

**Climate Resilience Zoning Task Force
City of Cambridge, Massachusetts**

**Summary of Meeting #6
Wednesday, June 26, 2019**

Task Force members present

1. Jason Alves, East Cambridge Business Association
2. Louis Bacci Jr, Laborers Local 151/East Cambridge/Planning Board
3. Doug Brown, West Cambridge
4. Tom Chase, Energy & Resilience Consultant, New Ecology
5. Ted Cohen, North Cambridge/Planning Board
6. Conrad Crawford, East Cambridge/Cambridge Redevelopment Authority
7. Nancy Donohue, Cambridge Chamber of Commerce
8. Iram Farooq, Assistant City Manager for Community Development
9. Brian Goldberg, MIT Office of Sustainability
10. Tom Lucey, Harvard University
11. Lauren Miller, Climate Consultant, CDM Smith
12. Margaret Moran, Cambridge Housing Authority
13. Mike Nakagawa, North Cambridge
14. Jim Newman, Resilience Consultant, Linnaean Solutions
15. Craig Nicholson, Just-a-Start
16. Mike Owu, MITIMCo
17. Kathy Watkins, City Engineer/Assistant Commissioner of Public Works

Project staff and facilitation team members present

1. Jeff Roberts, Director of Zoning and Development, City of Cambridge
2. Shabnam Bista, Zoning and Development Intern, City of Cambridge
3. Pat Field, CBI facilitator
4. Elizabeth Cooper, CBI facilitator
5. Nathalie Beauvais, Kleinfelder
6. Indrani Ghosh, Kleinfelder

Next steps:

- The next meeting will take place July 31 at the Citywide Senior Center. The subsequent meeting will be a joint meeting with the Health and Environment Committee of the City Council at 5:30 PM on September 11 in the Sullivan Chamber of City Hall.
- The City will prepare a future discussion on strategies used by other cities, including Green Factor and other performance-based standards.
- The City will look for more information on how solar panels impact the cooling benefits of white roofs.
- The City will schedule future meetings.

Meeting materials:

For more details of the analysis summarized below, see the meeting materials available at <https://www.cambridgema.gov/CDD/Projects/Zoning/climateresiliencezoning>.

Principles and factors to guide zoning strategies

The Task Force reviewed a list of principles and considerations developed based on group discussion of flooding impacts and strategies and made suggested additions. The document will continue to be updated as needed as task force discussions progress and will be available as a reference as the group deliberates zoning strategies. It is available along with other meeting documents at the link above.

Climate Change and Urban Heat in Cambridge

Heat projections for Cambridge

The City has developed downscaled climate change projections to predict impacts in Cambridge for temperature and rainfall. Models predict that by 2030, the current average of 11 days per year of over 90-degree temperatures could triple. By 2070, models show frequency of over-90-degree days could increase six times. The urban heat island effect, which is due to large amounts of impervious and darker surface such as pavement and roofs, magnifies ambient temperatures. Additionally, humidity increases “feels-like” temperatures and exacerbates heat impacts on human health. Efforts to plan for greater resilience to high temperatures must account for vulnerabilities, including considering particularly vulnerable populations, infrastructure, and services that could be impacted.

Significant factors contributing to urban heat island effect include:

1. Low proportion of tree canopy
2. High proportion of impervious surface
3. Large area of roofs
4. Dark roofing surfaces

Preparing for and adapting to increasing heat

Key City resilience strategies are

1. **A Prepared Community:** Strategies to strengthen community, social, and economic resilience.
2. **Adapted Buildings:** Strategies to protect buildings against projected climate change impacts.
3. **Resilient Infrastructure:** Strategies to ensure continued service or a speedy recovery from community-wide infrastructure systems.
4. **Resilient ecosystems:** An enhanced living environment integrating air quality, waterways, green infrastructure, and the urban forest as a system resilient to climate impacts.

The City emphasized that adaptation is always about increasing resilience and safety for people.

Adapted buildings:

- *Increasing heat will change energy use for buildings:* whereas historically more days have required building heating, the balance will shift to require more cooling days. Thus, building design to promote cooling will become more important.
- *Design for passive resilience and high-performing buildings* will help to keep buildings cool in the summer and warm in the winter, particularly during energy outages.
- *White roofs* are effective to help mitigate urban heat island effects. They are more effective at reducing urban heat island than many forms of green infrastructure, but do not provide cobenefits of water quality improvement and flood reduction from smaller storms.

Green infrastructure:

Green infrastructure best management practices (BMPs) can reduce heat island effects, and also provide cobenefits of better water quality and improved stormwater management to strengthen flood resilience. Strategies include green roofs, rain gardens/natural infiltration systems, reducing impervious area through landscaping, and increasing tree canopy coverage.

Standards to improve heat resilience

Heat resilience can be addressed through a number of standards.

Examples of performance standards:

- Green Factor: Seattle
- Green Area Ratio: Washington DC
- LEED Resilience Pilot Credit for Passive Thermal Resilience
- Solar Reflectance Index

Examples of prescriptive standards:

- Minimum landscape requirements
- Maximum impervious cover
- Passive house building envelope
- Community space sheltering requirement
- Back-up power/energy storage
- Cool roof requirements

Urban Forest Master Plan update

The Reed Hildebrand team conducting the Urban Forest Master Plan (UFMP) for the City provided an update on the planning process and shared some preliminary findings.

Draft principles guiding the UFMP

The following principles are guiding the UFMP:

- Value the forest as a public resource
- Invest in canopy in the public realm

- Share responsibility for a healthy forest (much of the canopy loss is on private property, so public property strategies alone will not be sufficient to reverse the trend of declining canopy cover.)

