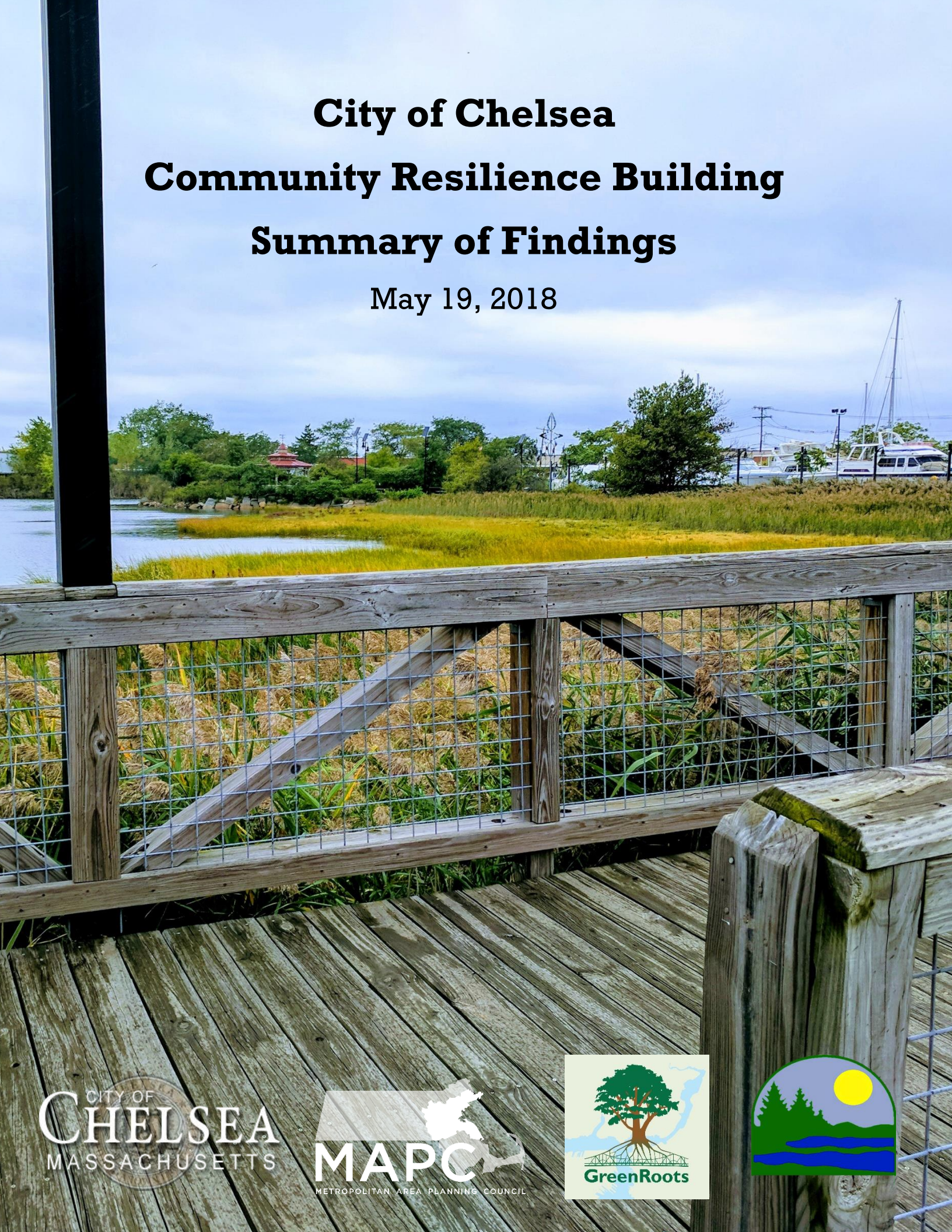
City of Chelsea
Community Resilience Building
Summary of Findings

May 19, 2018



CITY OF CHELSEA MASSACHUSETTS

MAPC METROPOLITAN AREA PLANNING COUNCIL

GreenRoots

ACKNOWLEDGEMENTS

The project was conducted by the Metropolitan Area Planning Council (MAPC) with funding from Executive Office of Energy and Environmental Affairs. Special thanks to GreenRoots, Inc., a community-based organization and partner who provided critical community engagement to gather participants for the workshop and provided their space for the workshop. Special thanks to Alexander Train, Assistant Planning Director, and Karl Allen, Economic Planning Director for their enthusiasm, participation, and engagement in this process. A very special thanks to the residents of Chelsea who participated in the workshop, whose care for their City and community inspires stronger resilience in the face of climate change.

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Workshop Facilitators	Anne Herbst, Carolina Prieto, Elise Harmon, Barry Keppard, Emily Torres-Cullinane, and Sam Cleaves

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CORE TEAM MEMBERS

JOHN DEPREIST, AICP	DIRECTOR OF PLANNING
ALEXANDER TRAIN	ASST. DIRECTOR OF PLANNING AND DEVELOPMENT
ROSEANN BONGIOVANNI	EXECUTIVE DIRECTOR, GREENROOTS, INC.
KARL ALLEN	PLANNER/ECONOMIC DEVELOPMENT SPECIALIST

Citation

Metropolitan Area Planning Council. 2018. City of Chelsea Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Chelsea, Massachusetts.

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Overview

In the last five years, Massachusetts has experienced increasingly more frequent and severe weather events. Record-breaking snowfall in 2015, a wide-spread and severe drought in 2016, the warmest year on record in 2017, and four Nor'easters in one month and flooding comparable to the Blizzard of 1978 in 2018 are just some examples. Climate Change is not imminent but affecting the people and cities and towns of the Commonwealth today, particularly those in coastal communities such as the City of Chelsea.

Known for its rich, cultural diversity, industrial working waterfront, thriving businesses and extensive City-park system, Chelsea is a vibrant community. Chelsea is also low-lying surrounded by four different rivers in its 1.8 square miles and densely developed creating significant and urgent vulnerability to its people, places, and economy. A sea level rise and coastal flooding study performed by Stantec, Woods Hole Group, and others indicated that by 2030, 35% of the City will be located in a flood zone and nearly half of the City will be in a flood zone by 2070.[1] This will affect the 35,000 residents and 16,000 jobs for documented residents, but there are likely many, many more. But these impacts will not only be significant locally, there is a regional risk to Chelsea's climate vulnerability, particularly around the Northeast food distribution center and natural gas and LNG farms on the waterfront. However, Chelsea has the foresight to plan and prepare for the changes associated with climate change to ensure its prosperous future. One example is its participation the Commonwealth's Municipal Vulnerability Preparedness program.

Community Resilience Building Workshop

The City of Chelsea received a grant from the Massachusetts Executive Office of Energy and Environmental Affairs to participate in the Commonwealth's Municipal Vulnerability Preparedness (MVP) program. The program provides supports for municipalities to plan and implement key climate resilience actions using a community-based, multi-disciplinary, participatory planning effort through the Community Resilience Building[2] (CRB) platform. Chelsea hired the Metropolitan Area Planning Council (MAPC) who subcontracted with the prominent community-based organization, GreenRoots, Inc. to administer community outreach and local expertise to the program. The process was guided by a core team that included City planning staff and GreenRoots, Inc.

The Core Team outlined the following objectives for its MVP and CRB participatory planning event:

1. Understand connections between ongoing issues, hazard, and local planning and actions in Chelsea.
2. Identify and map vulnerabilities and strengths of people and places, both buildings and natural environment/parks.
3. Develop and prioritize actions that reduce vulnerabilities and reinforce Chelsea's strengths.
4. Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience in Chelsea.

GreenRoots, Inc. led the community outreach to engage area residents and activate community members to participate in the workshop. Participants were incentivized with Market Basket gift cards for participation. This is an important strategy to encourage participation, particularly with residents who are not accustomed to having a voice in government planning efforts. The entire

[1] CZM, Stantec, Woods Hole Group, Worcester Polytechnic Institute, and Sea Grant. 2017. *Designing Coastal Community Infrastructure for Climate Change*.

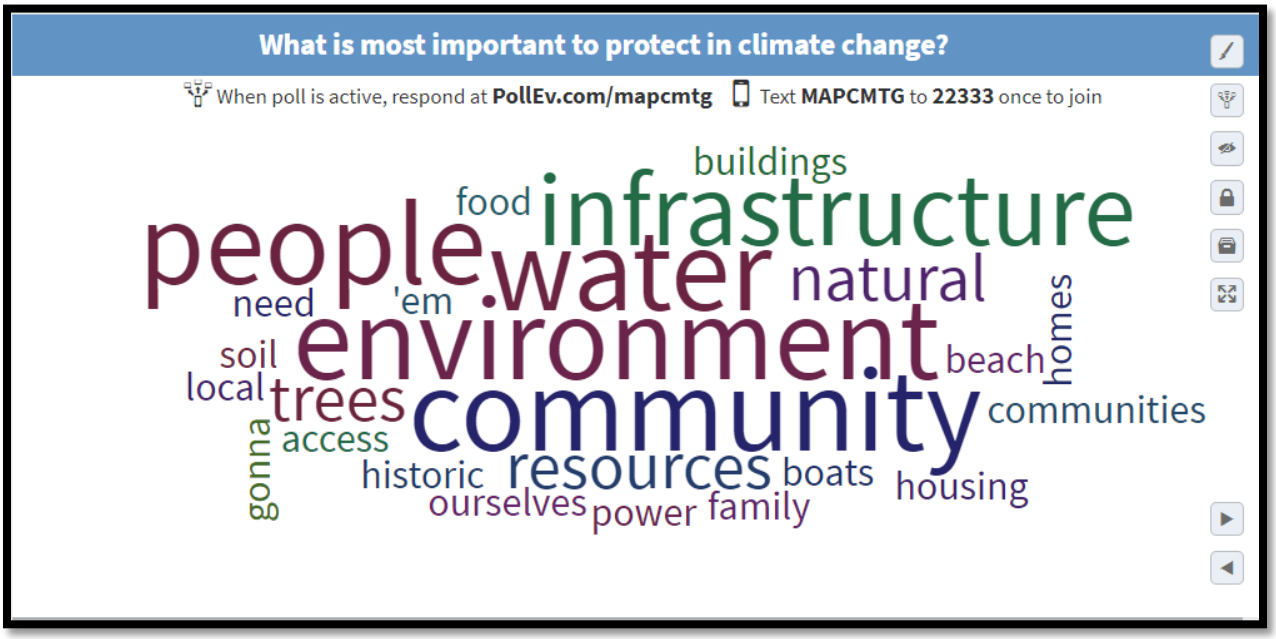
2 www.CommunityResilienceBuidling.com

workshop was interpreted in Spanish with listening devices and with MAPC Spanish-speaking facilitators.

MAPC led and facilitated the workshop with five CRB-trained individuals and two additional MAPC staff. Participants were grouped into small tables under the guidance and direction of GreenRoots, Inc. We grouped Chelsea youth together and Spanish-speaking individuals together per their preference. The remaining participants were assigned groups randomly as they arrived.

MAPC led a cell-phone poll with participants to understand participants concerns and opportunities with climate change (Figure 1) whose results are provided in Appendix B. Participants were then introduced to Chelsea's climate risks regarding sea level rise, inland flooding/stormwater management, urban heat island, social vulnerability, and options for resilience. Participants in their assigned small groups rotated to learning stations for a guided introduction and discussion on each of the aforementioned topics. Appendix C contains the learning boards for each of the topics.

Figure 1 *Word cloud response from cell phone polling at the Chelsea CRB workshop.*



The following sources were used to inform the climate change learning boards: (i) the Northeast Climate Science Center, (ii) Woods Hole Group, (iii), The Trust for Public Land's Metro Mayors Climate Smart Cities[3], (iv) MAPC urban heat island analysis,[4] (v) National Oceanic and Atmospheric Administration, (vi) Cambridge Climate Change Vulnerability Assessment, (iv) the Boston Research Advisory Group, (vii) Massachusetts Office of Coastal Zone Management, and (viii) Blue Hill Observatory and Science Center.

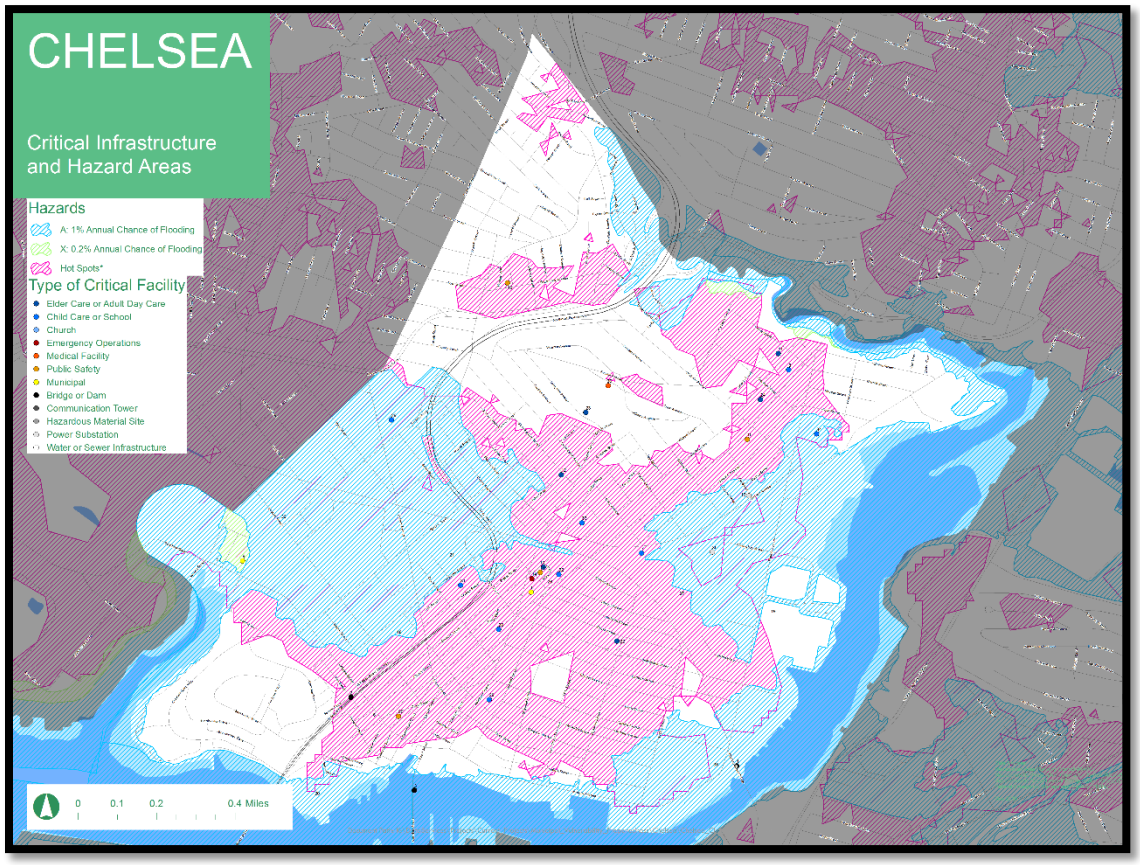
Participants brought wealth of knowledge and expertise from their respective yet diverse local experiences and fields and engaged in a collaborative effort that gathered to protect what was

[3] https://web.tplgis.org/metromayors_csc/

[4] MAPC uses land surface temperature data during the hottest periods of the summer months in 2016 to ascertain how likely an area may experience the urban heat island effect. We represented the area in Chelsea that outlines the top fifth percentile of land surface temperature of the 101 communities in Metro Boston.

most important to them-their community, environment, and infrastructure. Driven by those who live and work in Chelsea, the opportunity to advance resiliency is greatly enhanced through the CRB workshop platform, a collaborative and consensus-building exercise for Chelsea's future.

