Mapping Extreme Heat on MIT Campus

MIT Office of Sustainability
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MITOS


Solving global sustainability issues at a local level

By utilizing the campus as a testbed and incubator, we aim to transform MIT into a powerful model that generates new and proven ways of responding to the challenges of our changing planet.
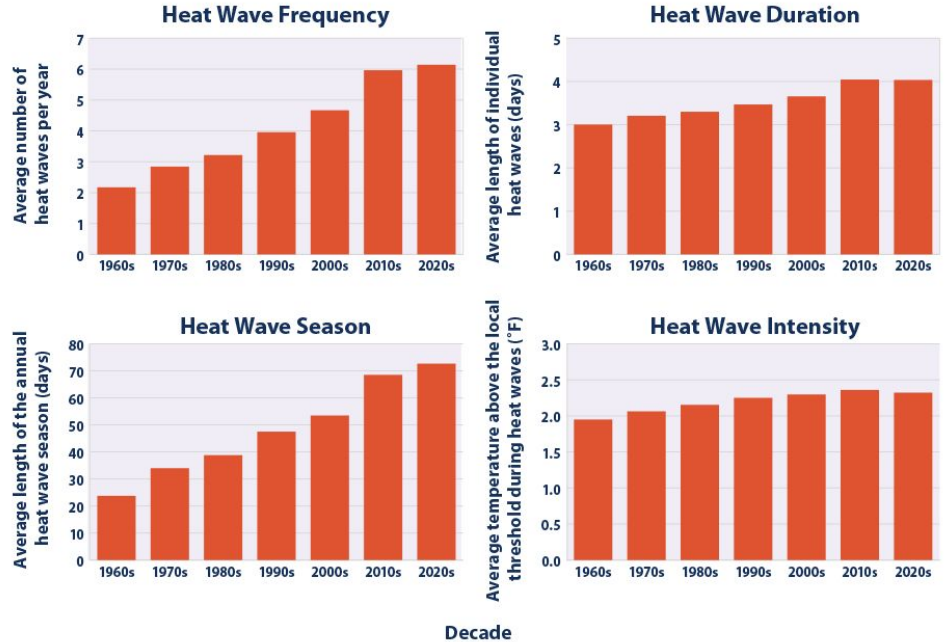
Extreme Heat

- Climate change, driven by global greenhouse gas emissions, is causing worldwide temperature increases.

June, July, and August Global Temperature Anomaly (°C compared to 1951-1980 average)

≤-4   -2   0   2   ≥4
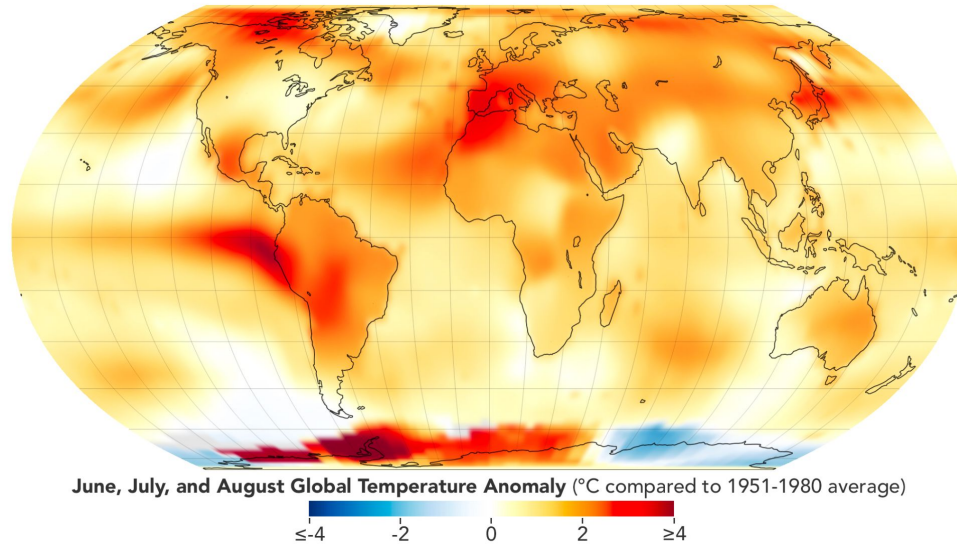
Extreme Heat

- Climate change is leading to more frequent and intense heatwaves, making extreme urban heat events more common and severe. Urban populations are thus facing higher risks of heat-related health issues.
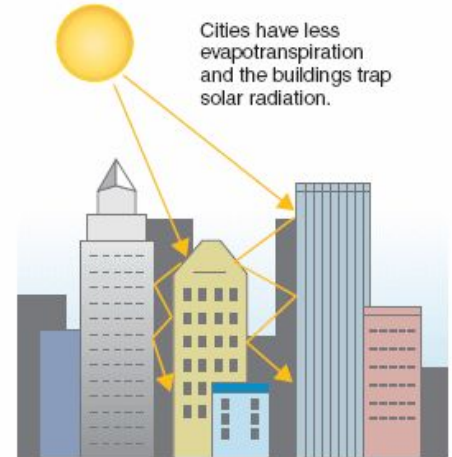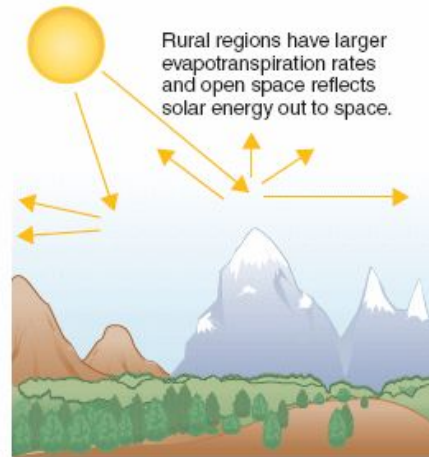
Extreme Heat