Key findings on the state of the urban forest

Twenty-six percent of the City’s land area is covered by canopy, which has been declining at a rate of 16.4 acres per year since 2009. Most of the canopy loss has been in residential land use areas. Areas with lower canopy coverage tend to be home to more vulnerable populations, and also tend to be more susceptible to the urban heat island effect, due in part to higher impervious coverage. High priority areas for the plan will be those with higher density of vulnerable populations, urban heat island spots, areas with social infrastructure, and “cool corridors” to aid people taking trips using public or active transit. Improvements in areas that are included in other planning efforts such as Envision Cambridge’s Alewife plan are considered less of a priority since it is assumed that they will be addressed outside the UFMP.

Tree canopy begins to provide the most significant cooling effects at and above 45% coverage. Citywide and urban heat island-focused canopy improvement strategies are being considered for the plan.

Street trees offer a significant opportunity to increase the urban forest canopy; however, about one quarter of street trees are in poor condition. Street trees in front yard setbacks tend to be in better condition.

Relationship between zoning and goals of the UFMP

Currently, tree protections and new planting mandates are scattered throughout the zoning ordinance.

Land use strategies to enhance tree canopy may include:

- Encourage shade over paved areas, public spaces, backyards, front yards
- Encourage contiguous shaded spaces
- Incorporate trees as part of comprehensive resilience strategies
- Encourage shade in neighborhoods with canopy deficits

Options for zoning recommendations include the possibility of requiring canopy cover in zoning districts, (including, e.g. overlay districts for a canopy corridor or for priority heat island areas). Given the importance of street trees to an urban forest strategy, setback requirements play a significant role to give trees adequate space and keep them in good condition.

Questions and comments from Task Force members *(direct responses from project staff and consultants are in italics.)*

Promoting tree health and improved canopy coverage

- How do utility tree trimming and above-grade utility lines impact tree canopy health?

- *Above-grade utilities require smaller trees, which impacts canopy cover. Utilities avoid cutting out the middle of the tree, which is helpful.*
- Does the UFMP intersect with traffic calming goals?
 - *Yes, creating bump-outs for trees supports canopy cover and traffic calming goals.*
- Are trees being lost to climate impacts already? Are different trees being recommended due to climate change?
 - *We have created a database to give trees rankings for climate vulnerability and will have a new recommended street tree list coming out. Generally, the trees that are suffering the most are drought intolerant.*
- What is the role of soil health in the UFMP?
 - *The plan will discuss complementary strategies that support tree health, including possibilities for more intense soil management to mitigate compaction, soil health, and salt issues.*
- Trees on roofs could give cooling benefits.
- If poor maintenance and lack of water are drivers of tree loss, to what extent might improved maintenance help improve the health of trees over time? How might the Task Force weigh maintenance as an option for helping improve tree canopy health as compared to other performance standards?
 - *Maintenance is a strong contributing factor, including providing healthy conditions for the tree at the time of planting.*
- Gas leaks have an impact on tree health. Are you tracking this?
 - *Yes, the plan includes examining the impacts of gas leaks.*
- Have you examined the effects of trees on thermal mass heating?
 - *The U.S. Forest Service has looked at this extensively and has documented the cooling effects of trees on buildings. Modeling has to be done building by building.*
- The Forest Service study shows that pavement lasts longer if shaded.
- A minimum requirement for canopy needs to be developed, as tree canopy should be considered a necessary public benefit. The Task Force should consider what would be required to reach 45% canopy cover. Will the UFMP include recommendations to allow 45% coverage?
 - *Yes. Open space currently has about 45% coverage.*
- What target should be sought for canopy coverage?
 - *The benefits of canopy coverage are not linear. There is a big jump in protectiveness for heat around 40% coverage, but the increase in benefits increasing from 20 to 30% are greater than going from 10 to 20%, for example. Contiguous canopy is also important.*
- What zoning tools can help with canopy coverage? How can goals like canopy corridors be achieved through zoning? Could design guidelines include setbacks for trees in areas without wide enough sidewalks for trees?
 - *Zoning can require setbacks, open space, and other outcomes. It is important to consider the tradeoffs and establish priorities before selecting zoning tools.*

Weighing land use and zoning strategies and outputs to mitigate heat impacts

- The “feels like” temperature on a 90-degree day with humidity looks to pose challenges across the City, not only in hot spots. This may be important to consider when weighing strategies specific to priority areas versus ideas that carry benefits citywide.
- Where vegetation is not possible, passive design guidelines including guidance for overhangs, canopies, and other ways to provide shade could be useful.
- The Task Force should be mindful of who can benefit from the ideas being considered, such as who can access parks or forms of social infrastructure.
- Large-scale development creates large increases in thermal mass. Larger structures can also permanently displace trees. Periodic, deeper setbacks with space for mature trees are needed. What other strategies can reduce the thermal mass of big buildings?
- Incentives or performance-based requirements using a points-based menu can be helpful, since measures to address heat need to be adapted to a range of situations and development types. “Green factor” requirements combine canopy, open space, and other green infrastructure and should be discussed by the group.
- How will zoning recommendations be weighed against and reconciled with other City priorities such as bike lanes, utility work, or other issues to avoid creating regulations or guidance in conflict with each other?
 - *The staff is working to bring related work currently underway to the Task Force.*
- Considering the impact of impervious surfaces on flooding and heat, are changes to parking requirements being considered?
 - *Parking is one issue addressed as part of the Envision Cambridge plan. It does relate to depaving as a tool for flood and heat resilience.*
- Development will continue in the City. Many of these concepts interact and conflict with other city goals. For example, tree corridor requirements conflict with the affordable housing overlay being discussed. The focus should be on achievable zoning changes.
- More actual recorded temperatures to support the modeling of heat impacts would be helpful.
 - *Some citizen science is advancing to collect more of this data.*

No public comments were offered. The meeting was adjourned at 8 PM.