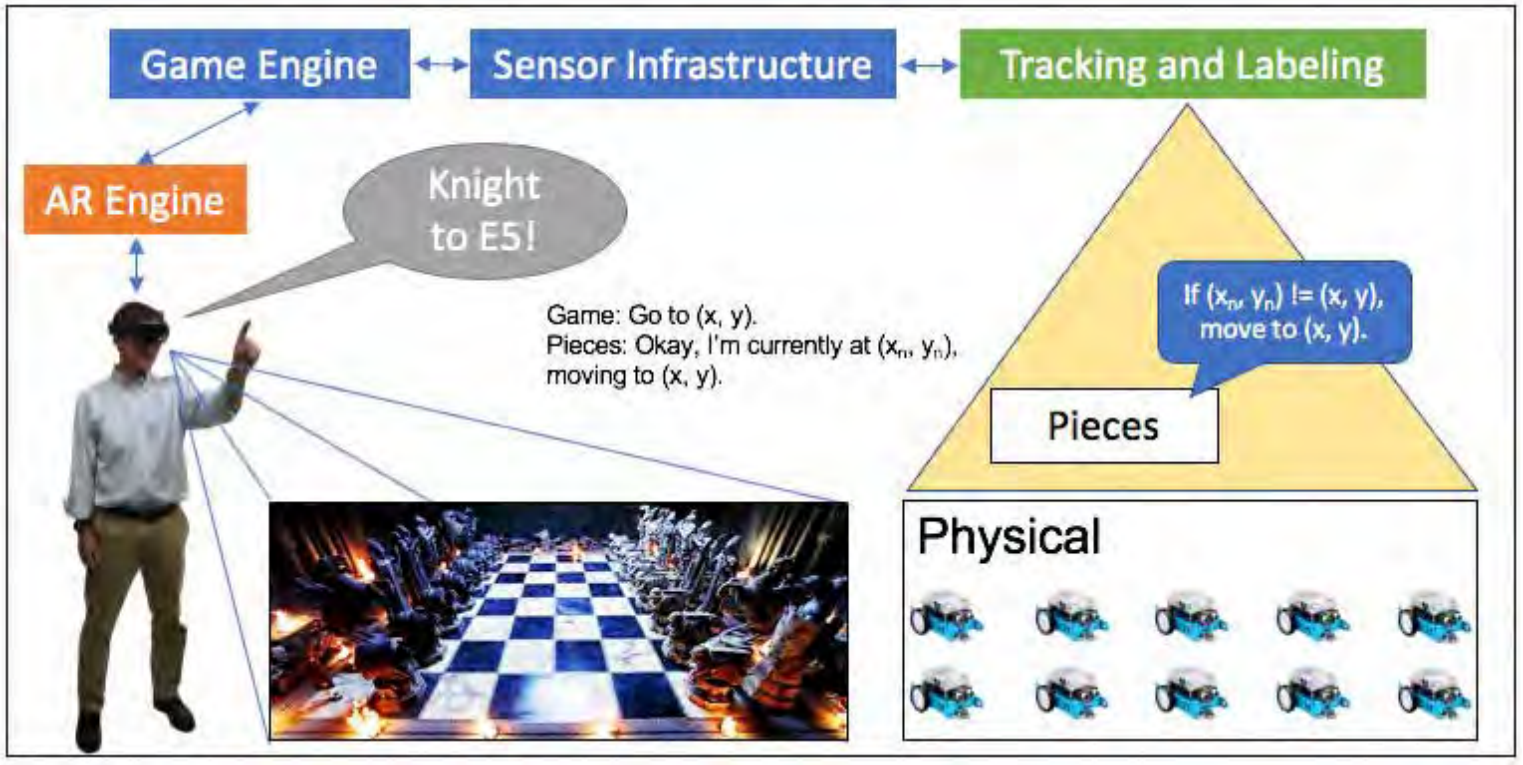
Gesture control

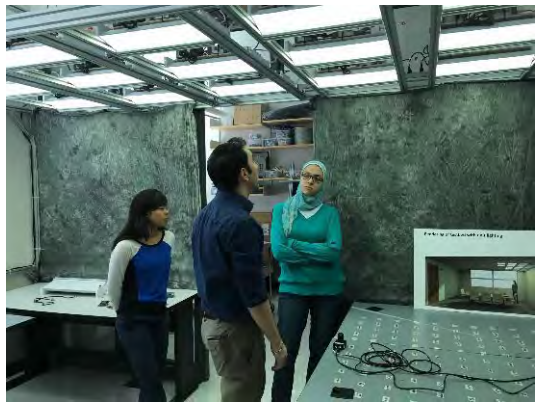
Summary – IoT workflow: instrumentation to analysis



