

**campus
climate
action**



MIT Campus as a Test Bed: Understanding Climate Resilience

 **Brian Goldberg**
Assistant Director
MIT Office of Sustainability

6.900
February, 6, 2026

Office of Sustainability Mission: Your opportunity this semester

...to transform MIT into a replicable model that generates just, equitable, applicable, and scalable solutions for responding to the unprecedented challenges of a changing planet.

Scales of Impact



You

Campus

City

State

Globe

←→

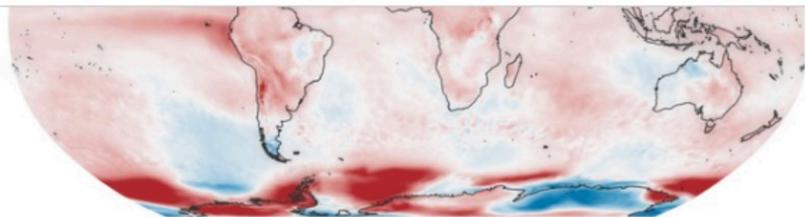
We start with you to find solutions at the campus level to serve both the institution's needs as well as to incubate new and big ideas.

←→

Seeking solutions to common challenges with the cities of Cambridge, Boston and beyond. We recognize and the deep interconnectivity between our urban campus and the city and seek to operate at both scales.

←→

Making structures, processes, and solutions developed at MIT accessible for reapplication and scaling across the globe.



Earth Just Had Its Hottest Month Ever.

**Burning pavement, scalding water hoses:
Perils of a Phoenix heat wave**

It's so hot in Arizona, doctors are treating a spike of patients who were burned by falling on the ground

By Jen Christensen, CNN
Published 7:03 AM EDT, Mon July 24, 2023

Heat Will Likely Soar to Record Levels in Next 5 Years, New Analysis Says

Human-caused climate change is making high temperatures more common and intensifying the dryness that fuels catastrophic wildfires.

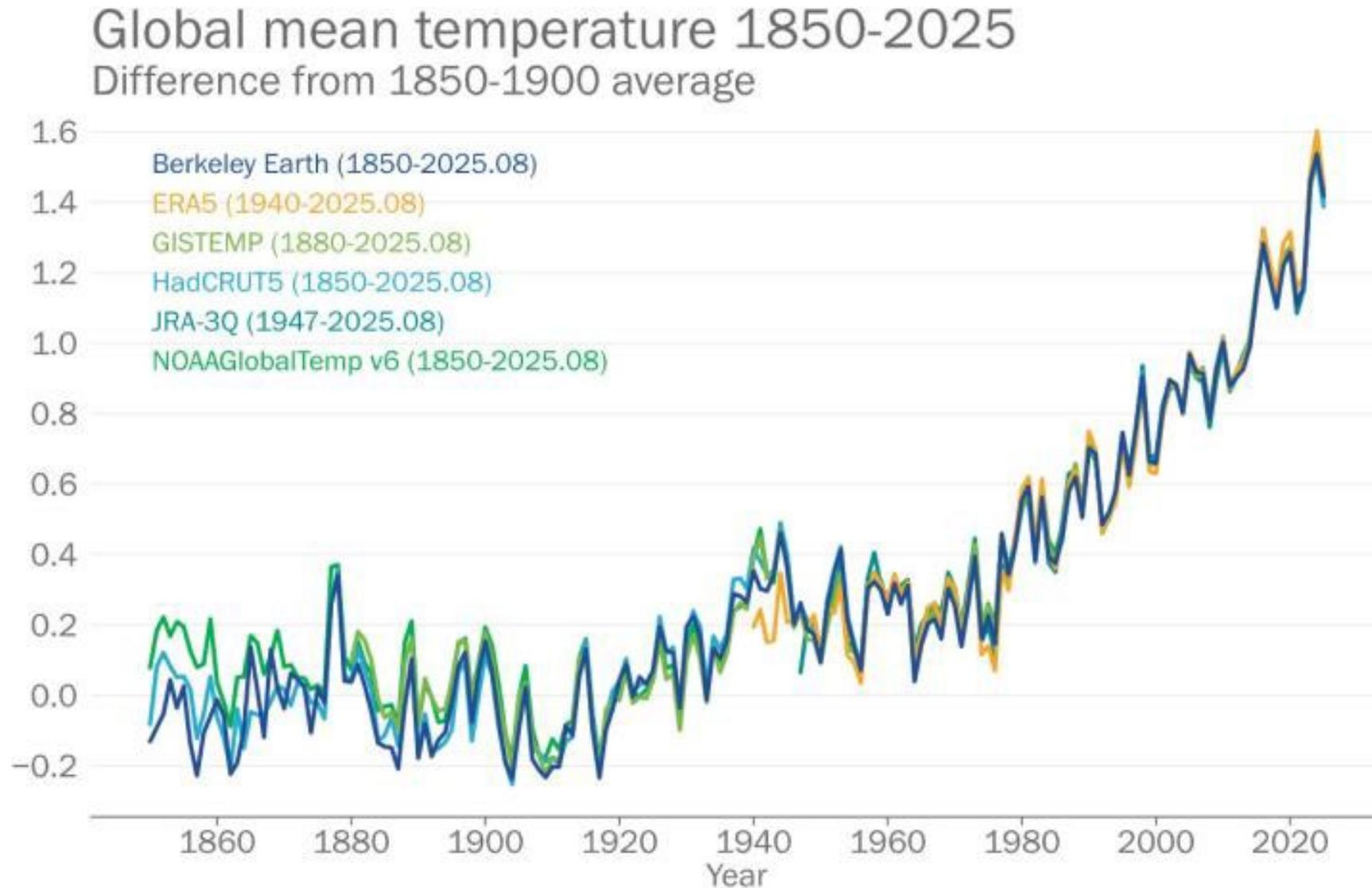
How Extreme Heat Causes Cascading Crises