Figure 2 Chelsea Small Group table map.



Each small group had a table map (Figure 2 and Appendix A) that identified Chelsea's Critical Infrastructure, 1% Annual Chance Flood, locally identified hazards and areas of extreme heat.[5] After identifying the City's vulnerabilities and identifying and prioritizing actions in their small groups, the participants reconvened to collate their top small group priorities and vote on their overall top priority actions as a large group. The completed risk matrices are located in Appendix A. This report serves to provide a summary of findings from Chelsea's one-day CRB workshop on May 19, 2018. Once completed, the prioritized action plans serve as a basis for future resiliency and potentially state funding for implementation.

Summary of Findings

Top Hazards and Vulnerable Areas

The Core Team identified top hazards for the City of Chelsea. These hazards were determined by challenges the City has already experienced from recent events, long-standing issues, and recent climate vulnerability assessments and planning efforts. These top hazards have already affected stormwater management, road flooding, disruption in services, and health risks.

City of Chelsea Climate Hazards include:

- Sea Level Rise
- Extreme Heat / Air Pollution
- Severe Storms (ice storms, tornados, Nor'easters, blizzards)
- Inland flooding/stormwater management

Chelsea youth small group at CRB Workshop. Photo credit Darci Schofield

These hazards pose greater risks in some localized areas and others throughout the City of Chelsea. Participants found the following areas of significant concern:

Chelsea Areas of Concern

Neighborhoods	Society	Infrastructure	Environment
The Waterfront	Senior Citizens	Stormwater infrastructure	Littering
Tobin Bridge/Route 1 Viaduct	Linguistically isolated residents	Schools located in flood zone	Air Quality
Island End River neighborhood commercial area	Students	Emergency and public transportation	Water Quality
Shurtleff-Bellingham-neighborhood	Chelsea residents who work in Boston Seaport	Senior Center	Toxic exposure with industrial waterfront uses
Western waterfront contaminated area	Low Income Individuals	Medical facilities/hospitals	Shoreline erosion
Bellingham Square	Renters	Housing Authority facilities.	
Addison Neighborhood		The Learning Center	

Current Concerns and Challenges Presented by Hazards

Chelsea has been mitigating and responding to community concerns, damage, and emergencies as a result of extreme weather events for some time. The most significant include coastal flooding, inland flooding from extreme precipitation events and stormwater management, and extreme heat. Participants noted that these events are becoming more frequent and intense and they were eager to build upon their existing strengths to protect their people, places and economy through our changing climate.

Coastal flooding has been an ongoing challenge in the City, particularly during the Nor'easters in March 2018 (Figure 3). Due to significant impervious surface and development in the City as well as aging infrastructure, stormwater management exacerbated by extreme precipitation events can often cause road flooding or overflow in stormwater infrastructure (Figure 3). This also causes additional challenges related to water quality in the Mystic River and Chelsea Creek as well as disrupting transportation and ability to commute to work. Finally, air pollution is a major concern for the community, exacerbated by extreme heat. Factors that contribute to this concern is Logan Airport flight path, vehicle emissions around Route 1, the Tobin Bridge, and other localized traffic, significant impervious cover, and lack of tree canopy. Hospitalizations related to asthma are already notably higher in Chelsea in comparison to Commonwealth as a whole.[6]

Figure 3 Coastal flooding from Island End River, March 2018 (top) and over capacity of Chelsea's stormwater drainage causing overflow and localized flooding.

Photo credit GreenRoots, Inc. (top) and City of Chelsea (bottom).

[6] Massachusetts Environmental Public Health Tracking. https://cognos10.hhs.state.ma.us

Specific Categories of Concerns and Challenges

The People of Chelsea

Small group at CRB workshop after completing the risk matrix. Photo credit Darci Schofield

According to the Commonwealth of Massachusetts Department of Public Health, Chelsea is a 100% environmental justice community.[4] However, community cohesion and spirit is incredibly valued by residents and were what participants most loved about Chelsea (Figure 4). Accordingly, the workshop participants were most concerned about the people of Chelsea with climate change. These included linguistically isolated individuals, undocumented residents, low income individuals, senior citizens, and students. Areas of concern included access to food with flooding of the food distribution center, lack of access to emergency communications, disruptions to commute with road flooding and job security, flooding of public and senior housing, mold, and public health with air quality challenges exacerbated by extreme heat. Renters, who comprise most of the residents in Chelsea, were a significant concern because of absent landlords. With absent landlords, investments in building resilience are less likely to occur. Seniors were a concern for access to affordable food and social isolation. And students were a concern because many schools are in a flood zone.

Flooding Disrupting Transportation to Job Centers

Coastal flooding and flooding associated with stormwater system overflows and extreme precipitation are already causing flooding in key roads and transportation corridors in Chelsea. These include key public transportation, such as the Silver Line and MBTA bus routes in which residents rely upon for commuting to work in Boston. Most specifically regional transit for Bus Routes 111,116, and 117 are at high risk compromising resident's ability to get to work. Further, nearly 4,000 (±660) of 12,403 households or 31% of households do not have a vehicles.[7]

An important example is the Seaport District in Boston. Adjacent to Chelsea, it is a low-lying neighborhood already prone to flooding today and with sea level rise in the future, was a major concern for participants for residents whose jobs are located in this area. There is concern about job security if climate change is not adequately addressed. Participants were also concerned on how traffic could make evacuation during flooding events extremely difficult, in particular around Route 1, Chelsea Bridge, and the Tobin Bridge, all burdened with traffic daily without an emergency. Furthermore, participants raised concerns about coastal flooding impeding ambulances heading toward the two major medical facilities in the City, Massachusetts General Hospital and Beth Israel.

Toxic Exposure

Chelsea has a Designated Port Area serving important economic industries and Chelsea is known for its industrial waterfront. Though these industries are an economic driver, the risk of toxic exposure exists today and could be severe with sea level rise and coastal flooding. Chelsea hosts Eastern

[7] American Community Survey 2016. Five-year estimates.

Minerals, Inc. and a 50-foot salt pile that supplies neighboring communities during winter storms, and residents protest air and noise pollution issues today. Further, Chelsea hosts a petroleum and LNG storage tanks along the waterfront. Participants raised concerns that these businesses were not prepared for sea level rise and coastal flooding. The risk of infrastructure failure would have localized and far-reaching public health and water quality risks if their infrastructure is not climate resilient or community action plan during emergencies is not in place. Participants noted that if these were in place, they were not being communicated to the City. They noted that better communication and collaboration is critical but challenging. Finally, Chelsea has numerous 21E sites and sites with AULs, along with residual soil contamination, dating back to the City's industrial legacy, beginning with the Industrial Revolution and exacerbated by the 1973 fire.

Multi-lingual Communications-Climate Change and Emergencies.

There are over 30 languages spoken in Chelsea's schools and its rich, cultural diversity is one of its greatest assets and strengths. However, participants were concerned that residents new to the United States may not have access to municipal services for storm preparation, emergency response, or recovery if they have limited English-speaking skills. Much of Chelsea's communications are translated into Spanish, but participants noted that communications need to be multi-lingual. Outreach and education to Chelsea's residents on climate change risks, vulnerabilities, and opportunities were also important to participants. This outreach should be multi-lingual and community-based. One small group suggested creating a program of neighborhood rescue during emergencies with "block captains". Participants believed that newer residents would be most comfortable communicating with their neighbors to access emergency information and connecting through the block captain to municipal or medical services during such an event.

Burke School Complex playground. A school located in a flood zone. Playground is under design to incorporate more trees and green infrastructure. Photo credit Darci Schofield

Greening the City –Parks and Trees

Nearly 98% of residents are within a 10-minute walk to a park, playground or natural area in Chelsea.[8] These areas can serve as a foundation in weaving a fabric of climate resilience through nature-based solutions and participants noted that new park design should incorporate and consider climate adaptation and mitigation factors. All participants promoted planting trees as a critical solution and action toward climate resiliency-air pollution, stormwater management, flooding, urban heat island mitigation, and quality of life. However, participants noted that littering is a significant problem in Chelsea, harming their parks, natural spaces, and neighborhoods. It is also clogging stormwater drainage infrastructure exacerbating localized and nuisance flooding. Participants suggested a robust campaign to educate the community on littering, providing better trash facilities in parks and public places, and imposing fees for non-compliance to more stringent littering regulations.

Stormwater Infrastructure

CRB participants raised concerns regarding Chelsea's stormwater infrastructure, which is aging and under capacity, Combined System Overflow (CSO). Approximately 70% of the City if serviced by a CSO. Most of Chelsea's wastewater and stormwater is transported to the Massachusetts Water Resource Authority's Deer Island Treatment Plant, treated, and then discharged. However excessive stormwater, particularly during periods of intense precipitation, can exceed to the capacity of the sewer pipes. During this time, the CSO, an overflow safeguard, can releases excess flow to local water bodies to prevent backflow into homes, businesses, and other buildings.[9]

CSO flows are untreated potentially carrying debris, street pollutants from stormwater runoff, and potentially untreated wastewater. The CSOs are activated yearly raising concerns from CRB participants that climate change could exacerbate existing challenges before stormwater infrastructure upgrades and improvements are completed. The City is committed to a 100% separate system, and in 2015, it completed over 10 sewer separation improvements and designed seven future projects. Participants concerns included aged and inadequate infrastructure, clogged drains causing localized road flooding, water quality issues, and other public health issues related to stormwater flooding. Participants also noted that the significant impervious surface contributes to the stormwater issues in the City and noted that they needed to bring the water back into the ground.

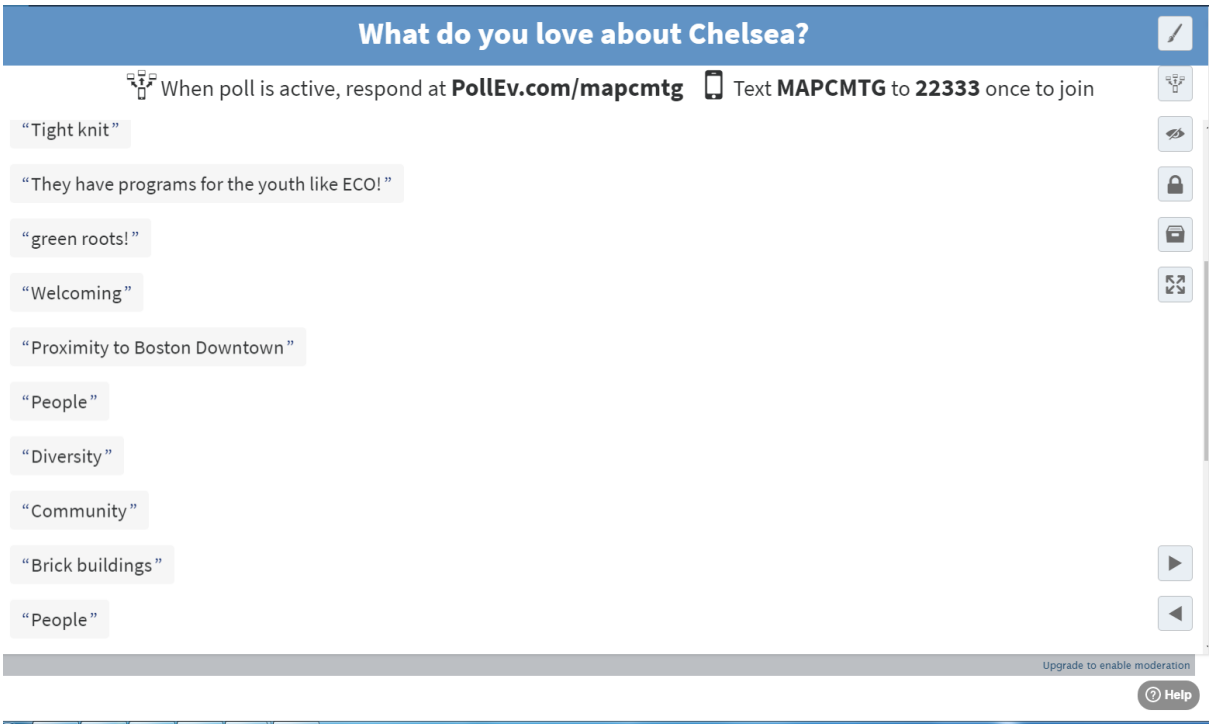
[8] Park Serve © The Trust for Public Land. https://parkserve.tpl.org/city/id/2513205/

[9] https://www.chelseama.gov/sites/chelseama/files/uploads/combined_sewer_overflow._city_of_chelsea.pdf

Current Strengths and Assets

Chelsea already does and will endure significant challenges through our changing climate. Widespread flooding, extreme heat, excessive stormwater and inland flooding, and toxic exposure. But the City has tremendous assets and strengths to bring to these challenges, including planning, services, and people which will serve to enhance its livability and resiliency. CRB participants highlighted these and sought to improve these assets to ensure a vibrant future for their community. The following section describes assets identified by participants.

