

# CLIMATE PERSPECTIVES

Summary of Findings from Focus Groups with Workers in  
Construction, Farming, Home Healthcare and Fishing

July 2019



# ACKNOWLEDGEMENTS

This document was produced with professional technical assistance provided by the Metropolitan Area Planning Council staff Jeanette Pantoja, Heidi Stucker, Raul Gonzalez, Daniel Koff and artists Hortense Gerardo and Carolyn Lewenberg. Anne Herbst, Senior Regional Environmental Planner and Darci Schofield, Senior Environmental Planner advised on the launch of the project with introductions to industry partners and invaluable feedback on focus group discussion guide content and approach.

Funding support was provided by the Barr Foundation.

## MAPC Officers

President Erin Wortman, Town of Stoneham  
 Vice President Adam Chapdelaine, Town of Arlington  
 Secretary Sandra Hackman, Town of Bedford  
 Treasurer Sam Seidel, Gubernatorial

## MAPC Staff and Artists

Jeanette Pantoja, Public Health Planner  
 Heidi Stucker, Assistant Director of Public Health  
 Raul Gonzalez, Economic Development Planner  
 Daniel Koff, Regional Arts and Culture Planner  
 Hortense Gerardo, MAPC Artist-in-Residence  
 Carolyn Lewenberg, Consulting Artist

## Industry Partners

Thank you to our industry partners for helping to recruit focus group participants and sharing your expertise both before and during the focus groups.

Home Healthcare	Rebecca Gutman, Vice President at 1199 SEIU United Healthcare Workers East Vaughn Goodwin, Union Organizer at 1199 SEIU United Healthcare Workers East
Farming	David Webber, Farmers' Market Program Coordinator, MA Department of Agricultural Resources Mary Jordan, Agriculture Markets Director, MA Department of Agricultural Resources
Fishing	Mary Parks, Executive Director, Green Crab R&D Project (formerly with Red's Best) Jared Auerbach, Founder and CEO of Red's Best
Construction	Steven R. Sullivan, Director of Workforce Development at the Massachusetts Chapter of Associated Builders and Contractors, Inc.

# CONTENTS

<b>Introduction</b> .....	<b>3</b>
Project Background .....	3
Objectives .....	3
<b>Key Findings</b> .....	<b>4</b>
<b>Methods</b> .....	<b>7</b>
Recruitment.....	7
Literature Review and Industry Partner Interviews.....	7
Focus Group Process .....	8
<b>Participant Background</b> .....	<b>9</b>
Home Healthcare .....	9
Farming.....	10
Fishing .....	11
Construction.....	12
<b>Focus Group Findings</b> .....	<b>13</b>
Home Healthcare .....	2
Farming.....	17
Fishing .....	22
Construction.....	26
<b>Art Installation and Next Steps</b> .....	<b>31</b>

# INTRODUCTION

## Project Background

Climate change is already visible across the Metro Boston region, forcing individuals and communities to cope with increasingly severe weather, unpredictable harvests and workplace conditions, and greater risks from vector-borne and heat-related illnesses. The Metropolitan Area Planning Council (MAPC) has been working alongside communities in the region to enhance their resilience in the face of these impacts. Engagement with the diversity of perspectives on climate change within our region is critical to the pursuit of thoughtful climate resilience planning and policy advocacy.

The *Climate Perspectives* project integrates focus groups and participatory art-making to collect individuals' perspectives on the current and future impacts of climate change as well as emerging resilience strategies. This project intentionally focuses on industries and workforces with greater exposure to climate impacts and employees who serve climate vulnerable populations as part of their work. MAPC facilitated four focus group and conducted several follow-up interviews in early 2019. The focus groups were comprised of managers, employees, and representatives from various occupation groups, including outdoor workforces and home health workers.

This report shares findings from the focus group and interview activities. MAPC and collaborating artists will be working through the spring and summer of 2019 to integrate these findings into the art installation. The goal of the art installation is to both communicate the focus group findings and serve as a platform for the collection of additional perspectives from the public.

