Executive Summary

Assessing Heat Risks to Prepare Chelsea, Massachusetts for a Changing Climate

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The Problem

The residents of Chelsea, MA are vulnerable to the effects of increasing temperatures. Furthermore, the City has yet to identify the extent of the risks on the vulnerable residents, because it is still a new area of research for the Metropolitan Area of Massachusetts.

Goal

The goal of this project was to identify the populations and geographic areas that would be particularly impacted by increasing temperatures and recommend the best practices that the city can further pursue to mitigate negative heat impacts on the vulnerable populations.

Methods

To achieve our goal we completed four objectives:

1. Qualitatively define heat vulnerability.

We researched heat vulnerability factors from both journals and previous projects in order to assess how characteristics contribute to one's vulnerability. The three dimensions of heat vulnerability are one's levels of: adaptive capacity, sensitivity, and exposure.

2. Identify the demographics in Chelsea who are vulnerable to extreme heat and their geographic distributions.

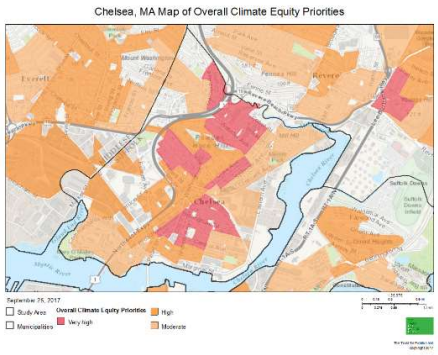

Figure 1

We relied on our sponsors as well as interviews with local stakeholders, such as Luis Prado of the Health Department and the Chelsea Restoration Corporation, who would be able to give us insight into which demographics are present in the city. We also sought any existing mappings like Figure 1 and discovered the Trust for the Public Land's Climate Smart Cities™ GIS tool. They gave us permission to use their tool for mappings of numerous vulnerable demographics in Chelsea.

3. Analyze strategies implemented in the US to lessen people's risks of and vulnerability to extreme heat.

We were able to identify strategies that affect vulnerable demographics represented in Chelsea. We then researched strategies that other cities in the area, like Boston and Cambridge, have used as well as interviewed stakeholders in those communities.

4. Identify the best management practices for Chelsea, MA to further consider.

We organized a matrix that contains all the strategies and practices resulting from our research and used it to identify and compare the potential solutions we intended to propose to the DPD. We then consulted Chelsea city officials about who is vulnerable, the geographic distribution of vulnerable demographics around Chelsea, city policies, recommendations they might have for us, etc. From this, we synthesized our matrix down to the six types of countermeasures that we felt would work best in Chelsea. We also sorted these methods based on level of importance and difficulty of implementation.

Recommendations

Our recommendations focus on six types of extreme heat countermeasures: Cooling Shelters, a Plan and Plant Methodology, Air Conditioning, Cool roofs, Public Risk Education, and a Community Action Plan. We have them organized individually by strategy and the recommendations for implementation.

Implementing and improving **cooling locations** around Chelsea.

A broader set of recommendations for Chelsea include:

- Establish new cooling shelters
- Partner with local transportation companies to provide free transportation to and from the cooling shelters
- Create a system to notify the citizens of extreme heat events (see Chapter 4.5)
- Produce programs to incentivize attendance at the cooling shelter
- Hire medical staff at each cooling shelter to assist those who need it.

Additional Work to implement Cooling Shelters:

- Contact transportation companies to arrange free transportation to and from cooling shelters
- Provide medical staff at cooling shelter through partnership with the Chelsea Fire Department or other local EMS Services

Recommendations for improving Parks:

- Install more shade
    - Tree Canopy
    - Artificial Canopy

Recommendations/Additional Work for Impromptu Cooling Shelters

- Advocate that a larger, regional organization purchase the misting tent and allow municipalities in the Metro-Boston area use it on a first come, first serve basis
- Co-purchase the misting tent with other cities in the area

Establishing a **Plan and Plant Methodology** to remind developers to produce locations that incorporate materials that will not compound the effects of extreme heat events and utilize green space to absorb greenhouse gases.