Instrumentation, technology, processes to collect, analyze and report on the environment

Novel positioning and tracking for labeling, mapping, and association with physical objects





Funding: ARPA-E, NSF CNS, NSF ERC

Parks for *all*: Equitable Planning for Climate Risk

Madhu C. Dutta-Koehler, PhD

Associate Professor of the Practice.
Director, City Planning and Urban Affairs Program.
Metropolitan College

BOSTON UNIVERSITY

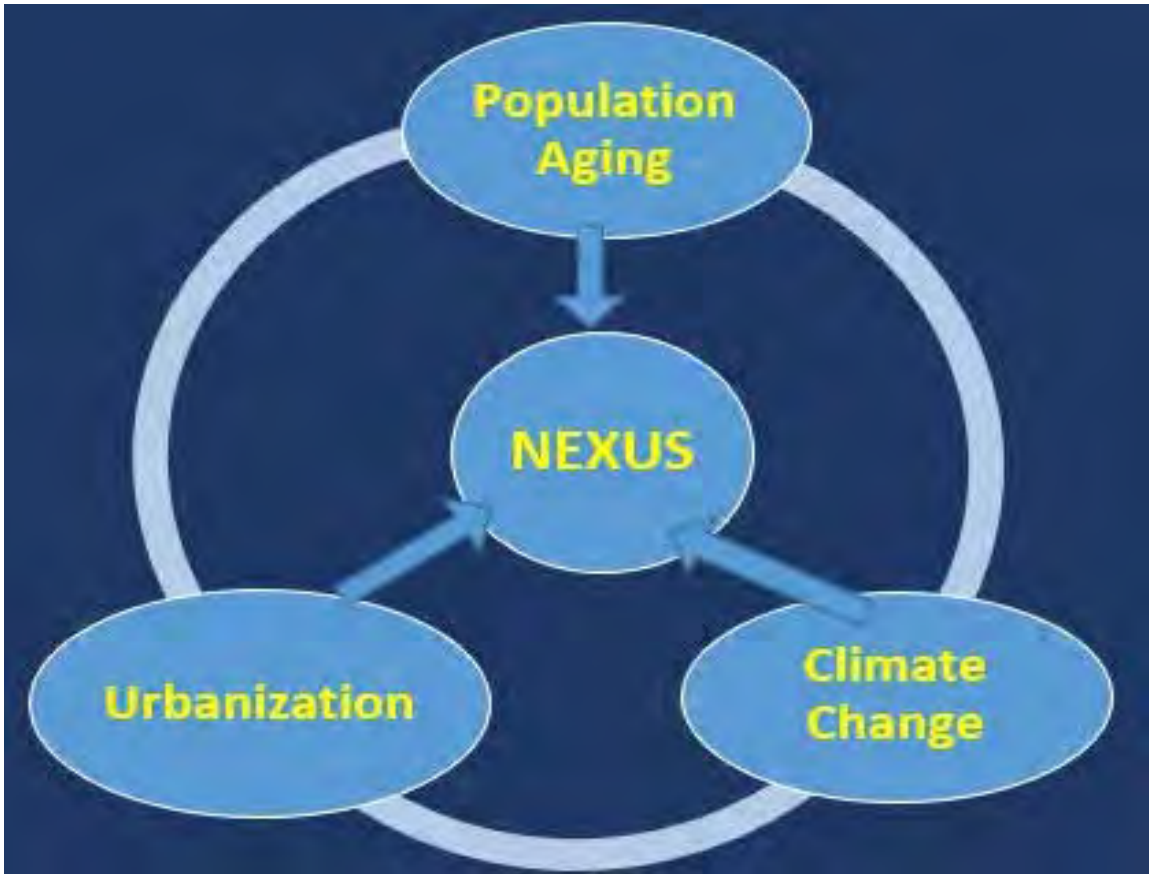
Boston ranks 18th among world cities for its urban tree canopy at 18.2%.

It also ranks 13 out of 100 US top cities for its park systems and green spaces

Climate Action + Outreach Community Events City of Boston, 2015-2017
Agencies mapped: Greenovate, Climate Ready Boston, BPDA, City of Boston, Commonwealth of MA, Partner Events

We are as strong as our weakest link!