Figure 4 MVP workshop poll responding to what they love about Chelsea.



La communidad divsera

During the workshop polling, participants were asked what they loved about Chelsea. The majority of the responses were regarding people: the diversity, the tight-knit community, and strong families (Figure 4). One participant group also noted that seniors are active in the community as voters and participants in dedicated programs. Another significant and laudable strength is the ECO youth of Chelsea, already highly engaged in climate resilience planning, programs, and projects as well as improving their overall community livability. Indeed, the Chelsea CRB workshop participants included six youth from the community. Social cohesion or community cohesion is a critical asset and strength in climate resilience where people are better able to adapt to and recover from challenges like climate change with a foundation of familiarity and amicability.[10] Further, a tight-knit community that cares for its place is more likely to take action to improve it and solve complex

[10] Ostrom, Elinor and Ahn, T. K., The Meaning of Social Capital and its Link to Collective Action (October 1, 2007). HANDBOOK ON SOCIAL CAPITAL, Gert T. Svendsen and Gunnar L. Svendsen, ed., Edward Elgar, 2008 ; Indiana University, Bloomington: School of Public & Environmental Affairs Research Paper No. 2008-11-04. Available at SSRN: https://ssrn.com/abstract=1936058

problems like climate change.[11] Diversity and community are one of Chelsea's greatest strengths and assets.

Parks and Trees

CRB participants stressed the importance of nature-based solutions in building a fabric of resilience for the City, and Chelsea already has programs and assets bringing this to fruition. Participants noted the many parks in the City and the opportunity to redesign and retrofit those parks to cool the City and absorb stormwater. Chelsea's parks total 44 acres or 33 football fields. Nearly all residents, 98%, are within a 10-minute walk of a park, playground, or natural area, significantly above the national average of 55%.[12] In addition, GreenRoots has been instrumental in creating three new parks and continues to advocate for more. CRB participants also noted the tree planting program in the City is an important strength, one in which they sought to expand. With GreenRoots, Chelsea has a Tree City designation and worked in partnership with MA Executive of Energy and Environmental Affairs Greening the Gateway Cities program to plant over 2,000 trees.

Participants noted repeatedly the important of bringing the water back into the ground to alleviate inland flooding and stormwater overflow challenges. Chelsea is working to expand its green infrastructure solutions for stormwater management across the City, including the installation of a rain garden at the Housing Authority by Mill Creek and developing a plan "Designing Parks and Playgrounds for Climate Resilience and Stormwater" by MAPC. There are several challenges in Chelsea for green infrastructure including low depth to groundwater, 21E sites, and poorly drained soils.

Economic Growth and New Industry

Participants noted that recent commercial and infrastructure development have brought new people, services, and economic growth to Chelsea, further enriching the community. Some of these assets include Market Basket, the Federal Bureau of Investigation, the Broadway Shopping Center, and the newly developed Silver Line with a dedicated transit lane, improving access to Boston and economic/job centers. Market Basket has greatly improved access to affordable, healthy food improving Chelsea's health.

Community Services and Groups

Participants noted that Chelsea had an abundance of programs and services that service and enrich residents, and a laudable strength of the community. Some examples include the senior center and churches bringing community together and providing a food pantry and support services. Many participants noted that Chelsea's multilingual schools are a critical asset and noted that residents have moved in order to send their children to the Kelly Middle School in particular which has outstanding multilingual programs. GreenRoots was also called out as a significant community strength. A community-based organization, it works to achieve environmental justice, waterfront access, youth leadership, improved public health, greening the city and food justice. Other important community service noted at the CRB workshop included the Learning Center, providing pre-kindergarten to residents, and the Soldiers Home, a facility providing multi-faceted health care to Veterans.

[11] https://www.brown.edu/academics/college/swearer/linking-social-cohesion-and-climate-change-west-end
[12] ParkServe™. The Trust for Public Land. https://parkserve.tpl.org/about/

Top Recommendations to Improve Resilience

At the end of the workshop, participants gathered as a large group to report on their top resiliency actions from their small groups for each of the three categories: infrastructure, society, and environment. These actions were documented and combined when appropriate on posters by the leader in a large group discussion. Participants were given three stickers each to vote on the collated large group priority actions. Appendix D illustrates the voting results. Table 1 provides a list of all small group actions by prioritization and category created by CRB participants.

From this exercise, the Chelsea CRB participants designated the following as their top priority actions:

Chelsea CRB Workshop participants, facilitators, partners and interpreters. Photo Credit Darci Schofield.

Infrastructure

- Perform an evaluation of drainage/ stormwater infrastructure, which is old yet critically important.
- Pilot resilience actions at Public Housing including white roofs, solar panels, trees, and parks.
- Prioritize resilience actions for the Regional Food Distribution Center either with relocation or creating an earthen berm to stop flooding.
- Create regulations that incorporate green infrastructure and building resilience (such as raising critical systems) in all development.

Society

- Create an evacuation plan for the whole City of Chelsea for emergencies.
- Protect people and students now-students are the future.
- Provide multi-lingual communication services for emergencies.
- Create innovative strategies for outreach and education on climate change that are multi-lingual. One example is creating neighborhood block leaders and letters, especially for emergencies.

Environment

- Prioritize stormwater management.
- Plant trees in places with high heat, important for air quality an in places with flood risk.
- Convert unused parking lots and impervious surfaces into parks and green space with more trees.
- Engage MassPort to provide funding for environmental projects for MassPort land and City land, as mitigation to the air and noise pollution from Logan Airport.

Table 1 Recommended actions for resiliency, natural hazard mitigation, and community livability by priority, category and small group.

H= high, M=Medium, S=Short-term, L=Long-Term, O=Ongoing.

Table	Category	Mitigation- Sea Level Rise, Extreme Heat/Air Quality, Stormwater, Severe Storms	Priority	Time
Blue	Environment	Plant trees at locations of flood and heat. Add more grass.	H	S
Blue	Environment	Reduce salt pile/Absorb water.	H	L
Blue	Environment	Mitigation pollution in water by Installing trash/litter cans to reduce pollution. Eliminate CSOs.	H	O
Green	Environment	Partner with private developer to clean up contaminated land.	H	O
Green	Environment	Request funding from the petroleum farms on the waterfront to help protect and mitigate potential toxic exposure in flooding plan. Propose adaptation and mitigation projects to utility companies.	H	O
Purple	Environment	De-pave impervious surface. Transition parking lots to green space. Green abandoned lots.	H	
Purple	Environment	Consider relocating salt pile.	H	
Purple	Environment	Logan Flight Paths/Parking Lot-shift to other locations.	H	
Purple	Environment	Use alternative vehicles such as electric or other European examples, use the VW Settlement funds to mitigate air pollution.	H	
Blue	Infrastructure	Have preparedness program/ spread word about storms or heat.	H	O
Blue	Infrastructure	At schools, create a preparedness plan (instructions for emergencies)/ More drainage/ Install a back-up generator fueled by solar panels.	H	S
Blue	Infrastructure	Solar Panel, install rain barrels, plant trees, maximize green space at public housing.	H	S
Purple	Infrastructure	Regional Food distribution center earthen berm or protection, relocation, work with produce businesses and enhance communications and collaboration.	H	
Purple	Infrastructure	Institute a commuter fee to reduce traffic, have an evacuation plan and publicize it. Look into boats and water taxis.	H	
Purple	Infrastructure	Institute a commuter fee to reduce traffic, provide commuter ferries, parking lots and buses and bike system.	H	

Table	Category	Mitigation- Sea Level Rise, Extreme Heat/Air Quality, Stormwater, Severe Storms	Priority	Time
Purple	Infrastructure	No turf fields at schools and athletic fields in heat zones, reduce parking and transition to green areas rather than parking. Install green roofs and splash pads for cooling.	H	
Purple	Infrastructure	For Marginal Street flooding, install temporary gates for flooding areas, install berm protection, relocated buildings and have floodable green space	H	
Purple	Infrastructure	Require communication from the petroleum farms along the waterfront/floodplain on their solution in the event of flooding. Creating zoning restrictions or regulations for hazard mitigation.	H	
Blue	Society	Education Program, have students help lead change. Provide multi-lingual sessions at library for youth about climate.	H	S
Blue	Society	Information sessions and trainings on climate resilience for public housing residents.	H	S
Green	Society	Create a report for access to healthcare in the event of emergency. Create zoning changes to move critical equipment to higher floors. Provide outreach to low income housing communities on climate change.	H	L
Green	Society	Start improvements for green infrastructure solutions to mitigate heat. Paint structures white and create zoning changes to mitigate heat and use green infrastructure. Create better designed parks and playgrounds for cooling.	H	L
Purple	Society	City Council prioritize assistance for public housing in the floodplain. Provide resources for upgrades for central air, flooding, and mold.	H	
Purple	Society	Provide more food support such as subsidized meals for elderly.	H	
Purple	Society	Provide more outreach and multi-lingual outreach on emergency communications for renters such as when you sign a lease. Provide grants for emergency kits including cell phone chargers.	H	
Purple	Society	Prevent gentrification and displacement with Casino. Instill stronger affordability requirements, provide housing and tax business for displacement.	H	
Purple	Society	Support electric vehicles (EV). Retrofit buses to EV. Have City provide incentives and awareness for EV.	H	

Table	Category	Mitigation- Sea Level Rise, Extreme Heat/Air Quality, Stormwater, Severe Storms	Priority	Time
Yellow	Society	Bring community service facilities such as senior homes, senior center, and churches to higher ground to prevent flooding and keep providing supporting services.	H	O
Yellow	Environment	Create a littering campaign. Install new trash barrels, charge fees for littering, involve residents and City in organization of campaign.	H/M	O, S
Blue	Infrastructure	Water vacuum/ water storage for excess flood waters/ find places to absorb flood waters	L	L
Green	Infrastructure	Incorporate green infrastructure solutions to mitigate heat and flooding. Incorporate green infrastructure regulations into zoning and provide incentives.	L	S
Green	Infrastructure	Install bus shelters and make green. MBTA should create contingency plan for routes during periods of flooding.	L	O
Green	Infrastructure	Stormwater Management-Use porous pavement. Encourage businesses to install green infrastructure.	L	S
Green	Society	Provide air conditioner vouchers, reduce costs of AC to low-income residents and communicate regarding related existing programs.	L	O
Yellow	Society	Plant trees at the Learning Center which serves small children and located in an urban heat island.	L	O
Blue	Environment	Add trees.	M	S
Blue	Environment	Green the bridge	M	L
Green	Environment	Get funding from the EPA for clean-up for areas contaminated in the 1973 fire.	M	O
Purple	Environment	Solve gas leaks, more tree planting necessary.	M	
Blue	Infrastructure	Build flood barrier around base	M	O
Blue	Infrastructure	Paint roofs and other surfaces white or lighter colors (roofs, other surfaces), plant trees, add transit for the Broadway Shopping District.	M	O
Blue	Infrastructure	Replace trees/ Have plan for Bellingham Square, tree plantings with DCR/ limit cars.	M	O
Green	Infrastructure	Work with MBTA on flood resilience particularly bus routes in flood plains. Encourage riders to be involved in advocacy efforts.	M	O

Table	Category	Mitigation- Sea Level Rise, Extreme Heat/Air Quality, Stormwater, Severe Storms	Priority	Time
Green	Infrastructure	Install stormwater gates and tide gates, restore marsh land with Everett at Island End River. Work with produce companies for resilience.	M	O
Purple	Infrastructure	Keep water from entering, such as installing a berm	M	
Yellow	Infrastructure	Create an evacuation plan and incorporate green infrastructure to alleviate flooding around Williams Street under Tobin Bridge which floods and is in an urban heat island. Mitigate traffic with Tobin Bridge construction.	M	S/O
Yellow	Infrastructure	Marginal, Central, and Chestnut Streets-Create an evacuation plan, flood proof road with banks, sandbags, and concrete wall. Create an emergency flooding/evacuation plan. Clean sewers (drainage, stormwater infrastructure).	M	L
Yellow	Infrastructure	Educate families about the impact of flooding and climate change.	M	S
Yellow	Infrastructure	Investigate doubling the capacity of the drainage systems. Cleaning education campaign.	M	S
Yellow	Infrastructure	Keep sewers (stormwater/drainage infrastructure) clean. Have an evacuation plan.	M	O
Yellow	Infrastructure	Plant more trees. Coordinate with City on the creation of a shelter.	M	L
Yellow	Infrastructure	Create an action plan, especially while Madison is under construction. Create emergency awareness with civic participation, advertisements, outreach, and announcements at City Hall and with microphone.	M	S
Yellow	Infrastructure	Communication from City Hall on negative impact of Tobin Bridge construction is necessary.	M	S
Blue	Society	Households with no car access-Canoes, boats to get out of Chelsea/ specific elevated structure for flooding emergencies	M	O
Blue	Society	Temporary Housing on Water/ Build Senior Housing outside of heat and flood risk areas.	M	L
Green	Society	Piggy back on census to identify where seniors are located geographically. Perform targeted outreach to seniors on climate and emergencies.	M	O
Purple	Society	Provide easy access to recycling, phone numbers, education, free recycling bins.	M	

Table	Category	Mitigation- Sea Level Rise, Extreme Heat/Air Quality, Stormwater, Severe Storms	Priority	Time
Green	Environment	Work with local politicians to get clean-up of trash on streets which is polluting the water.		
Purple	Environment	Use living shorelines and plan retreat for shoreline erosion.		
Green	Infrastructure	Make poles more resilient. Request more public participation in new development and incentive participation.		
Purple	Infrastructure	Use other higher ground for relocation during flooding events. Can the Soldier's Home be a sheltering option for the City?		
Yellow	Infrastructure	Create an emergency route and plan to avoid bug issue. Institute traffic control.		
Yellow	Infrastructure	Perform evacuation drills with the children. Clean sewers to minimize flooding.		
Green	Society	Require utility equipment to be elevated at MGH and Beth Israel. Mitigate traffic to ensure ambulances can travel to medical facilities. Create an emergency management plan.		
Green	Society	Create regional flood resilient infrastructure.		
Green	Society	Provide multi-lingual outreach materials for emergency communications.		
Green	Society	Use community rescues, create neighborhood "block captains" for outreach and contact during emergencies.		
Yellow	Society	Create education campaigns, involve people in climate solutions, promote youth engagement, create law about trash and enforce it.		
Yellow	Society	Educate renters and homeowners on climate change and ways to take care.		