## Objectives

The Climate Perspectives Project will generate findings that can inform MAPC's climate technical assistance, research, policy advocacy, planning and communications. These findings include:

- Occupation-based and people centered definitions of resilience
- Changes to industry, livelihoods, and any perceived new health risks as a result of ongoing and anticipated changes in climate
- Perceived causes and consequences of climate vulnerability
- Examples of community or industry-derived climate resilience solutions and strategies
- Effective strategies to share messages and communication about climate change

## KEY FINDINGS

	Climate Impacts	Barriers to Resilience	Resilience Assets/ Strategies
<b>Home Healthcare</b>	<ul style="list-style-type: none"> <li>+ Extreme temperatures and lack of adequate weatherization of clients' homes undermines client and Personal Care Aide (PCA) health.</li> <li>+ Poor air quality and increased allergens may be contributing to seasonal respiratory health issues among clients and PCAs.</li> <li>+ PCAs have few alternatives to traveling during severe weather to provide care to their clients despite the difficulty and risks.</li> <li>+ PCAs face additional mobility barriers during severe weather events caused by local authorities failure to plan for and accommodate PCAs need to travel during these events.</li> <li>+ Storm-related risks include power outages that can lead to loss of power to clients' medical devices.</li> <li>+ PCAs do not feel adequately prepared for a climate-related emergency, but recognize the critical nature of their role.</li> </ul>	<ul style="list-style-type: none"> <li>+ Participants want more training on climate change. Specifically, they want to develop capacity around emergency preparedness and on the climate health issues.</li> <li>+ Clients often need financial assistance for utilities and access to free or low-cost home weatherization.</li> <li>+ PCA's do not have formal recognition as part of their client's emergency response team. They specifically asked for personal identification to be carried on their person and placed on their vehicle, so that they can more easily attend to their clients during a severe weather event.</li> </ul>	<ul style="list-style-type: none"> <li>+ PCA's share a strong commitment to their clients. This commitment and pride in their work motivates PCA's to persevere in a stressful and oftentimes poorly resourced work environment.</li> <li>+ Focus group participants are members of the 1199 SEIU Healthcare Workers union. The union facilitates access to information, training, and mobilization that can be leveraged to spread messages about climate change and build adaptive capacity among PCAs.</li> <li>+ Temp or "relief" PCAs may be able to provide additional support to clients when the client's primary PCA is unable to travel to them in the event of a storm or emergency.</li> </ul>
	Climate Impacts	Barriers to Resilience	Resilience Assets/ Strategies
<b>Farming</b>	<ul style="list-style-type: none"> <li>+ Warmer and less predictable seasonal conditions compromise crop planting, crop development, and harvests.</li> </ul>	<ul style="list-style-type: none"> <li>+ Farmers need help understanding what changes to anticipate, including which crops varieties and livestock are more suitable for a changing climate.</li> </ul>	<ul style="list-style-type: none"> <li>+ Participants anticipate that farmers will increasingly utilize greenhouses and controlled environments to protect crops from highly</li> </ul>

	<ul style="list-style-type: none"> <li>+ Erratic weather conditions and high summer heat undercuts the perceived benefit of a longer growing season.</li> <li>+ Less predictable conditions also makes it more difficult to complete on farm improvements.</li> <li>+ Farm operations may be inadequately protected to deal with the impact of extreme heat on worker health.</li> <li>+ Mild winters, storms, and humidity contribute to the introduction of new pests and growth of existing pests.</li> <li>+ More frequent precipitation contributes to work interruptions and poor soil maintenance. Humidity has also makes crop and hay storage more challenging.</li> <li>+ Sea level rise and coastal storms combine to damage coastal cranberry bogs. One farmer anticipates having to eventually abandon his farm.</li> <li>+ Cumulative climate impacts affect farmers' ability to consistently bring products to market and undermines farmers' efforts to sustain a stable base of customers.</li> </ul>	<ul style="list-style-type: none"> <li>+ Participants would like to see greater public and governmental focus on adaptation that is more reflective of their own sense of urgency.</li> <li>+ Regulations can make it more difficult for farmers to adopt some adaptive practices, specifically composting.</li> <li>+ Current regulations may not adequately account for changing climate conditions.</li> </ul>	<p>variable weather conditions.</p> <ul style="list-style-type: none"> <li>+ Farmers have increasingly adopted cover-cropping, silvipasture, and no-till practices as a way to promote soil health and protect soil from extreme precipitation and other climate impacts.</li> <li>+ Solar arrays help control electricity costs and assist with climate mitigation.</li> <li>+ Participants identified grant and technical assistance programs that have been supportive of their adaptation and resilience efforts.</li> <li>+ Policies that support local food production, like institutional purchasing of local food, support the overall viability and resilience of smaller scale agriculture.</li> </ul>
	<b>Climate Impacts</b>	<b>Barriers to Resilience</b>	<b>Resilience Assets/ Strategies</b>
<b>Fishing</b>	<ul style="list-style-type: none"> <li>+ Warming ocean temperatures are contributing to a northward shift in the range of many species.</li> <li>+ The species that are locally increasing in population include both</li> </ul>	<ul style="list-style-type: none"> <li>+ Regulatory catch limits do not reflect the shift in distribution of many commercial species.</li> <li>+ Discussion within the industry about climate change is still somewhat limited and affected by</li> </ul>	<ul style="list-style-type: none"> <li>+ Fishing operations, researchers, chefs, and new non-profits are collaborating to grow or develop markets for new seafood products, including invasive species.</li> </ul>