Population Aging, Urbanization, and Climate Change: The Nexus of the Three Global Trends



Judith G. Gonyea, PhD
Professor, Social Research Department, School of Social Work
January 28, 2019

Boston University Office of the Vice President and Associate Provost for Research

BOSTON UNIVERSITY

POINT 1: OLDER ADULTS ARE HIGHLIGHTED AS A VULNERABLE POPULATION IN TERMS OF CLIMATE CHANGE *HOWEVER THERE IS A SCARCITY OF RIGOROUS RESEARCH AND A STRATEGIC PLANNING REGARDING THE NEXUS OF THREE TRENDS!*

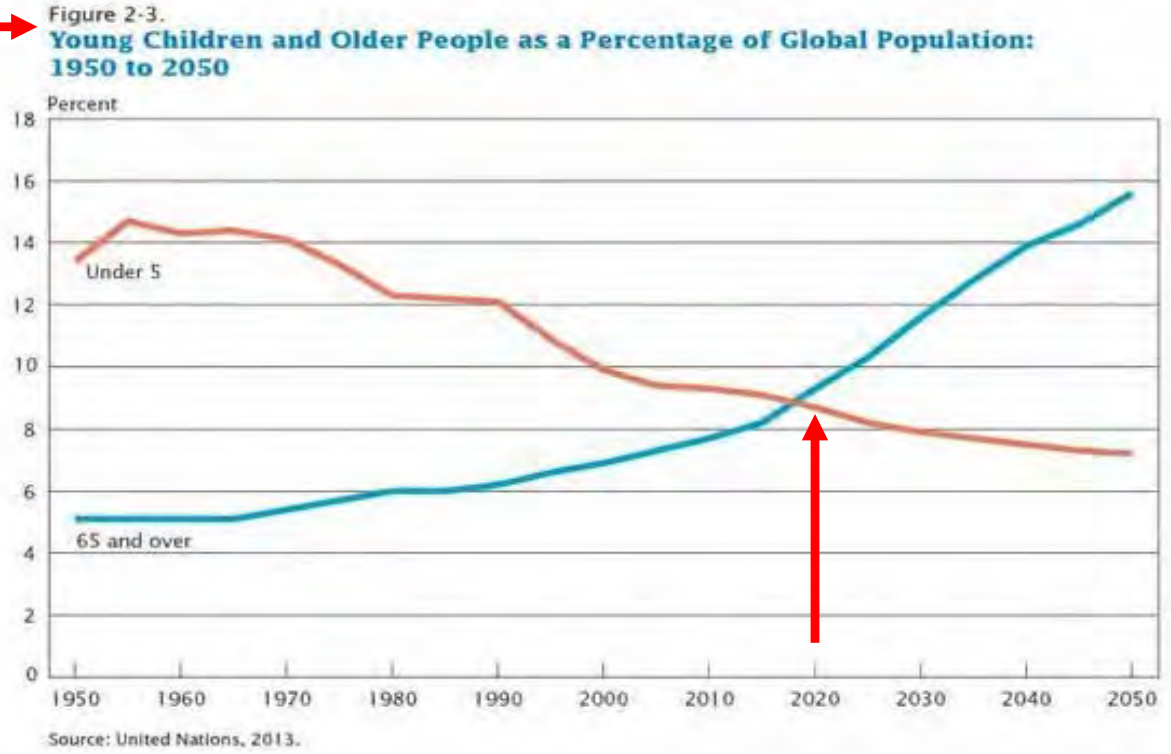
EPA U.S. Climate and Health Assessment does identify/emphasize the impacts of climate change on the health on eight vulnerable populations, including older adults.

OLDER ADULTS----Increased vulnerability to heat stress, extreme weather events, air pollution, water & foodborne illnesses, vector–borne infectious diseases (greater mortality, etc)

For the First Time in Human History: People 65 and Older Will Soon Outnumber Children Under 5

By 2030, 72m. persons, or 1 in every 5 Americans, will be 65+.
By 2050, more than 40% of adults aged 65+ can expect to live to at least 90.

Yet, in 2018 when UN met to review the Sustainable Development Goals for 2030, among the 17 goals and 169 targets, older people are acknowledged only twice — and marginally. The broader issue of population aging is not mentioned once.



POINT 2: POPULATION AGING IS NOT BEING IGNORED!

The UN's 2002 Madrid "International Plan on Action on Aging" offered a bold agenda for the 21st century. WHO Global Network for Age-friendly Cities (AFC), established in 2010, was a specific response to the dual trends of population aging and urbanization. AFC promotes the transformation of cities' built and social environments to promote older adults' engagement and health. Today, >700 cities and 39 countries are now Network members.