CRB Workshop Participants

GreenRoots, Inc. and the City of Chelsea Planning Department performed outreach and invitation for workshop participations. A modified version of the CRB participant worksheet was provided to aid in targeting participants in addition to community members and residents.

GreenRoots performed in-person, print, and electronic outreach to recruit participants. They created a bilingual flyer with relevant and recent Chelsea photos regarding recent flooding. Flyers were distributed door to door in the neighborhoods adjacent to Chelsea's waterfront and at GreenRoots member programs and activities. The GreenRoots ECO Youth performed peer to peer outreach. GreenRoots also publicized the event bilingually on its website with its own webpage, publicized on social media, and sent individual, direct and listserv emails to members, city leaders, businesses, and partnering organizations. They also sent texts to their most engaged members as a reminder. Finally, GreenRoots sent a workshop description and flyer to the City Manager for inclusion in the Chelsea Happenings email distribution.

The Chelsea Planning and Development Office targeted municipal staff, officials, and community members. They featured the workshop in the City Manager's monthly newsletter, invited City Council members and notified volunteer Boards and Committees including the Zoning Board of Appeals, Planning Board, Historic Commission, Conservation Commission and Community Preservation Commission. Finally, the City posted the information on the City's website and through social media on Facebook and Twitter.

Table 2 lists all the registered participants for the Chelsea CRB workshop. Some residents chose not to formally register though they participated for the entire day. The majority of the participants were residents of Chelsea. Other participants included the New England Aquarium, the Urban Harbors Institute, Chelsea Assistant Planning Director and Economic Planner, and GreenRoots staff.

Table 2 Participants in Chelsea CRB workshop.

First	Last	Small Group
Aandrea	Perdomo	Yellow
Judith	Dyer	Purple
Brandon	Lazo	Blue
Sergio	Cardona	Yellow
Leilani	Mroczkowski	Purple
Roseann	Bongiovanni	Red
Alex	Train	Green
Katherine	Zelaya	Blue
Alexandrina	Rodriguez	Yellow
Adela	Gonzalez	Purple
Isabel	Cardona	Yellow
Jamie	Graham	Purple
Jasmin	Lianez	Blue
Cate	Maas	Purple
Kristin	Kelleher	Green
Alejandrina	Concepcion	Yellow

Stuart	Spzna	Green
Isabel	Garcia	Green
Lorraine	Friere	Blue
Marisol	Guerrero	Yellow
Juan	Ortega	Purple
Latifa	Ziyad	Green
Mayra	Romerao	Yellow
Roberto	Roriguez	Purple
Allison	Novelly	Green
Shakaya	Moore Perkins	Blue
Maureen	Cawley	Green
Karl	Allen	Blue

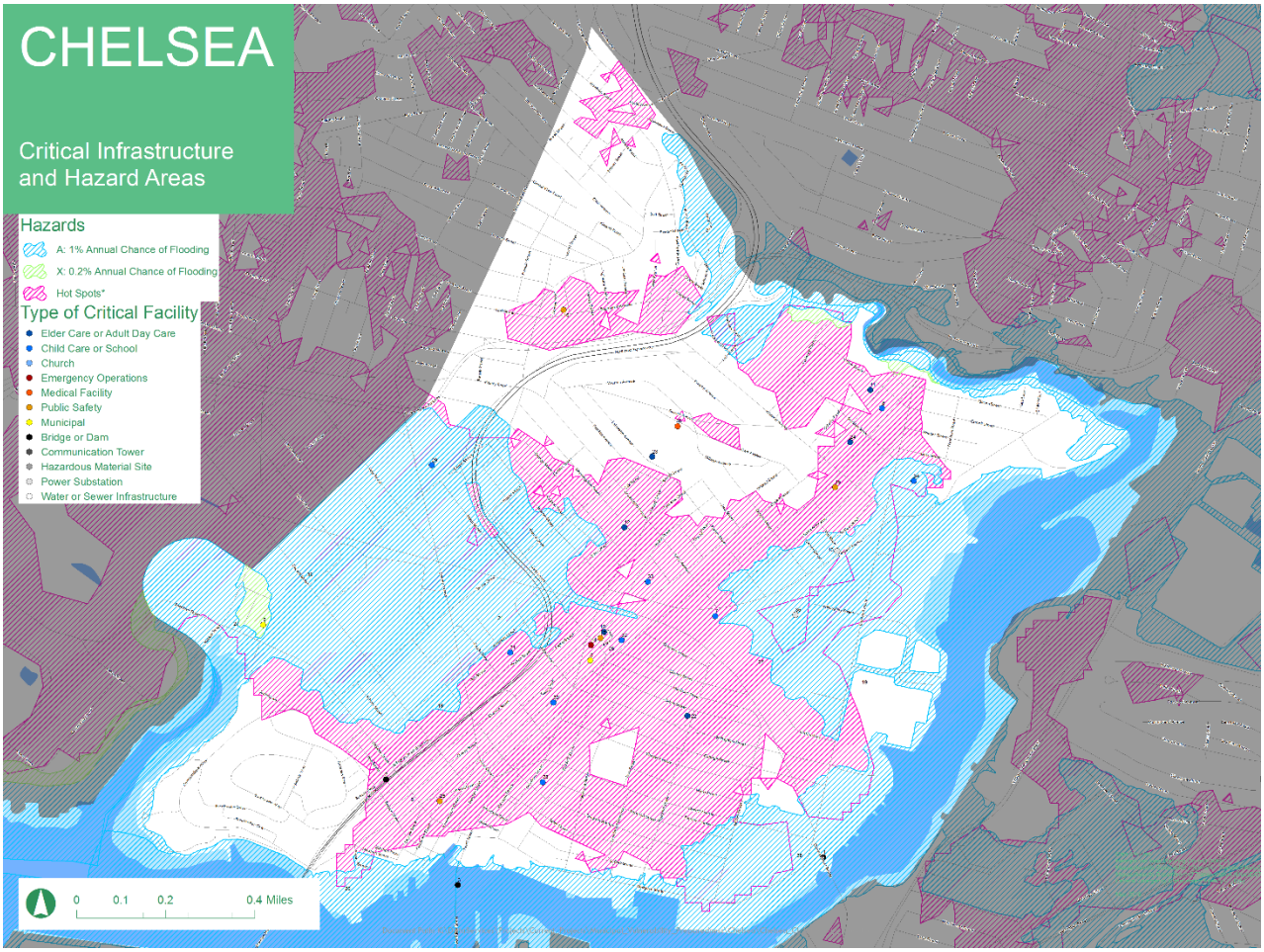
CORE TEAM MEMBERS

JOHN DEPREIST, AICP	DIRECTOR OF PLANNING
ALEXANDER TRAIN	ASST. DIRECTOR OF PLANNING AND DEVELOPMENT
ROSEANN BONGIOVANNI	EXECUTIVE DIRECTOR, GREENROOTS, INC.
KARL ALLEN	PLANNER/ECONOMIC DEVELOPMENT SPECIALIST

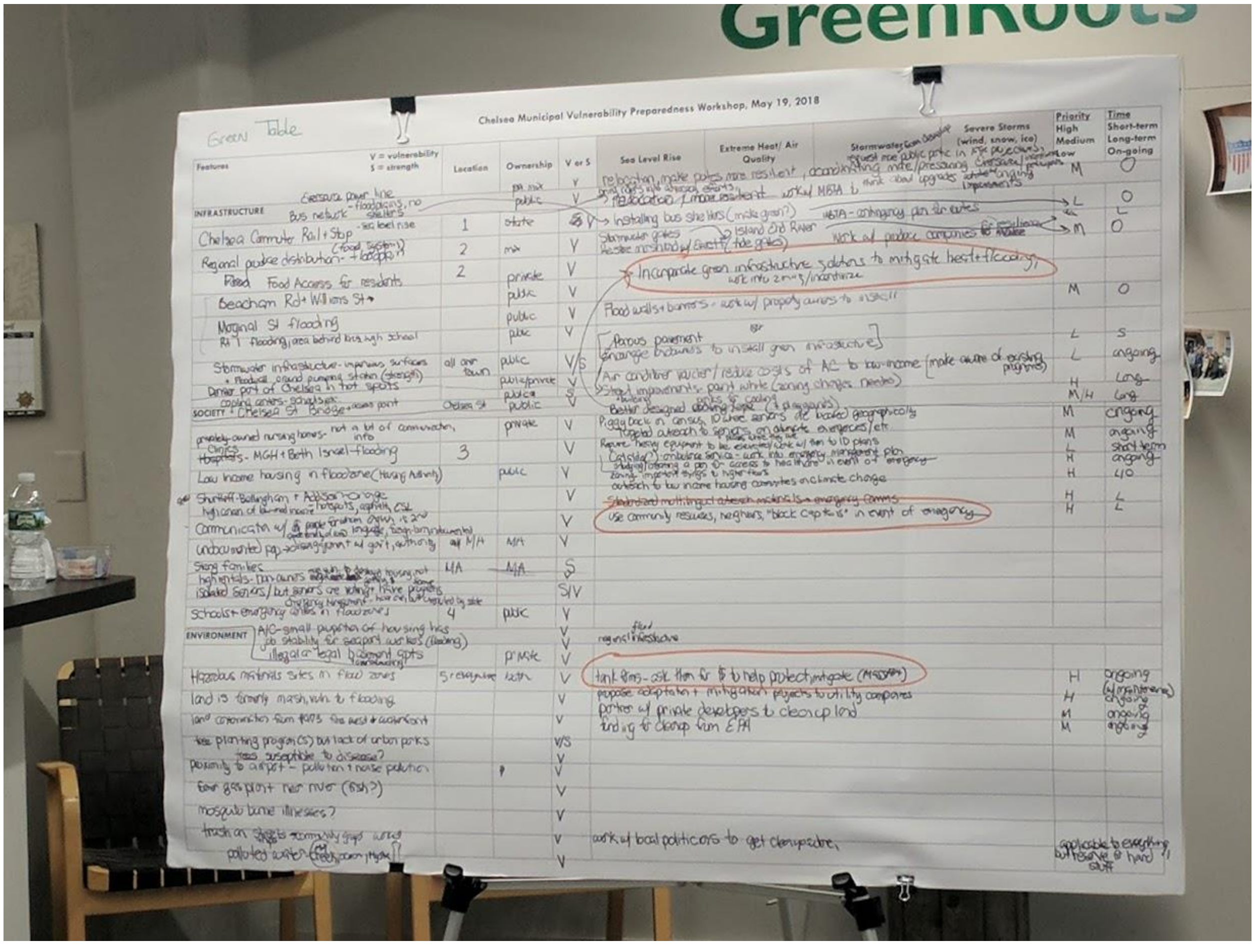
Citation

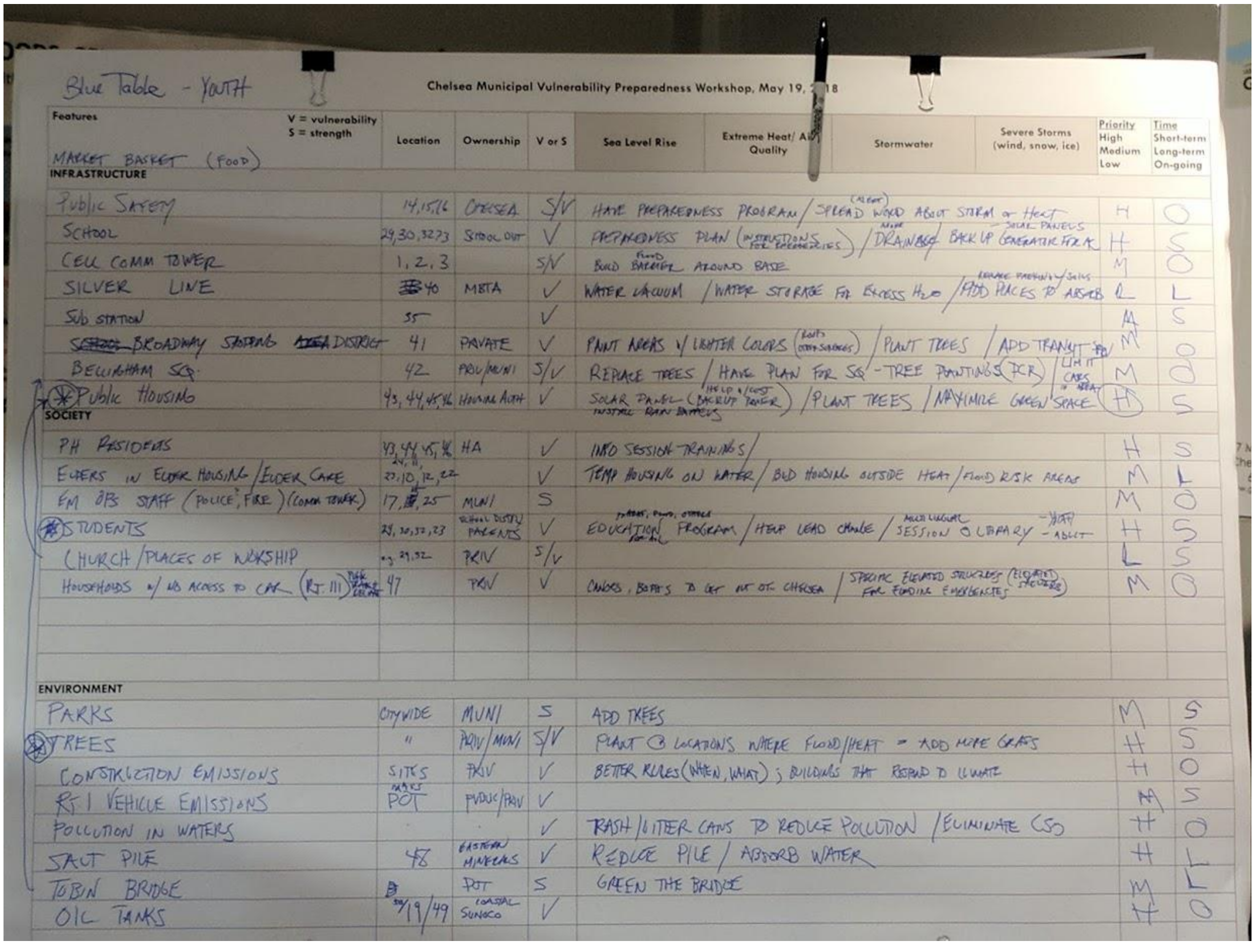
Metropolitan Area Planning Council. 2018. City of Chelsea Municipal Vulnerability Preparedness Program. Community Resilience Building Workshop Summary of Findings. Chelsea, Massachusetts.