	<p>commercially-viable species and invasive species with disruptive impacts on local habitats and other species.</p> <p>+ The frequency and breadth of emergency shellfish closures has increased following extreme precipitation events.</p> <p>+ Fishing and processing facilities are vulnerable to damage from sea level rise and severe storms.</p>	<p>tension between fishermen and the scientific and regulatory community.</p> <p>+ The fishing industry workforce is aging, while many barriers exist for potential new entrants.</p>	<p>+ New, flexible procurement partnerships enable the industry to adapt to unpredictable conditions and to develop markets for species that the industry is working to make more commercially viable.</p>
	<p><b>Climate Impacts</b></p>	<p><b>Barriers to Resilience</b></p>	<p><b>Resilience Assets/ Strategies</b></p>
<p><b>Construction</b></p>	<p>+ Less predictable seasonal conditions impact project scheduling.</p> <p>+ Warmer winter conditions allow operations to continue later into the year.</p> <p>+ Climate change motivated changes to building codes and regulations influence the types of new projects.</p> <p>+ Participants anticipate growing demand for resilience infrastructure.</p> <p>+ Participants are more vigilant about worker heat exposure, but it is not an urgent concern.</p> <p>+ Additional impacts include storm damage to worksites (e.g. power outages, flooding) and related increases to insurance costs.</p>	<p>+ The construction workforce is aging.</p> <p>+ Cost, reliability, and convenience are barriers to adoption of clean energy equipment and technology.</p> <p>+ Uncertainty about the anticipated long-term impacts contributes to a lack of urgency about climate change.</p> <p>+ Participants perceive a lack of decisive government action on climate change. Some were skeptical about public commitment to new funding streams for resilience projects.</p> <p>+ Participants do not perceive having full agency to determine how they will adapt. They see themselves as responsive to public policy and client needs.</p>	<p>+ Construction promotes resilience through living wages, job security, and many opportunities for skill development.</p> <p>+ Participants were not deterred by the notion of change. Adaptation is built into the culture of construction.</p> <p>+ Participants described worksite policies and practices that promote worker health and enhance worksite sustainability.</p> <p>+ Licensing boards have been effective in quickly building awareness and instituting change across the industry through new curriculum and licensing requirements.</p>

# METHODS

## Recruitment

The project began with the intention to engage focus group participants from occupations in which workers are more likely to be exposed to climate-related impacts or whose work involves working with populations perceived to be more vulnerable to the effects of climate change. The project team identified construction, farming, fishing, and home healthcare as industries on which to focus its recruitment effort.

The project team reached out to several MAPC partners and agency contacts from each of the four industries to request their partnership in identification and recruitment of focus group participants. These contacts included representatives from unions, trade groups, wholesalers, public agencies, and technical assistance providers. Ultimately, four organizations agreed to lead recruitment efforts for their respective industry. Most organizations recruited from within their own membership. The farming industry partnership was unique in that the project team partnered with conference organizers, so recruitment largely occurred among conference attendees. A small number of other organizations also provided some support by sharing recruitment materials with their networks.