How extreme heat takes a toll on the mind and body, according to experts

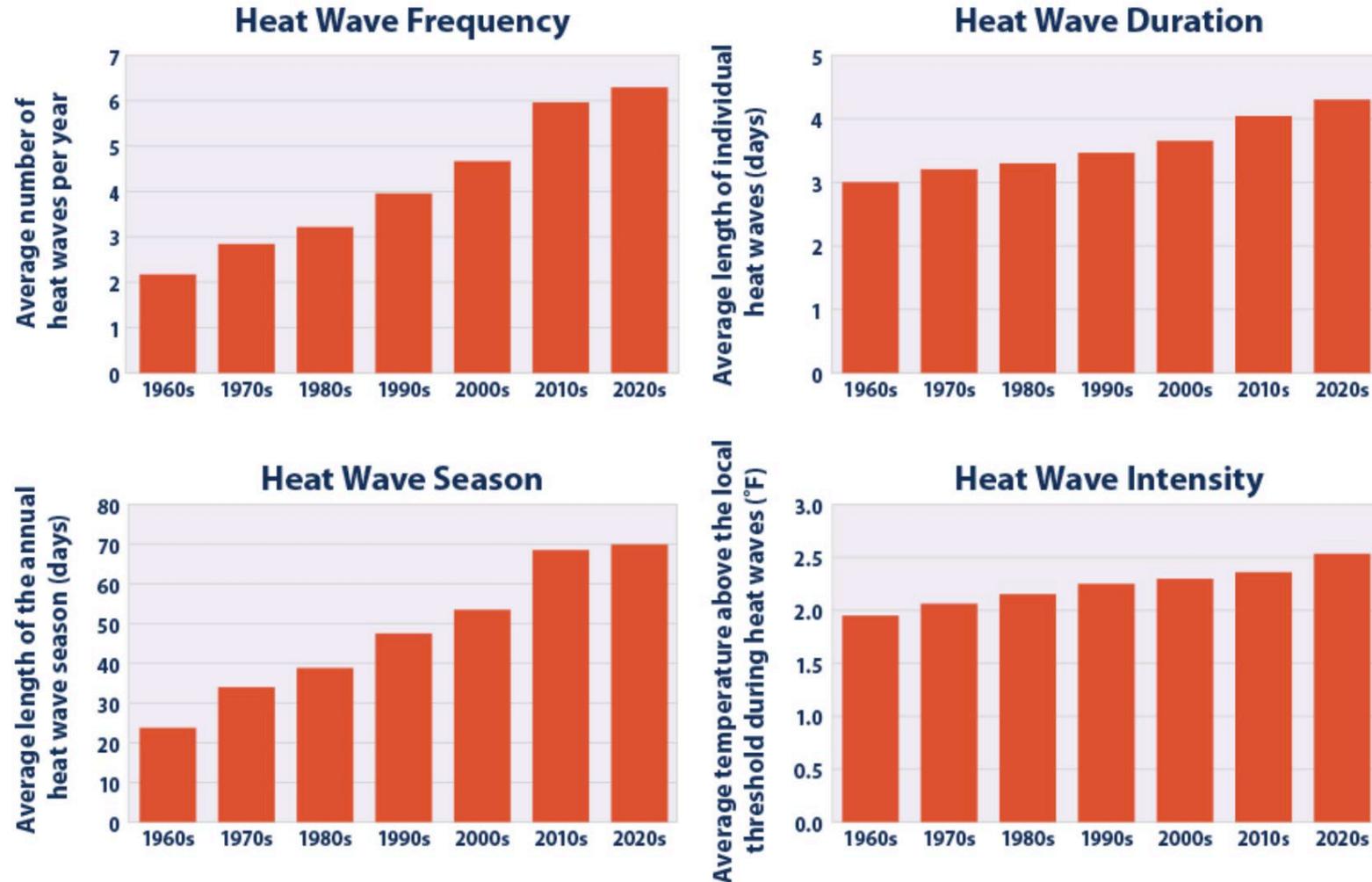
Haze From Canada Fires Spreads to New York Area