Appendix A -Small Group Table Map



Appendix B- Chelsea CRB Workshop Risk Matrices

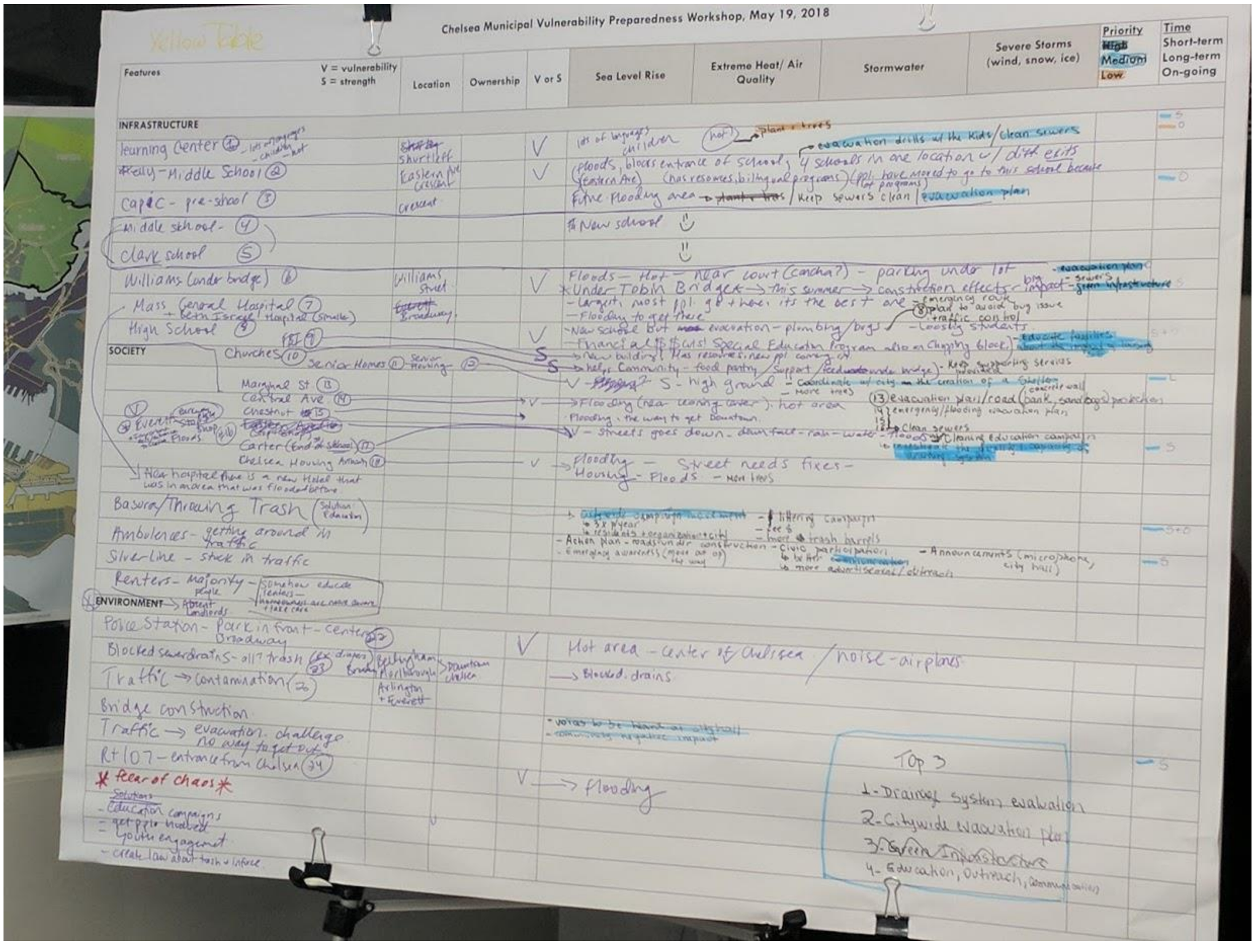

Chelsea Municipal Vulnerability Preparedness Workshop, May 19, 2018
Features
V = vulnerability
S = strength
Location
Ownership
V or S
Sea Level Rise
Extreme Heat/ Air Quality
Stormwater
Severe Storms (wind, snow, ice)
Priority
High
Medium
Low
Time
Short-term
Long-term
On-going
INFRASTRUCTURE
SOCIETY
ENVIRONMENT



Blue Table - YOUTH

Chelsea Municipal Vulnerability Preparedness Workshop, May 19, 2018

Features (V = vulnerability, S = strength)	Location	Ownership	V or S	Sea Level Rise	Extreme Heat/ Air Quality	Stormwater	Severe Storms (wind, snow, ice)	Priority (High, Medium, Low)	Time (Short-term, Long-term, On-going)
MARKET BASKET (FOOD)									
INFRASTRUCTURE									
Public Safety	14,15,16	CHELSEA	S/V	HAVE PREPAREDNESS PROGRAM / SPREAD (ALERT) WORD ABOUT STORM or HEAT				H	O
SCHOOL	29,30,32,73	SCHOOL DIST	V	PREPAREDNESS PLAN (INSTRUCTIONS FOR EMERGENCIES) / MORE DRAINAGE / BACK UP GENERATOR FOR A - SOLAR PANELS				H	S
CELL COMM TOWER	1, 2, 3		S/V	BUILD FLOOD BARRIER AROUND BASE				M	O
SILVER LINE	40	MBTA	V	WATER VACUUM / WATER STORAGE FOR EXCESS H_2O / ADD PLACES TO ABSORB - PERMEABLE PAVEMENT / SOILS				L	L
Sub STATION	55		V					M	S
~~SCHOOL~~ BROADWAY SHOPPING ~~AREA~~ DISTRICT	41	PRIVATE	V	PAINT AREAS W/ LIGHTER COLORS (ROOFS, OTHER SURFACES) / PLANT TREES / ADD TRANSIT				M	O
BELLINGHAM SQ.	42	PRIV/MUNI	S/V	REPLACE TREES / HAVE PLAN FOR SQ - TREE PLANTINGS (PCR) / LIMIT CARS IN HEAT				M	O
(*) Public Housing	43, 44, 45, 46	Housing Auth	V	SOLAR PANEL (HELP W/ COST, BACKUP POWER) / PLANT TREES / MAXIMIZE GREEN SPACE; INSTALL RAIN BARRELS				(H)	S
SOCIETY									
PH RESIDENTS	43, 44, 45, 46	HA	V	INFO SESSION TRAININGS /				H	S
ELDERS IN ELDER HOUSING / ELDER CARE	24, 11, 27, 10, 12, 22		V	TEMP HOUSING ON WATER / BUILD HOUSING OUTSIDE HEAT / FLOOD RISK AREAS				M	L
EM OPS STAFF (POLICE, FIRE) (COMM TOWER)	17, 25	MUNI	S					M	O
(*) STUDENTS	29, 30, 32, 23	SCHOOL DIST / PARENTS	V	PARENTS, PEERS, OTHERS EDUCATION FOR ALL PROGRAM / HELP LEAD CHANGE / MULTILINGUAL SESSION @ LIBRARY - YOUTH - ADULT				H	S
CHURCH / PLACES OF WORSHIP	e.g. 29, 32	PRIV	S/V					L	S
HOUSEHOLDS W/ NO ACCESS TO CAR (RT. 111)	47	PRIV	V	CANOES, BOATS TO GET OUT OF CHELSEA / SPECIFIC ELEVATED STRUCTURES (ELEVATED SHELTERS) FOR FLOODING EMERGENCIES				M	O
ENVIRONMENT									
PARKS	CITYWIDE	MUNI	S	ADD TREES				M	S
(*) TREES	"	PRIV/MUNI	S/V	PLANT @ LOCATIONS WHERE FLOOD/HEAT - ADD MORE GRASS				H	S
CONSTRUCTION EMISSIONS	SITES	PRIV	V	BETTER RULES (WHEN, WHAT); BUILDINGS THAT RESPOND TO CLIMATE				H	O
RT 1 VEHICLE EMISSIONS	PARKS, POT	PUBLIC/PRIV	V					M	S
POLLUTION IN WATERS			V	TRASH / LITTER CANS TO REDUCE POLLUTION / ELIMINATE CSO				H	O
SALT PILE	48	EASTERN MINERALS	V	REDUCE PILE / ABSORB WATER				H	L
TOBIN BRIDGE		POT	S	GREEN THE BRIDGE				M	L
OIL TANKS	50/19/49	COASTAL SUNOCO	V					H	O


Chelsea Municipal Vulnerability Preparedness Workshop, May 19, 2018
Features
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Sea Level Rise
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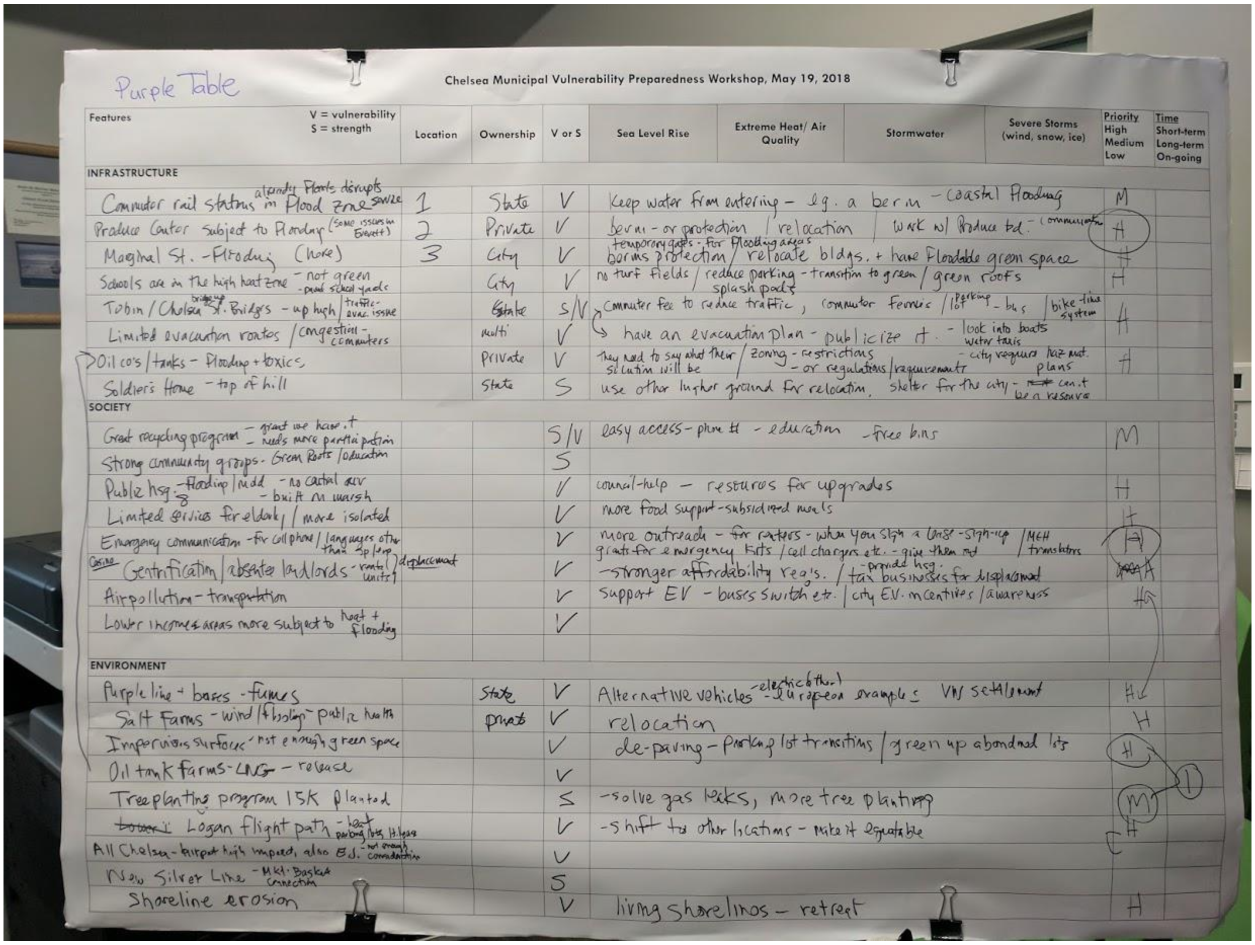
Stormwater
Severe Storms (wind, snow, ice)
Priority
High
Medium
Low
Time
Short-term
Long-term
On-going
INFRASTRUCTURE
SOCIETY
ENVIRONMENT
Top 3
1- Drainage System evaluation
2- Citywide evacuation plan
3- Green Infrastructure
4- Education, Outreach, (communication)