- Extreme urban heat is a condition where cities experience significantly higher temperatures than their rural surroundings, mainly due to human activities and the concentration of infrastructure. This is often referred to as the "Urban Heat Island" (UHI) effect.
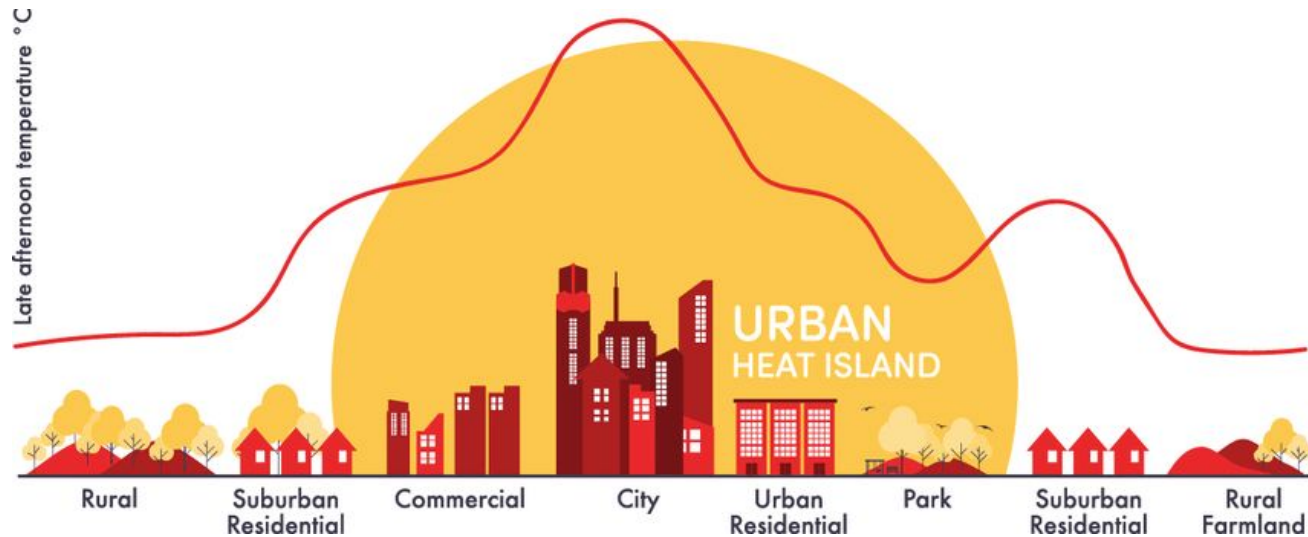
Extreme Heat

- **Causes:**
  - **Surface Albedo Reduction:** Dark surfaces like asphalt absorb more sunlight.
  - **Lack of Vegetation:** Reduced green spaces mean less cooling from shade and evapotranspiration.
  - **Energy Consumption:** High energy use in buildings and transportation generates heat.
  - **Dense Infrastructure:** Tall buildings and narrow streets trap heat.

Rural regions have larger evapotranspiration rates and open space reflects solar energy out to space.

Cities have less evapotranspiration and the buildings trap solar radiation.

Extreme Heat

- **Impacts:**
  - Increased energy demand for cooling.
  - Elevated risk of heat-related illnesses and mortality.
  - Compounded air pollution and greenhouse gas emissions.
  - Reduced water quality due to increased temperature.

Indirect Impacts

Impact on health services
- Increased ambulance call-outs and slower response times Heat cramps
- Response times
- Increased number of hospital admissions
- Storage of medicines

Increased risk of accidents
- Drowning
- Work-related accidents
- Injuries and poisonings

Increased transmission of
- Food and waterborne diseases
- Marine algal blooms

Potential disruption of infrastructure:
- Power
- Water
- Transport
- Productivity

Health Impacts of Exposure to Extreme heat

Direct Impacts

Heat illness
- Dehydration
- Heat cramps
- Heat stroke

Accelerated death from:
- Respiratory disease
- Cardiovascular disease
- Other chronic disease (mental health, renal disease)

Hospitalization
- Respiratory disease
- Diabetes mellitus
- Renal disease
- Stroke
- Mental health conditions

There is ==a lot== we can do to combat these issues!

Extreme Heat - New England

==New England appears to be warming faster than the world as a whole==. It is clear from the research that New England has warmed past the 1.5 °C level, which the IPCC has set as a do-not-pass threshold for the world [5], and New England is close to passing the 2 °C level.

Extreme Heat - MIT Campus

Distribution of Sensors

Eastman McDermott Court
The Hive
Outfinite Corridor
Central Parking Lot
Kendall Open Space
Stata Center Amphitheater
Kresge Lawn Area
MIT Medical Parking Lot
Vassar Street Locations

Link to interactive map

Requirements

- Air Temperature
- Relative Humidity
- Surface Temperature
- Self-charging
- Remote data updates
- Robust enough to withstand outdoors
- Robust enough to withstand MIT community
- Air pressure (nice-to-have)
- Lux (nice-to-have)
- Looks cool! (great-to-have)

Questions

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