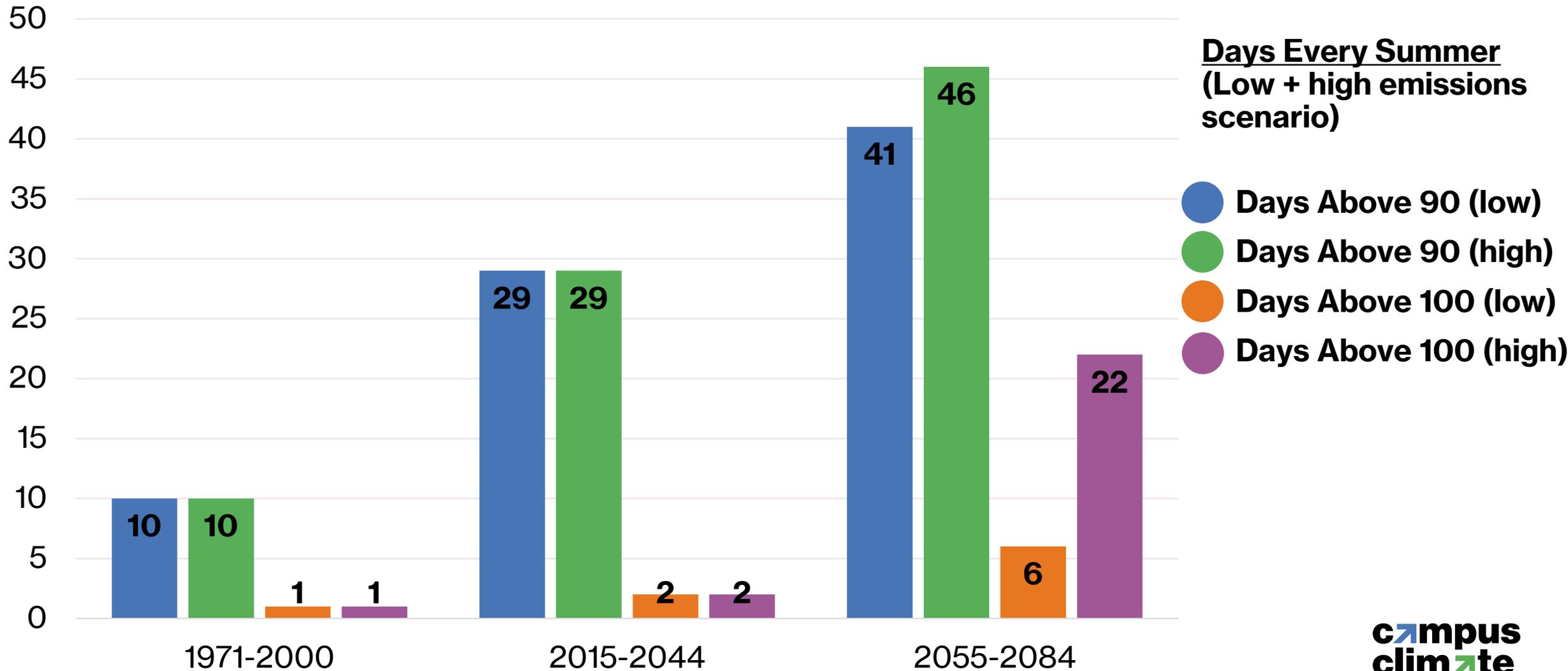
2015-2025: 11 Warmest Years on Record



Climate Change Increases Extreme Heat Risk



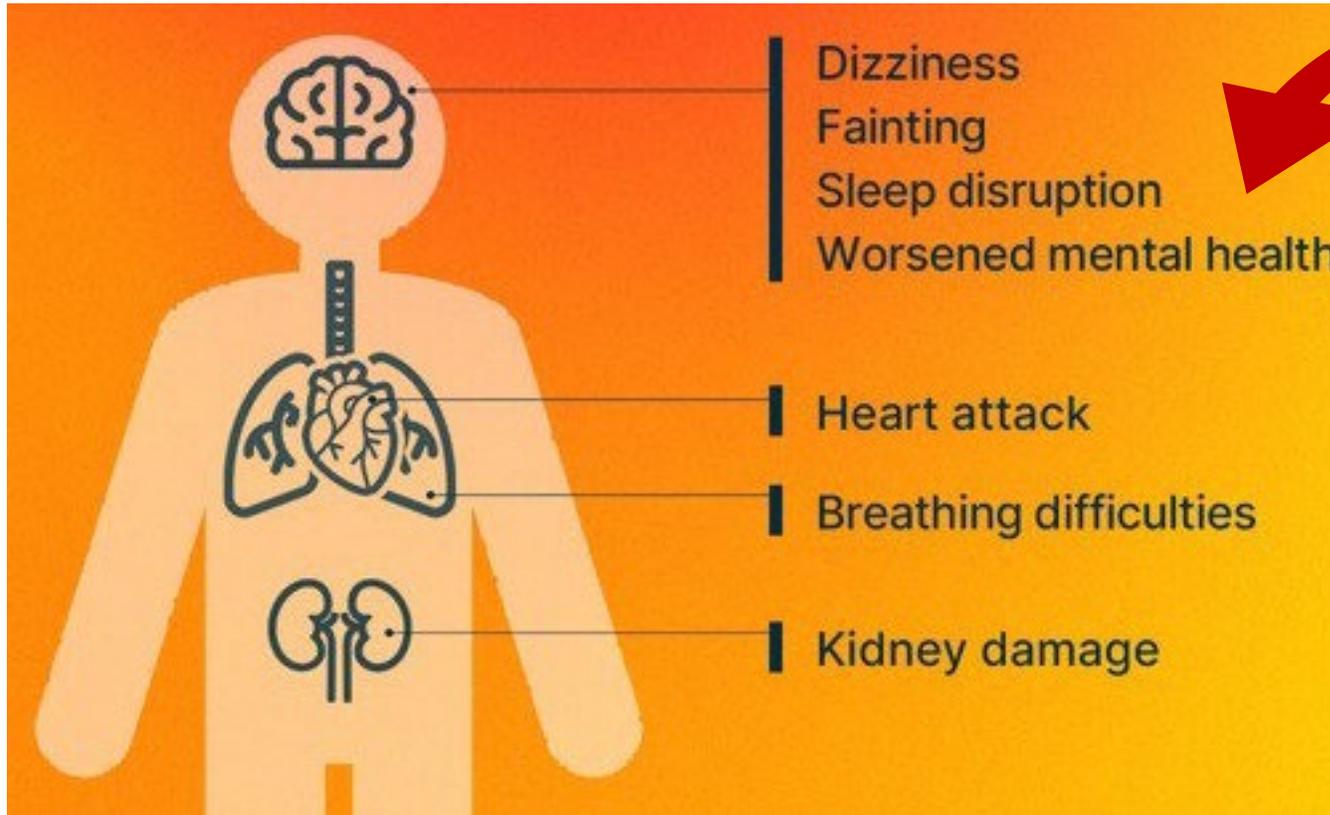
Cambridge Changing Climate Heat Risk



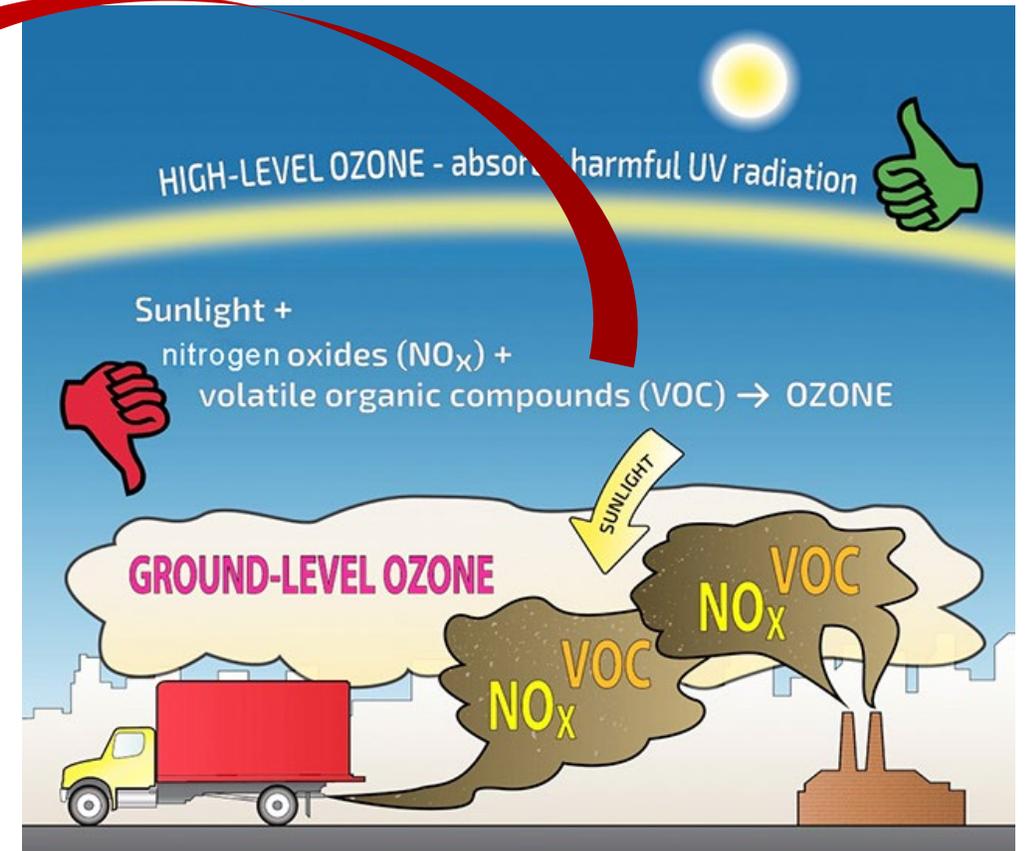
Source: City of Cambridge Climate Vulnerability Assessment



Problem: Elevated temps impact people + catalyze pollution



Health Impacts of Extreme Heat, Wellcome



Ground Level Ozone Explained, State of WA, Dept. of Ecology,

On a 90 deg F day why is A. warmer than C.?