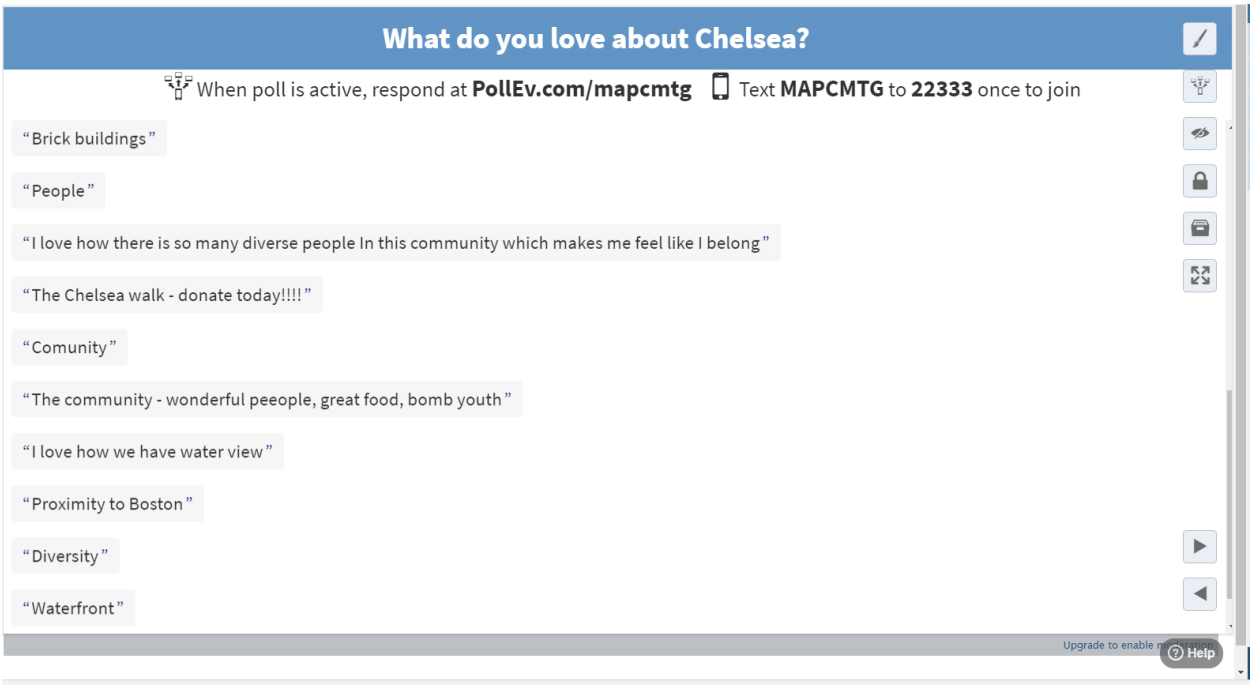


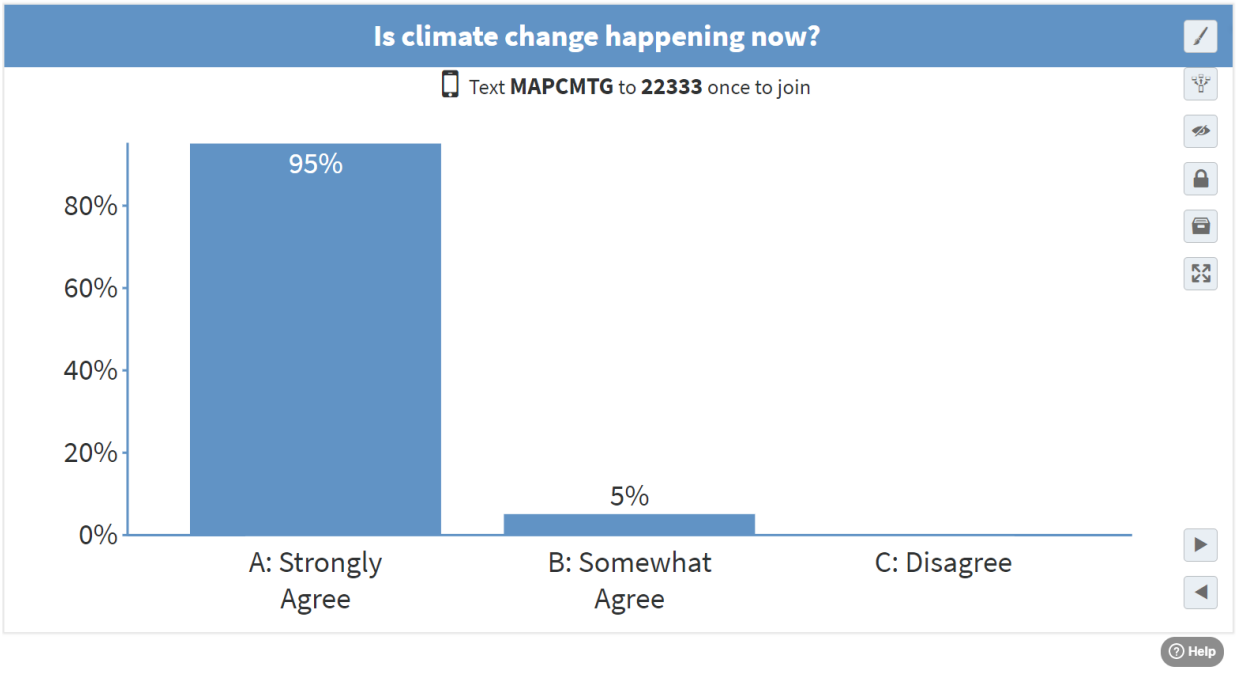
Purple Table

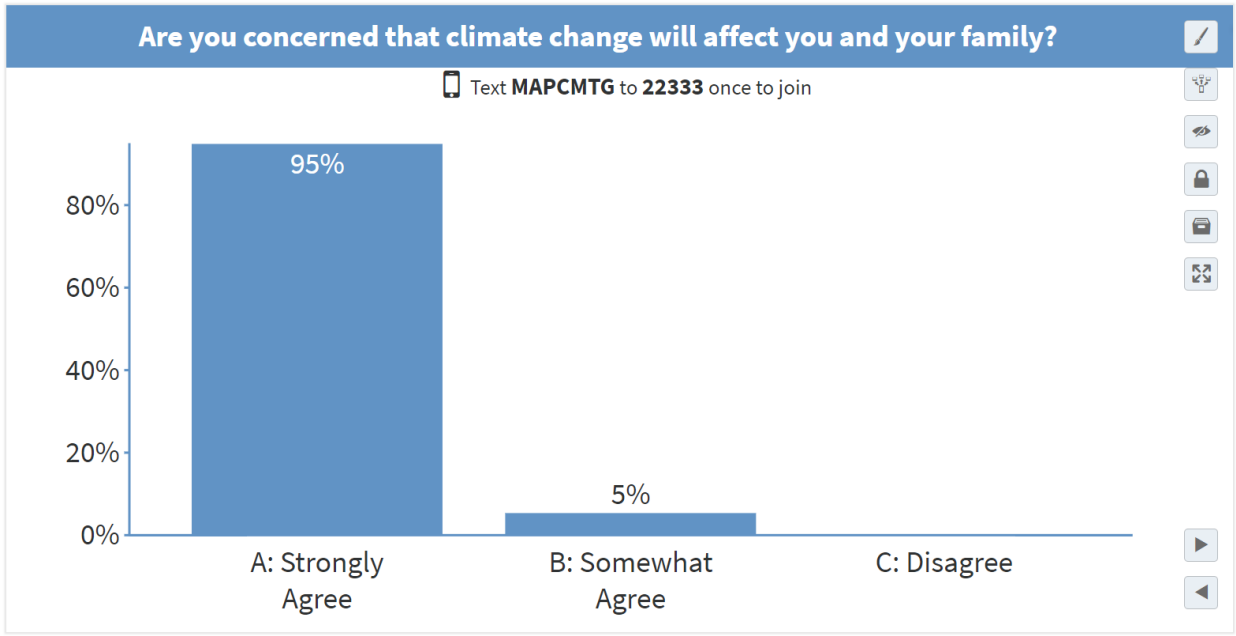
Chelsea Municipal Vulnerability Preparedness Workshop, May 19, 2018

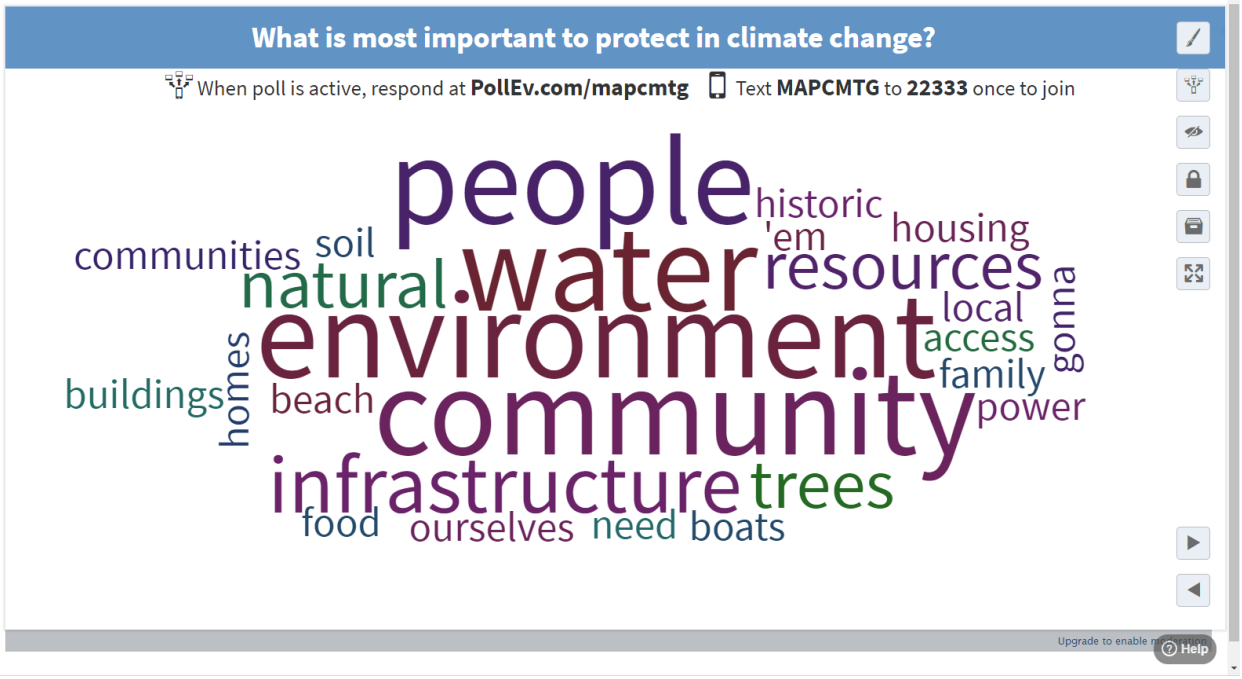
Features (V = vulnerability, S = strength)	Location	Ownership	V or S	Sea Level Rise	Extreme Heat/ Air Quality	Stormwater	Severe Storms (wind, snow, ice)	Priority (High, Medium, Low)	Time (Short-term, Long-term, On-going)
INFRASTRUCTURE									
Commuter rail stations in Flood zone – already floods disrupts service	1	State	V	Keep water from entering – eg. a berm – coastal flooding				M	
Produce Center subject to Flooding (some issues in Everett)	2	Private	V	berm – or protection / relocation / work w/ Produce Ctr. – communication				H	
Marginal St. – Flooding (here)	3	City	V	temporary gates – for flooding areas; berms protection / relocate bldgs. + have Floodable green space				H	
Schools are in the high heat zone – not green – paved school yards		City	V	no turf fields / reduce parking – transition to green / green roofs; splash pads				H	
Tobin / Chelsea St. Bridges – up high / traffic – evac. issue; bridge up		State	S/V	Commuter fee to reduce traffic, commuter Ferries / parking lot – bus / bike-time system				H	
Limited evacuation routes / congestion – commuters		multi	V	have an evacuation plan – publicize it. – look into boats, water taxis				H	
Oil co's / tanks – Flooding + toxics		Private	V	They need to say what their solution will be / zoning – restrictions – or regulations / requirements – city require haz mat. plans				H	
Soldier's Home – top of hill		State	S	use other higher ground for relocation, shelter for the city – can it be a resource					
SOCIETY									
Great recycling program – great we have it – needs more participation			S/V	easy access – phone # – education – free bins				M	
Strong community groups – Green Roots / education			S						
Public hsg. – flooding / mold – no central air – built in marsh			V	council-help – resources for upgrades				H	
Limited services for elderly / more isolated			V	more food support – subsidized meals				H	
Emergency communication – for cell phone / languages other than Sp / Eng			V	more outreach – for renters – when you sign a lease – sign-up / grants for emergency kits / cell chargers etc. – give them out / MEH translators				H	
Casino – Gentrification / absentee landlords – rental units / displacement			V	–stronger affordability reg's. / tax businesses for displacement – provide hsg.				H	
Air pollution – transportation			V	support EV – buses switch etc. / city E.V. incentives / awareness				H	
Lower income areas more subject to heat + flooding			V						
ENVIRONMENT									
Purple line + buses – fumes		State	V	Alternative vehicles – electric & [illegible] – European examples – VW settlement				H	
Salt Farms – wind / flooding – public health		private	V	relocation				H	
Impervious surfaces – not enough green space			V	de-paving – parking lot transitions / green up abandoned lots				H	
Oil tank farms – LNG – release			V						
Tree planting program 15K planted			S	–solve gas leaks, more tree planting				M	
Logan flight path – heat – parking lots – H. [illegible]			V	–shift to other locations – make it equitable				H	
All Chelsea – airport high impact, also E.J. – not enough consideration			V						
New Silver Line – Mkt. Basket connection			S						
Shoreline erosion			V	living shorelines – retreat				H	