## Primary Industry Partners

### Home Health Care

1199 SEIU United Healthcare Workers East  
Dorchester, MA

### Farming

Harvest New England Conference  
Sturbridge, MA

### Fishing

Red's Best (Wholesaler)  
Boston, MA

### Construction

Associated Builders and Contractors  
Woburn, MA

## Literature Review and Industry Partner Interviews

As preparation for the focus groups, the project team reviewed secondary source material and engaged in one-on-one conversations with representatives from each of the focus group participant industries to learn more about the specific industries and about current and anticipated climate impacts.

The secondary sources reviewed by the project team included industry-specific reports, academic articles, presentations, and news media of various formats. There were several limitations to the secondary sources, which should be noted. Many of the secondary sources were out of date and

not industry-specific. The geographies written about in the reports, studies, or news media were sometimes too large to provide much specificity about impacts in our region or were clearly dissimilar from communities in New England. Even so, these sources provided sufficient material to provide focus group participants with general information about current and anticipated climate conditions. They also provided sufficient material to inform question prompts or suggestions about potential industry impacts.

Project team members also spoke with individuals from each of the industry partners to hear their insight on the industry, what they have already heard about climate impacts on the industry, and relevant concerns that may influence participants' perceptions and engagement with climate change. This additional content was also incorporated into discussion guide topics and questions.

## Focus Group Process

MAPC held a total of four focus groups in different locations. Participants attended a one-time, 60-90 minute focus group where they discussed their knowledge, experience, and responses related to climate change.

Industry	Date	Location	Participants
Construction	February 5, 2019	Woburn, MA	15
Farming	February 27, 2019	Sturbridge, MA	14
Home Healthcare	February 28, 2019	Dorchester, MA	18
Fishing*	March 5, 2019	Boston, MA	6

\*MAPC staff conducted several phone interviews to gather additional data following the focus group in response to lower attendance in comparison to other groups.

Specific topics are listed below, and the discussion guides are available in the Appendix. MAPC staff moderated each focus group and followed a pre-established set of questions tailored to each industry group. The project team moderated the discussion guide topics slightly after the first focus group in reflection of the strength of certain questions and need to integrate others. Two to three project staff manually recorded each of the 60-90 minute focus group discussions (without any personal identifying information). Participants additionally completed a written response to a question at the conclusion of the focus group that asked participants to define climate resilience as it applies to them, personally, and workers in their industry.

### Focus Group Topics

- Current understanding and perception of climate change
- Experience with climate impacts and level of concern
- Perception of what is being done about climate change
- Need for information, resources, or support to take action on climate change
- Ideas for future strategies to address climate change
- Ideas for effectively communicating about climate change to workers in their industry

MAPC staff transcribed written responses and notes from the focus group discussion, coded the transcripts, and analyzed and compared data across focus groups.

# PARTICIPANT BACKGROUND

## Home Healthcare

Eighteen (18) people participated in the Home Healthcare focus group. All participants were 1199 SEIU member Personal Care Attendants (PCAs) living in and around the Codman Square area of Dorchester. However, several described traveling to various parts of Metro Boston to clients' homes. A number of the focus group participants are the PCA for a family member. PCAs provide personal assistance and healthcare support to older adults and people with disabilities in home and community-based settings. The home care workforce, and the focus group participants, primarily comprised of women and people of color.

## Impacts According to the Research

The project team was not able to find sources related to climate change impacts on home healthcare and the home care workforce. Potential impacts included in this table were distilled from research describing impacts to older adults and the healthcare sector, generally.