A.

98 °F



B.

90 °F

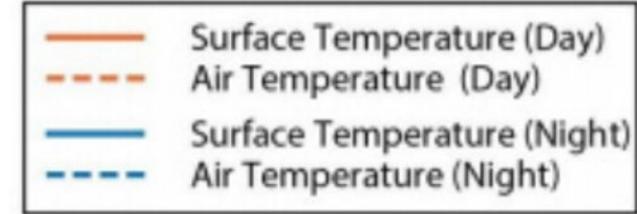
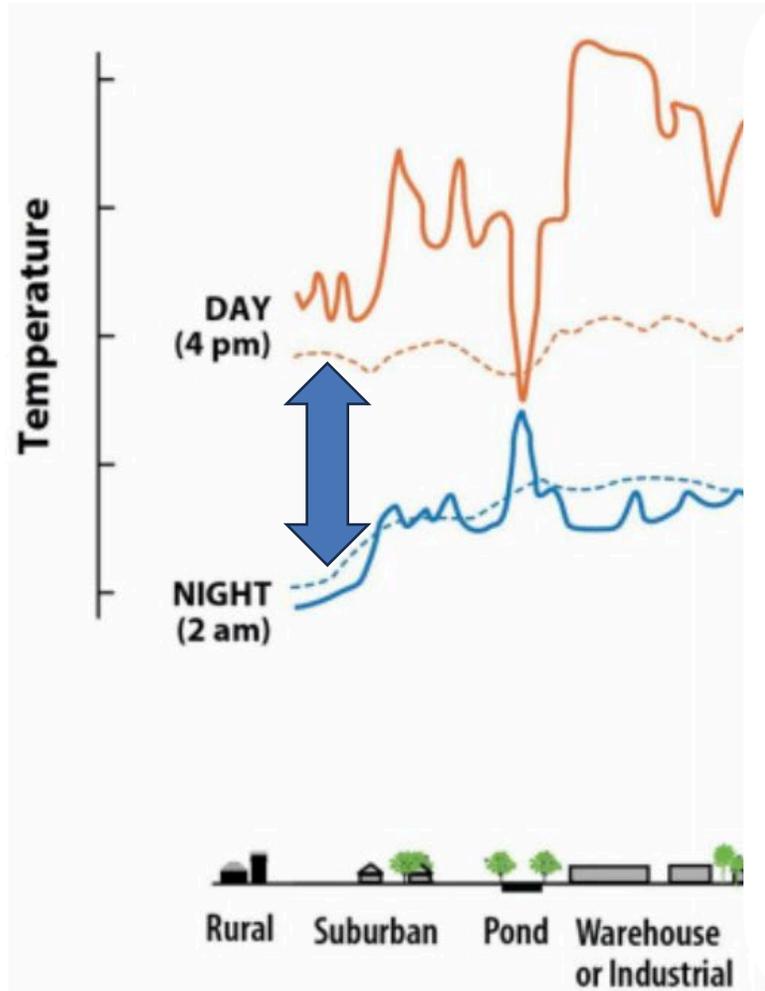


C.

88 °F

13

Urban heat island effect



We Act, *Urban Heat Island Report*, 2022

Sensing Outdoor Temperatures MIT Campus



2022



2023



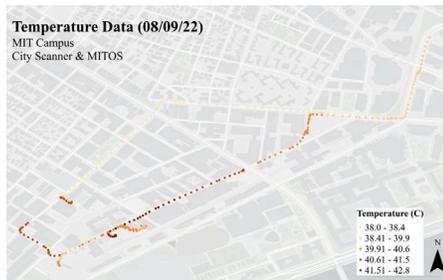
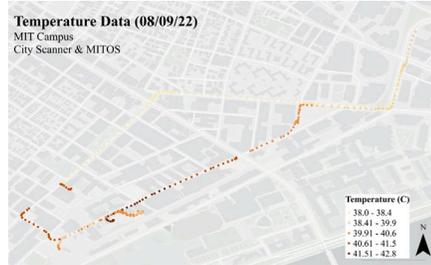
2024