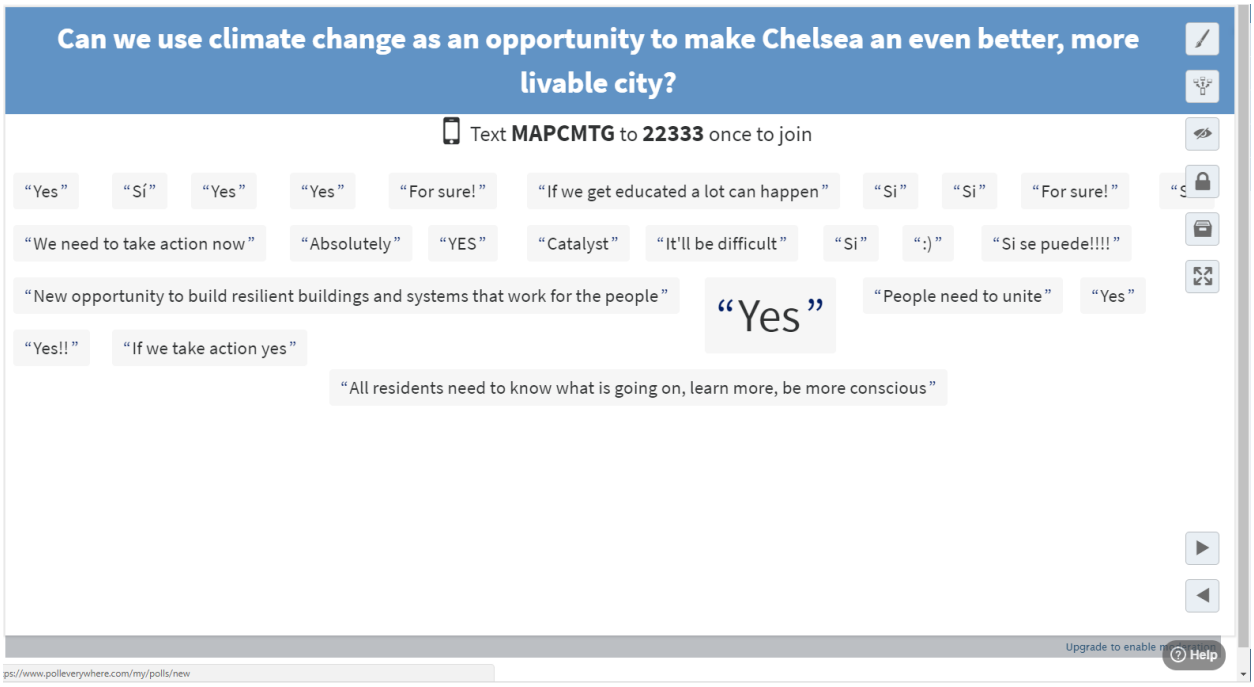
Appendix C – Cell phone polling questions and results


What do you love about Chelsea?
When poll is active, respond at PollEv.com/mapcmtg
Text MAPCMTG to 22333 once to join
"Brick buildings"
"People"
"I love how there is so many diverse people In this community which makes me feel like I belong"
"The Chelsea walk - donate today!!!!"
"Comunity"
"The community - wonderful peeople, great food, bomb youth"
"I love how we have water view"
"Proximity to Boston"
"Diversity"
"Waterfront"
Help


Is climate change happening now?
Text MAPCMTG to 22333 once to join
95%
5%
80%
60%
40%
20%
0%
A: Strongly Agree
B: Somewhat Agree
C: Disagree
Help


Are you concerned that climate change will affect you and your family?
Text MAPCMTG to 22333 once to join
95%
5%
80%
60%
40%
20%
0%
A: Strongly Agree
B: Somewhat Agree
C: Disagree
Help


What is most important to protect in climate change?
When poll is active, respond at PollEv.com/mapcmtg
Text MAPCMTG to 22333 once to join
people
historic
'em
housing
communities
soil
natural
water
resources
environment
local
access
family
gonna
buildings
homes
beach
community
power
infrastructure
trees
food
ourselves
need
boats
Help

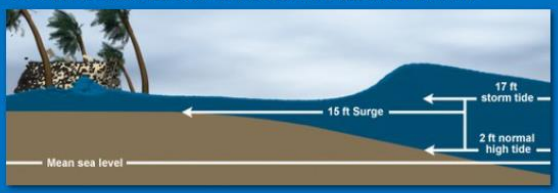

Can we use climate change as an opportunity to make Chelsea an even better, more livable city?
Text MAPCMTG to 22333 once to join
"Yes"
"Sí"
"Yes"
"Yes"
"For sure!"
"If we get educated a lot can happen"
"Si"
"Si"
"For sure!"
"We need to take action now"
"Absolutely"
"YES"
"Catalyst"
"It'll be difficult"
"Si"
":)"
"Si se puede!!!!"
"New opportunity to build resilient buildings and systems that work for the people"
"Yes"
"People need to unite"
"Yes"
"Yes!!"
"If we take action yes"
"All residents need to know what is going on, learn more, be more conscious"
Help

Appendix D- Climate Change Learning Boards

Climate Change in Chelsea: Sea Level Rise

Sea Level has risen 11 inches since 1890 in Boston Harbor.

The oceans are absorbing more than 90% of the increased atmospheric heat associated with greenhouse gas emissions from human activity. Sea Level Rise is caused mostly global warming temperatures. Warmer temperatures are melting glaciers and ice-sheets adding more water to the ocean and warmer temperatures are causing oceans to take up more space (since water expands as it warms).



Coastal Storms cause greater flooding with storm surge.

Chelsea is surrounded by four coastal rivers. The Mystic, Island End, Chelsea Creek and Mill Creek. Because it is low-lying at the shoreline, there is an even greater risk to flooding with coastal storms combined with sea level rise.

Sea level could rise another 8 in. in just 12 years and 7 ft. by 2100.

Scientists have created models that anticipate sea level rise based upon greenhouse gas emission trends, topography, tides, storms, rivers, and winds. The Boston Harbor Flood Risk Model (BH_FRM) is one of the most detailed models of coastal flooding. The Boston Tide Gauge Model was completed by UMass Amherst but does not account for glacial melting.

SLR Model	2030	2050	2070	2100
Boston BH_FRM [1]	8.00 in	1.50 ft.	3.10 ft.	7.40 ft.
Boston Tide Gauge [3]	0.4-0.9 ft	0.8-1.5 ft.	1.3-2.4	2.0-4.0

Chelsea is surrounded by four rivers and is low-lying along the shoreline. This map shows the probability of coastal flooding in 2030 using the BH_FRM. The greatest extent of coastal flooding in the map below could occur 2% of the time in any given year in the 2030 time frame.

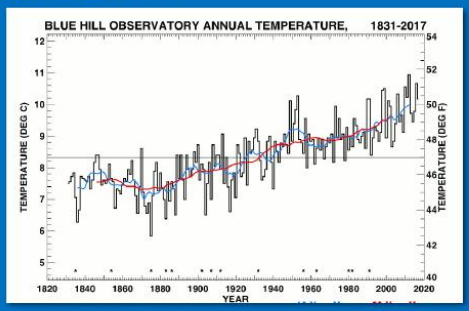
By 2070, the geographic extent of flooding does not increase, but the depth and probability of flooding does increase. This map shows that the areas of flooding that had a 2% chance of flooding in any given year increases to 50-100% chance of flooding toward the end of the century.

Designing Coastal Community Infrastructure for Climate Change. Stantec and Woods Hole Group, January 2017

Climate Change in Chelsea: Extreme Heat

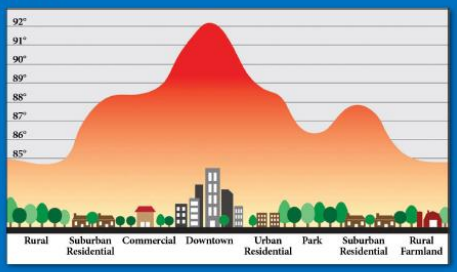
Global Temperatures have risen nearly 2° over the last century.

2016 was the warmest year on record and the worst drought in MA since the 1960s. 2015 was the second warmest and 2017 was the third warmest year. Even a small increase in temperature has a major impact on glacial melting and changing weather patterns. For example, since 1980, the Northeast US has increased its growing season by 10 days.



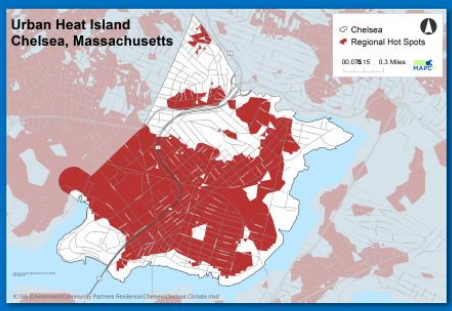
Chelsea could have 40-90 days with temperatures above 90° by 2100.

If so, our climate in Massachusetts will shift toward a climate more like Georgia or Alabama by the end of the century. This extreme heat will have a greater impact on Chelsea which has extensive asphalt and buildings. These surfaces capture and hold heat creating hotter days than areas with more trees and natural vegetation.



Chelsea is already at very high risk to the urban heat island effect.

More than 50% of Chelsea is an urban heat island. The areas in red in the map below indicate not only Chelsea's hottest areas but also the top 5% warmest areas in Metro Boston.



Chelsea has trees that improve heat, air quality, stormwater, and health.

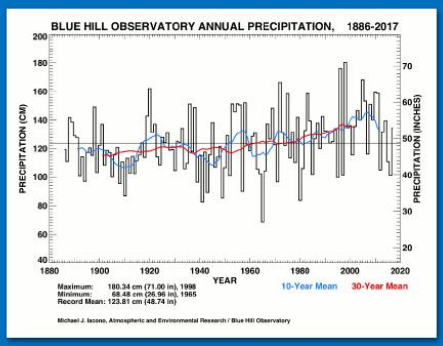
Trees and vegetation cool temperatures by 20-45°F in comparison to unshaded/ developed areas by providing shade and through evapotranspiration. Trees also capture carbon, stormwater runoff, and air pollutants from vehicles. This map illustrates Chelsea's trees. Chelsea is already planting more trees but more are needed for greater benefits and public health.

	Carbon Sequestration	Avoided Runoff	Air Pollutant Mitigation
Chelsea	77.9 tons and $11,146 per year	4.4 MG and $39,351 per year	4,470 lbs and $82,659 per year

Climate Change in Chelsea: Precipitation

There has been a 10% increase in precipitation in Boston area since 1970.

In the last 50 years, precipitation in the Northeast US increased 71% in the amount of rain that falls in the top 1% of storm events.

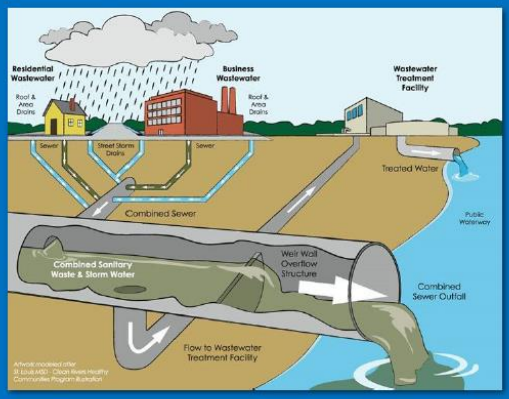


Chelsea could have 10 days of storms with >1" of rain by 2100.

Projections for future precipitation suggest an increase in total precipitation, changes in precipitation patterns, and increased frequency of extreme storms such as hurricanes and nor'easters. For example, a 10-year storm today can produce 5 inches of rain. That same storm could produce over 6 inches by the end of the century. Most of the increased precipitation will occur during the winter but warmer temperatures could also lead to increased drought.

More precipitation will risk Chelsea's rivers, recreation, and public health.

Chelsea is serviced by a combined sewer designed to collect both wastewater and stormwater. Most, 70%, of its wastewater is transported to Deer Island Waste Water Treatment Plant. During periods of intense precipitation, the capacity of the combined sewer is exceeded and stormwater then flows into a combined system overflow (CSO) which directly empties into nearby waterbodies. This stormwater is untreated carrying not only stormwater with pollutants from impervious services but also potentially untreated wastewater and debris. Chelsea is working to upgrade and separate its system, but bringing water back into the ground before entering the system will enhance Chelsea's resilience and its rivers.



Climate Change in Chelsea: People

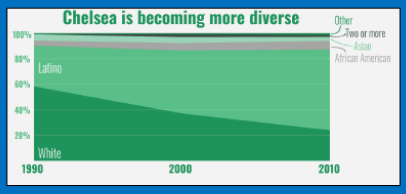
Who is most at risk from climate change impacts?

Social vulnerability refers to social, economic, demographic, or health factors that may make some people less able to adapt to or recover from climate change impacts or extreme weather events. Climate resilience strategies should prioritize first helping those at greatest risk.

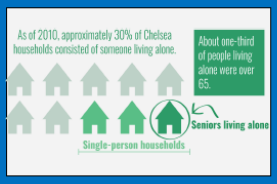
63% ± 5% Households in Chelsea that are low-income

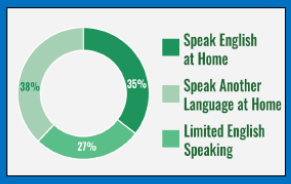
19% ± 2.5% Households in Chelsea that are below poverty level

*A four-person household earning less than $78,150 is considered low-income; a four-person household earning less than $24,563 is below poverty level

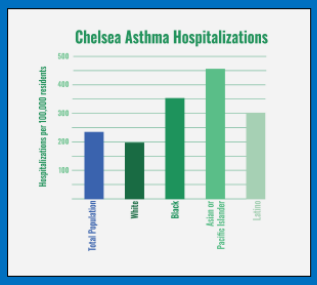


People who have difficulty adapting to, preparing for, or recovering from extreme weather events: Characteristics such as income, language, and household status can cause people tobe more at risk to climate change. For example, low-income people and families may have greater financial shocks after extreme weather events if their homes are damaged, if their work transportation is impaired by weather, if their medical needs are not met due to loss of transportation or financial shocks.





People in social isolation, such as individuals living alone, single-parent households, or individuals with limited English-speaking abilities, can limit access to critical information, city resources, and social support systems.



People who have certain health conditions: These may include older adults, very young children, pregnant women, people with disabilities, and/or people with chronic medical conditions. They may be more physically vulnerable to extreme heat and poor air quality caused by climate change. Individuals with mobility constraints, such as people with disabilities and seniors, may need additional assistance with emergency response.

People who live or work in vulnerable locations such as areas with historic and projected flooding, areas prone to heat islands and extreme heat, and neighborhoods prone to power outages. Outdoor workers, first responders, and those working in hot indoor environments are also vulnerable.