Climate Conditions	Home Healthcare Impacts <sup>1, 2, 3</sup>
Higher Temperatures	<ul style="list-style-type: none"> <li>- Heat-related illness</li> <li>- Impacts on client health resulting from heat-related illness (dehydration, heat stress, kidney failure, etc.)</li> <li>- Impacts on client health resulting from poor air-quality</li> <li>- Loss of power to medical devices</li> </ul>
Extreme Storms	<ul style="list-style-type: none"> <li>- Loss of power to medical devices</li> <li>- Client faces compromised ability to evacuate</li> <li>- Snow emergency or other storm-related traffic changes may impede ability to get to client</li> </ul>

<sup>1</sup> Centers for Disease Control and Prevention. (2014). *Climate Effects on Health*. Retrieved from <https://www.cdc.gov/climateandhealth/effects/default.htm>

<sup>2</sup> Liss, A. et al. (2017). *Heat-Related Hospitalization in Older Adults: An Amplified Effect of the First Seasonal Heatwave*. Scientific Reports. Retrieved from: <https://www.nature.com/articles/srep39581>

<sup>3</sup> Lane, K. et al. (2013). *Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment*. Journal of Environmental and Public Health. Retrieved from: <https://www.hindawi.com/journals/jep/2013/913064/>

## Farming

Fourteen (14) people participated in the Farming focus group. These included fruit and vegetable farmers, livestock farmers, a cranberry farmer, representatives of buy-local and sustainability organizations, a farmer's market manager, among others. Most participants were attending the Harvest New England Conference, where the focus group was held. Most participants were from Massachusetts, with a few from Maine and Vermont.

### Impacts According to the Research

Climate Conditions	Farming Impacts <sup>4,5</sup>
Higher Temperatures and Drought	<ul style="list-style-type: none"> <li>- Impacts on crop production</li> <li>- Diminishment of livestock health and productivity</li> <li>- Impacts on farmworker health resulting from heat-related illness</li> <li>- Increase in pest, diseases and weed pressure</li> </ul>
Increased Precipitation and Extreme Storms	<ul style="list-style-type: none"> <li>- Soil degradation, particularly from erosion (and compaction, organic matter loss, toxification)</li> </ul>

<sup>4</sup> Hatfield, J., Takle, G, et al. (2014). *National Climate Assessment, Chapter 6: Agriculture* Retrieved from <https://nca2014.globalchange.gov/>

<sup>5</sup> Luber, G. Knowlton, K. et al. (2014). *National Climate Assessment, Chapter 9: Human Health* Retrieved from <https://nca2014.globalchange.gov/>

## Fishing

Six (6) people participated in the Fishing Trades focus group. The project team followed up with one-on-one phone interviews with two fishermen to supplement data. Participants consisted of both recreational and commercial fishermen, wholesalers, technical assistance providers, and a researcher. Fishermen represented various gear-groups, including digging/shell fishing, line and reel, and aquaculture (i.e. kelp farming).

### Impacts According to Research

Climate Conditions	Fishing Impacts <sup>6, 7, 8, 9</sup>
Higher Temperatures	<ul style="list-style-type: none"> <li>- Species range expansion (both commercial and invasive)</li> <li>- More frequent bacterial and algal outbreaks</li> </ul>
Increased Precipitation	<ul style="list-style-type: none"> <li>- Storm-water pollution/contamination leading to shellfisheries closures and bacterial/algal outbreaks</li> </ul>
Extreme Storms	<ul style="list-style-type: none"> <li>- Damage to low-lying infrastructure</li> <li>- Shoreline erosion</li> </ul>
Ocean Acidification	<ul style="list-style-type: none"> <li>- Poor shell formation (calcium carbonate dissolved in acidic water)</li> </ul>

<sup>6</sup> Morley, J. et al. (2018). Projecting shifts in thermal habitat for 686 species on the North American continental shelf. PLoS ONE. Retrieved from: <https://www.fisheries.noaa.gov/feature-story/new-study-climate-change-shift-many-fish-species-north>

<sup>7</sup> Working Group on Climate Change Impacts on Shellfishing in Wellfleet Harbor. (2015). Planning for Climate Change Impacts on Shellfish in Wellfleet Harbor. Social and environmental Research Institute. Retrieved from: <http://wellfleet.seri-us.org/>

<sup>8</sup> Jolicoeur, L. and Mullins, L. (2017). Concerned Citizens and Fishermen Help Scientists Track Ocean Changes in Effort to Fight Climate Change. WBUR News. Retrieved from: <https://www.wbur.org/news/2017/08/23/citizens-track-water-data-climate-change>

<sup>9</sup> Shea, Andrea. (2017). Bacteria That Thrive in Warmer Waters Keep Mass. Oyster Fisheries on High Alert. WBUR News. Retrieved from: <https://www.wbur.org/news/2017/08/30/oyster-bacteria-climate-change>

## Construction

Fifteen (15) people participated in the Construction Trades focus group. Participants were predominantly business owners and contractors from a range of construction sub-specialties (e.g. plumbing, HVAC, electrical, etc.). Some were alternatively administrative-level staff working in construction companies or organizations that provide services to the construction sector (e.g. insurance, human resources, compliance, workforce development, etc.). Collectively, they provide construction services across the Metro Boston region.