Credit: Noah Phoenix, MIT Open Space Programming



Sensing Outdoor Temperatures MIT Campus



Credit: Noah Phoenix, MIT Open Space Programming

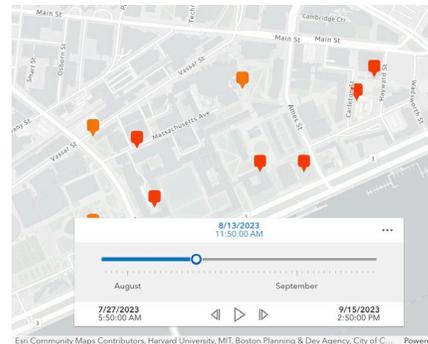
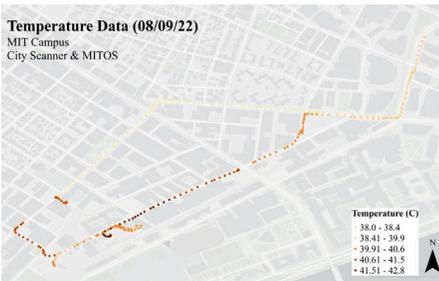
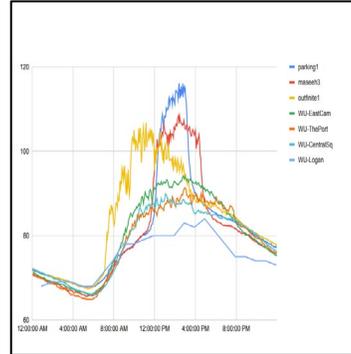
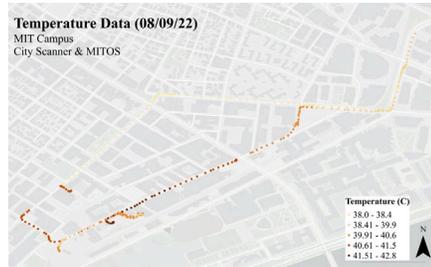
2022

2023

2024



Sensing Outdoor Temperatures MIT Campus



Credit: Noah Phoenix, MIT Open Space Programming

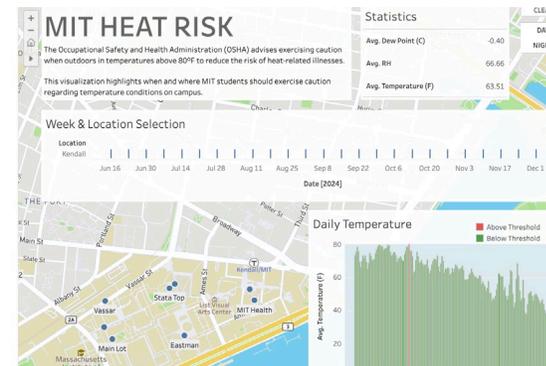
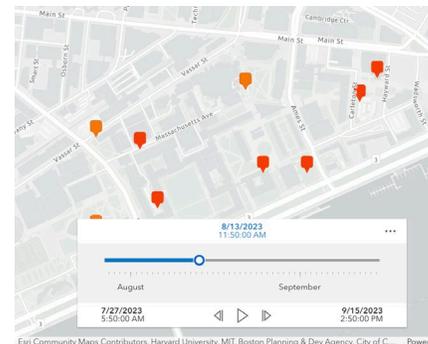
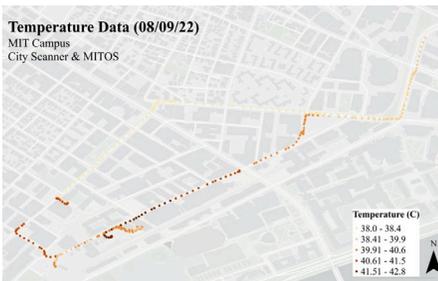
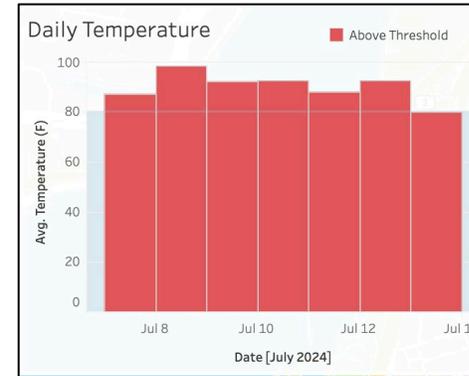
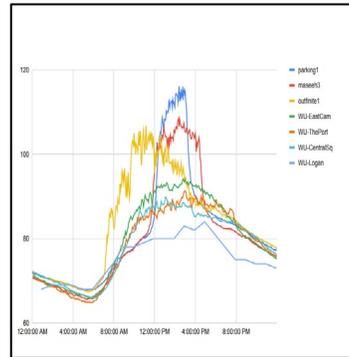
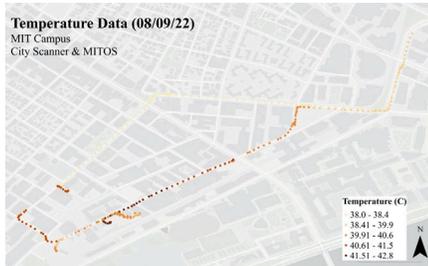
2022