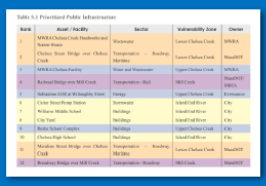
Climate Change in Chelsea: Possible Solutions

What are your solutions for a healthy, vibrant, livable Chelsea through climate change?

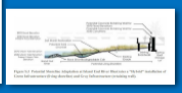
As a member of the Chelsea community, you are all the experts for place. And this workshop is seeking your input to protect the people and places of Chelsea most vulnerable to climate change. Below are some examples from plans that have addressed climate change and extreme weather events combined with some possible solutions. These can be used to help think of new climate resilience action items for Chelsea with this workshop.

Example Climate Vulnerability	Possible Solutions
Flooding by Market Street and Food Distribution Center	Install earthen berms at Island End Park that provide additional waterfront accessibility. Investigate salt marsh restoration and floating wetlands to minimize flooding and improve water quality.
Stormwater system overflows into streets and rivers during heavy rain events.	(a) Install rain gardens, trees, and bioswales (green infrastructure) through the city to bring water back into the ground. (b) Upgrade stormwater pipes and infrastructure to include future precipitation projections.
Sea Level Rise Flooding at Mill Creek, flood multiple retail stores like Walgreens, Auto Store, Lowes	Seek funding to perform ecological restoration to Mill Creek to improve flow of water. Could include dredging, invasive species removal, marsh/wetland restoration. Create better public access to Mill Creek with river parks. Expand the floodplain by protecting land around Mill Creek and constructing wetlands.
Flooding at Chelsea Housing Authority	Clear drainage ditch to prevent future flooding. Upgrade infrastructure toward future precipitation/flood patterns. Add more parks/natural vegetation to the area to capture stormwater, beautify neighborhood, and improve air quality.
Sea level rise/storm surge risking Chelsea's waterfront businesses.	Upgrade floodplain zoning and conservation regulations to be consistent with existing and future flood zones. Assess Chelsea waterfront from additional sea/flood wall protection as well as living shorelines and earthen berms.
Loss of electricity during severe storms	Require all new development to put utilities underground.
Children and seniors living in urban heat islands.	Increase tree canopy cover to cool the city and mitigate air pollution . Create an Extreme Heat Program with transportation that brings seniors to cooling centers that also provides food and other programs for socialization.
City Yard Chelsea DPW is in a flood zone.	Install deployable flood fences, seek alternative sites for new facility.
Chelsea is one of the hottest areas in Metro Boston, with significant urban heat island.	Consider green roof regulations to include raised garden beds and/or solar panels to cool the city. Use energy efficient electrical and mechanical equipment that reduces heat emissions, energy costs, and greenhouse has emissions.
Flooding of sites with hazardous materials could expose toxics to people of Chelsea.	Asses the risk of water-reactive chemicals stored in flood-prone buildings. Design guidelines and prioritization for better enforcement of flood proofing standards.
People live, work, and play in flood prone and extreme heat areas potentially exposing health issues, building damage, and hazardous conditions.	Ensure Emergency Management and Operations will protect the most vulnerable people from climate change. Create a multi-lingual network to inform residents of emergency situations, emergency shelter, and services to recover from extreme weather events.

Chelsea's most vulnerable buildings at risk to flooding.[1]



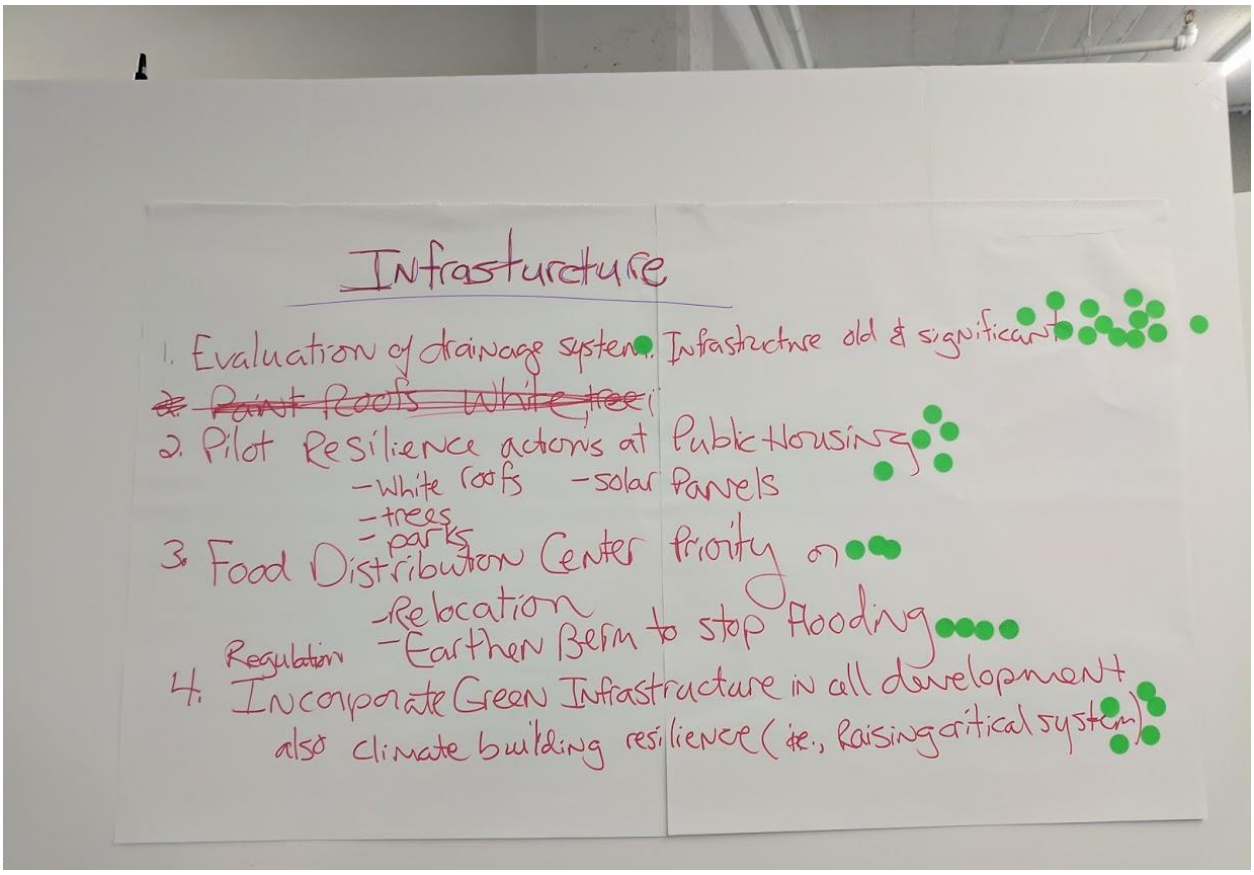
Island End River Vulnerability Zone. Examples of infrastructure at risk to sea level rise/storm surge and possible solutions to prevent flooding.[1]

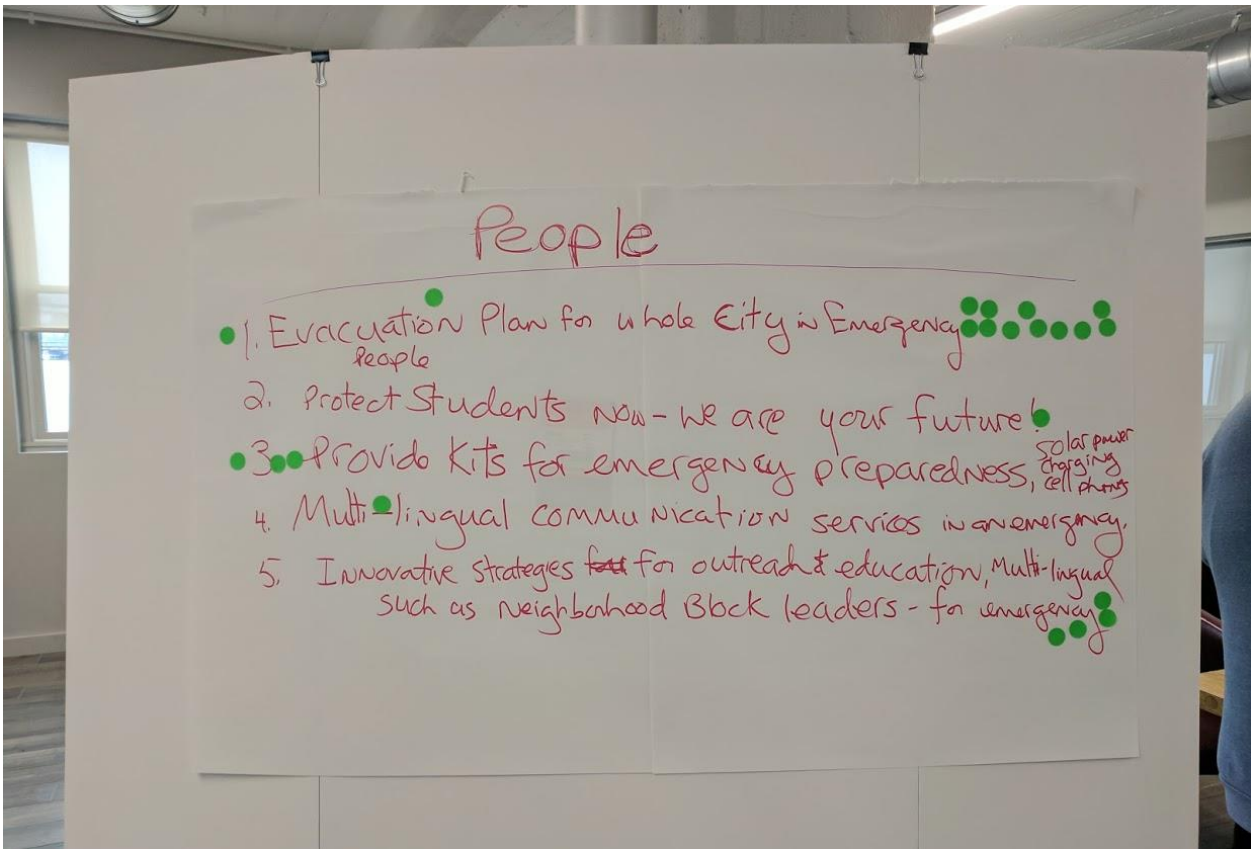


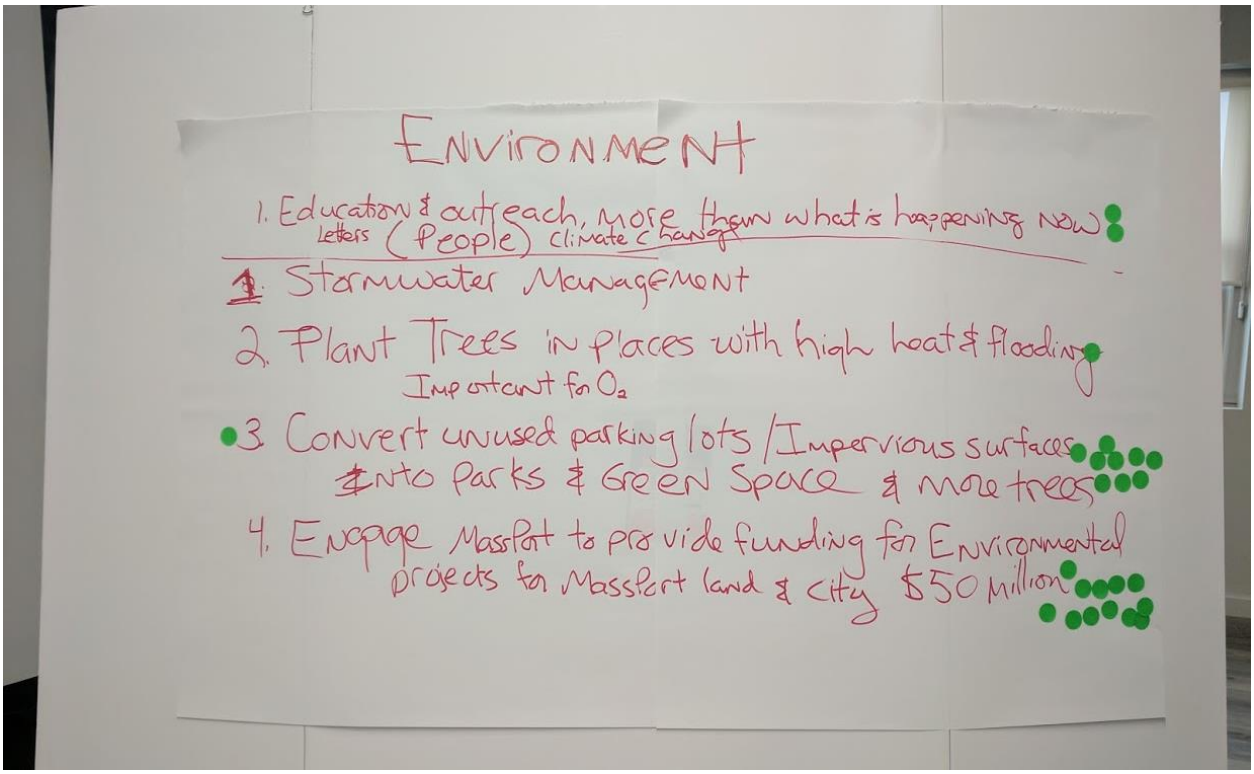
Example of how the wastewater system is vulnerable to flooding and a potential solution. [1]

[1]Designing Coastal Community Infrastructure for Climate Change. Stantec and Woods Hole Group, January 2017

Appendix E –Priority Actions Voting Results by CRB Participants




People
1. Evacuation Plan for whole City in Emergency
People
2. Protect Students now - we are your future!
3. Provide Kits for emergency preparedness, solar power charging cell phones
4. Multi-lingual communication services in an emergency.
5. Innovative strategies for outreach & education, Multi-lingual such as neighborhood Block leaders - for emergency


ENVIRONMENT
1. Education & outreach, more than what is happening now
Letters (People) climate change
1. Stormwater Management
2. Plant Trees in places with high heat & flooding
Important for O2
3. Convert unused parking lots / Impervious surfaces into parks & Green Space & more trees
4. Engage Massport to provide funding for Environmental projects for Massport land & city $50 million