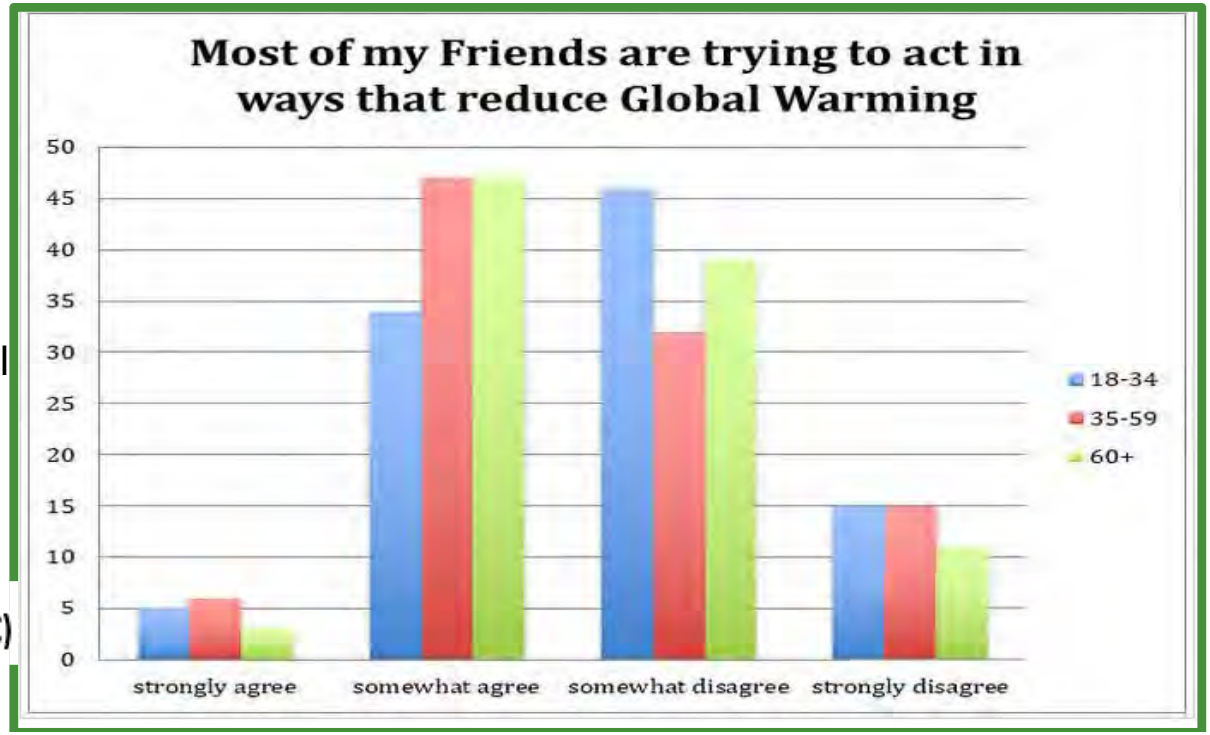
HOWEVER, CLIMATE CHANGE IS NOT INTEGRATED INTO THE AFC FRAMEWORK (DIFFERENT SILOS.)

POINT 3: CLIMATE CHANGE STRATEGIES MUST BE INCLUSIVE OF THE CAPABILITIES, RIGHTS AND VULNERABILITIES OF OLDER PEOPLE TO REFLECT THE CONVERGENCE OF POPULATION AGING, URBANIZATION, AND CLIMATE CHANGE.

Ageism and age discrimination---Older people are often viewed as passive and incapable of understanding science and technology and having little to contribute to the generation of climate change strategies. Older adults are among those often excluded from the debates/forums on climate change, from the grassroots or community level up to the national/international level.

By failing to engage the older population in such efforts, our society is missing out on a GROWING resource to address climate change and environmental sustainability issues.

GREY AND GREEN- Older people are eager to contribute their talents and time to environmental stewardship. How do we then create accessible and diverse opportunities for an heterogeneous older population?



The Yale Project on Climate Change Communication (YPCCC)

BU Initiative on Cities
Urban Climate Initiative

Doctoral Student and Postdoc Workshop

Studying or interested in studying the

intersection of urban environment and climate change?

Join the monthly meetings of the **UCI** postdoctoral and graduate student workshop, an opportunity to:

Share your work on climate problems and solutions for cities in the 21st century
Seek out new collaborations across departments
Learn new skills and professional development strategies

Kickoff Meeting on **Feb. 19, 2019**

4:30 pm-5:30 pm in the Photonics Center 9th Floor West End Lounge.

Dinner provided

RSVP **http://www.bu.edu/urbanclimate/students-and-postdocs/**

Questions? Please contact Lindsey Butler ljbutler@bu.edu or Drew Trlica atrlica@bu.edu.

Upcoming Research on Taps

For more details: bu.edu/research/researchontap

Coastal Cities, People, and Waterways
Monday, February 4, 2019 | 4-6 pm

The American City: Promoting Inclusion or Sowing Division?
Wednesday, February 27, 2019 | 4-6 pm

High Tech and High Touch: Digital Innovations from BU's Mobile and Electronic Health-ARC
Wednesday, March 20, 2019 | 4-6 pm

Mechanobiology: How Force and Stretch Shape Life
Tuesday, April 2, 2019 | 4-6 pm

BOSTON UNIVERSITY