2023

2024



Sensing Outdoor Temperatures MIT Campus



Credit: Noah Phoenix, MIT Open Space Programming

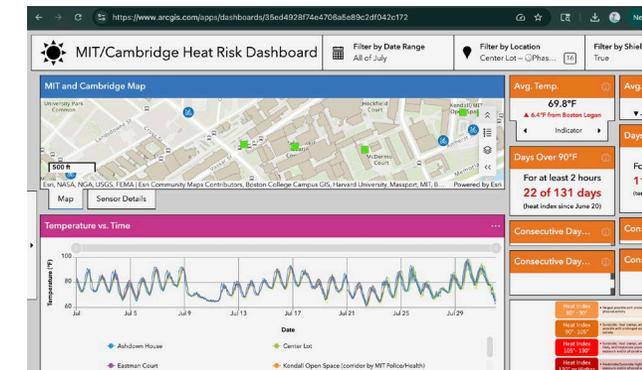
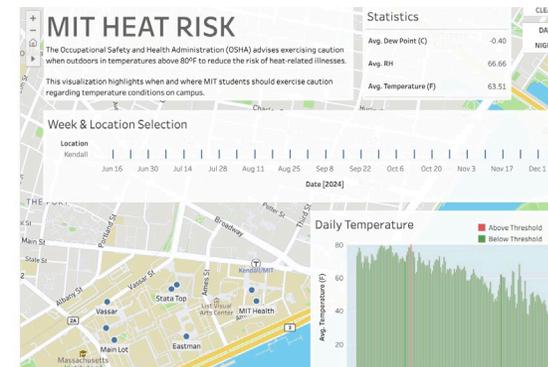
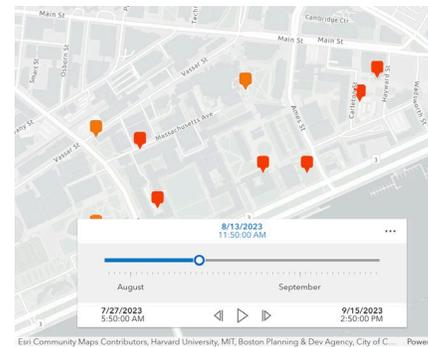
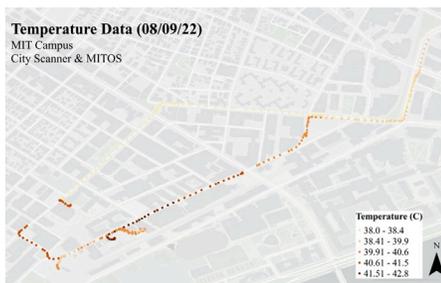
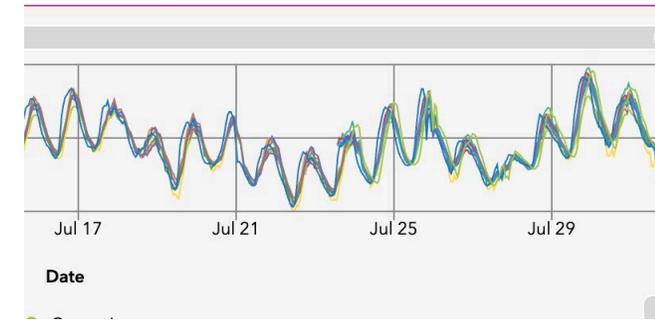
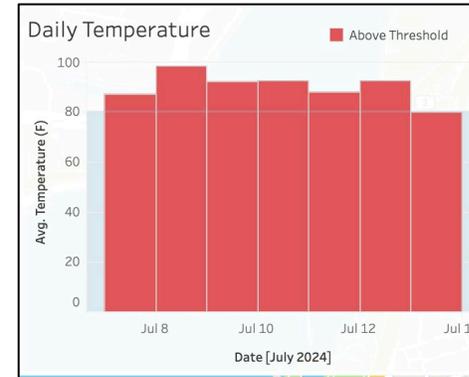
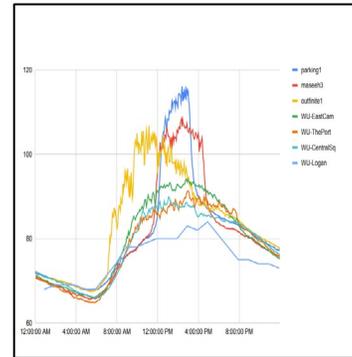
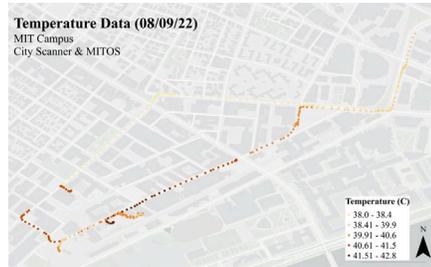
2022