Recommendations:

- Developers
  - Incentivize the use of green space in new developments
- City Projects
  - Utilize cool surfaces
  - Plant trees in city parks
  - Plant green spaces
  - Install water appliances for hydration and cooling needs

Make **Air Conditioning** more accessible to the community

Recommendations/ Additional Work:

- Implement strategies to work with the one window policy
  - In-wall air conditioners
  - Portable air conditioners
- Advocate the state to provide cooling to low income populations
- Create policies so developers must use energy efficient air conditioning

Implement **Cool Roofs** to reduce indoor temperatures

Recommendations: *White Roofs*

- Contact local painting companies and try to come up with an agreement for more affordable service.
- Create a plan to financially help the low-income population of Chelsea.
- Advertise and promote cool roofs in order to familiarize the residents of Chelsea with this new idea.

Recommendations/ Additional Work: *Green Roofs*

- Conduct further research on what type of green roofs are appropriate for Chelsea

Establish **Public Risk Education** to raise awareness to the risks of extreme heat

Recommendations:

- Create a website with heat-related information
  - Make the URL short and easy to remember
  - Make it shared on major community social media pages
- Work with community organizations to spread information

Establish a **Community Action Plan**, delegating responsibility to key stakeholders during extreme heat events

Recommendations:

- Produce a Community Action Plan
- Partner with local stakeholders to have them be a part of the plan
- Benchmark plan to Milwaukee but benchmark climate to Boston

Deliverables

We provided the City of Chelsea, Department of Planning and Development with two additional deliverables to supplement our recommendations. First, a cooling shelter checklist. This can be used to ensure that all buildings being utilized as public cooling shelters are running efficiently and are up to date. Second, a mnemonic device "Plan and Plan". That can be used as a reminder to the city and other developers of the impact of their designs on Chelsea's Urban Heat Island.

Conclusion

The main objectives of our project were to define heat vulnerability, to identify the demographics in Chelsea who are vulnerable to extreme heat and their geographic distributions, to analyze strategies implemented in other locations, and to identify the best management practices for Chelsea, MA to further consider. In order to achieve these, we researched vulnerability factors and listed them in matrices, collected data from GIS systems, analyzed mitigation strategies that have been successfully applied to other places, and conducted several interviews with local officials to familiarize ourselves with the vulnerability of the city.

Chelsea will have to confront multiple challenges in order to create a solid mitigation plan. A major issue we have observed is the lack of green space. However, due to the density of the city, expanding green space is likely to be very challenging. Additionally, we are aware that there are a lot of people in Chelsea living in overcrowded apartments that surpass the officially recorded number of residents. We believe that the city might face difficulties encouraging those people to seek help in case of a heat-related emergency.

Chelsea needs a plan for how to overcome these challenges. We suggest that the DPD look into each recommendation carefully and consider conducting further research to evaluate whether they are appropriate solutions for Chelsea. Our project is a first step into providing the city a sense of direction on how it may go about planning for increasing temperatures rather than a comprehensive, professional-level climate resilience plan. We concede that our efforts to gain more insight into Chelsea itself from local stakeholders fell short. It is for this reason that we suggest the city next look further into the feasibility and suitability of our recommendations by taking actions such as finding what would be required to make certain policy changes and consulting the groups we recommended to get their feedback. If the city wishes to pursue strategies that involve resident expenses, such as implementing cool roofs or promoting air conditioning units, the city should perform analysis of methods to make these utilities as accessible and inexpensive for residents as possible.

Chelsea has the opportunity to become a leader in implementing strategies to reduce heat vulnerability and risk among its. As urbanization continues to cause increasing density in cities around the country, plans such as Chelsea's will be key in providing a reference guide for how

others may mitigate heat vulnerability and ensure the safety of their residents while working with such conditions.