2023

2024



Sensing Outdoor Temperatures MIT Campus



2022

2023

2024

2025



Summer 2025: Heat Risk Dashboard



MIT/Cambridge Heat Risk Dashboard



Filter by Date Range
All of July



Filter by Location
Center Lot - Phas... 16

Filter by Shield
True



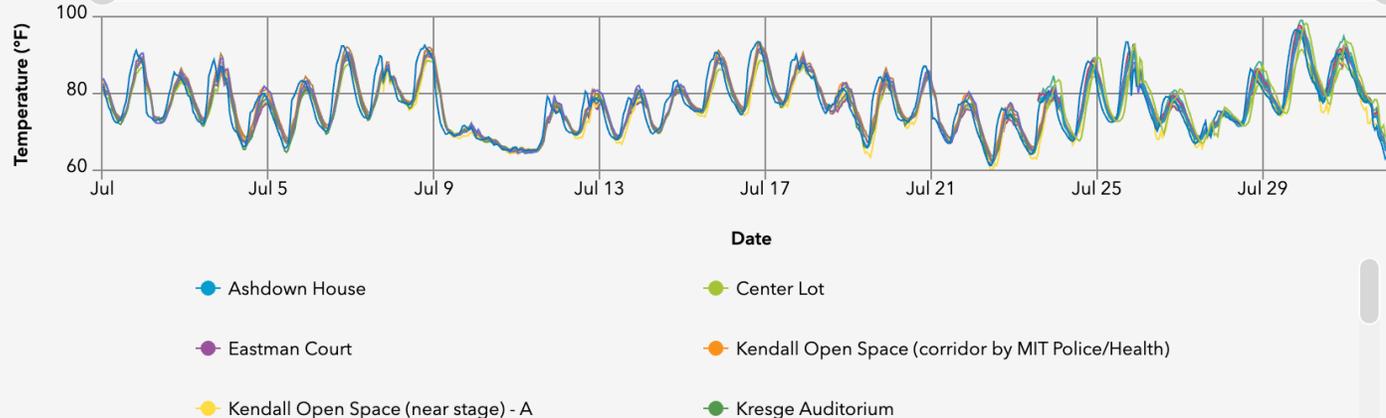
MIT and Cambridge Map



Map

Sensor Details

Temperature vs. Time



Temperature

Relative Humidity

Heat Index

Avg. Temp.

69.8°F

▲ 6.4°F from Boston Logan

Indicator

Avg. Rel. Hum.

65.4%

▼ -3.2% from Boston Logan

Days Over 90°F

For at least 2 hours
22 of 131 days
(heat index since June 20)

Days Over 90°F

For at least 2 hours
11 of 131 days
(temperature since June 20)

Consecutive Day...

Consecutive Da...

Consecutive Day...

Consecutive Da...

Heat Index
80° - 90°

• Fatigue possible with prolonged exposure and/or physical activity

Heat Index
90° - 105°

• Sunstroke, Heat cramps, and Heat exhaustion possible with prolonged exposure and/or physical activity

Heat Index
105° - 130°

• Sunstroke, Heat cramps, and Heat exhaustion likely, and Heatstroke possible with prolonged exposure and/or physical activity

Heat Index
130° or Higher

• Heatstroke/Sunstroke highly likely with continued exposure and/or physical activity

Source: NOAA, image hosted by RHSB.org.

Heat Index Classifications



What makes for a valuable sensor design...



- Consistent logging and reporting of temp and humidity
- Long battery life
- Ease of accessing data – via blue tooth or even wifi
- Simple dashboard with real time reporting
- Attractive for anyone to view data when walking by
- Not impacted by solar gain
- Easy to deploy
- Rugged for New England conditions in a public space

Questions we're asking about outdoor heat



1. What is the **distribution of outdoor heat** across campus?
2. On hot days, what areas of campus are **hottest**?
3. **How much hotter** are some areas than others?
4. What is **role of shade** in/around athletic fields?
5. What are the **coolest outdoor spaces** on hot days?
6. For **most popular walking routes** on hot days:
 1. Which are the coolest routes?
 2. Hottest routes to avoid?
7. Have you experienced hotter summers? **What metrics matter** to you, to fellow students?

6.900 heat sensor design criteria



- 1. Accurately measure exterior air temperature and humidity as a person walks around, with dynamics appropriate for the use case.*****
2. Measure sun exposure as a person walks around, with dynamics appropriate for the use case.*
- 3. Design sensor to be very small, portable, and able to easily affix to a backpack or similar object so one can walk without trouble.*****
4. Sense should report faults, such as battery failure, mechanical destruction, etc.**
- 5. Sensor should be as inexpensive as possible, with a COGS of no more than 20USD.*****
- 6. Electronics should be able to be fabricated and assembled by JLCPCB.*****
- 7. Environmental data from each sensor node should connect to location at which data is obtained as the person walks around.*****
- 8. Sensor should maintain privacy. *****
- 9. Sensor should operate with a battery lifetime of 3 mo or at least 24+ between recharging.*****
- 10. It should be rugged and able to withstand a summertime Boston-area environment (heat, rain) and typical jostling during transit. *****
11. Transit environmental data should be able to be connected to spot measurements of the person's body temperature. **
- 12. Multiple systems should be able to be used simultaneously. *****
- 13. System should present the information on a dashboard in real-time or near real-time. Allow downloading of raw data.*****

* → ***: level of importance