### Impacts According to the Research

Climate Conditions	Construction Impacts <sup>10, 11, 12</sup>
Higher Temperatures	<ul style="list-style-type: none"> <li>- Impacts on worker health resulting from heat-related illness</li> </ul>
Increased Precipitation	<ul style="list-style-type: none"> <li>- Workplace flooding and storm-water contamination</li> <li>- Work interruptions due to impact on concrete curing, excavation, etc.</li> </ul>
Extreme Storms	<ul style="list-style-type: none"> <li>- Equipment and structural damage</li> <li>- Higher insurance premiums</li> </ul>
Cumulative/Other	<ul style="list-style-type: none"> <li>- Work forecasting challenges due to unpredictable seasonal conditions</li> <li>- Change in building/zoning regulations and design standards as communities implement climate resilience policies</li> </ul>

<sup>10</sup> Centers for Disease Control and Prevention. (2014). *Climate Effects on Health*. Retrieved from <https://www.cdc.gov/climateandhealth/effects/default.htm>

<sup>11</sup> Freeman, Jennifer. (2017). Climate and Construction. National Oceanic and Atmospheric Administration ClimateWatch Magazine. Retrieved from: <https://www.climate.gov/news-features/climate-and/climate-construction>

<sup>12</sup> Orien, M. and Laughlin Silver, T. (2008). Climate Change is Heating Up the Construction Industry. Construction Lawyer by the American Bar Association. Retrieved from: <https://www.hollandhart.com/articles/climatechangeheatingupconstruction.pdf>

# FOCUS GROUP FINDINGS

## Home Healthcare

### Climate Impacts on Personal Care Aides and Clients

*Personal Care Aides (PCAs) provide valuable in-home health care to individuals with disabilities. Climate change impacts, from high heat to severe storms, and related power outages and other issues can further impair client health and put PCAs at risk as well. PCAs are a generally under-recognized and lack protections and resources relative to the services they provide and the vulnerable clients they serve.*

**+ Many PCAs shared concerns related to extreme temperatures and lack of adequate weatherization of clients' homes. Temperature extremes can worsen clients' health conditions and result in higher utility cost burdens that impact both clients and PCAs. PCAs also suggested that higher indoor temperatures undermine their ability to safely and comfortably carry out job duties.**

*"My parents lived in a place that gets extremely hot and doesn't have AC. I walked in to find my mom sweating, distressed and physically sick. I called elder abuse, city inspectors, you name it, but the building wasn't required to make any changes. I had to move my parents, which was emotionally stressful. My dad has PTSD and Alzheimer's. The stress of moving made him go over the edge, and he had to move to a nursing home."*

PCAs identified impacts related to both hot and cold temperature extremes. They focused their comments on utility costs, their clients' health conditions, and their own ability to cope with temperatures while at work. Many of the issues identified by PCAs were related to or a direct result of inadequate air conditioning or weatherization in clients' homes. PCAs also explained that most clients take medications or experience health conditions that compromise their ability to cope with extreme temperatures within their homes or restrict their ability to be outside. Some of these conditions included arthritis, diabetes, respiratory conditions, weak immune systems,

physical disabilities, and dementia. PCAs also reported that clients, many of who live on fixed incomes, may be severely cost burdened by high summer and winter utility bills. At least one PCA reported assisting their clients with utility expenses to secure her own comfort and that of her client's while working in her client's home. PCAs also briefly talked about their own challenges with summer and winter utility expenses.

Clients' limited incomes, health conditions, and need for homes with accessible features also make relocation to a weatherized unit more difficult. One PCA gave a detailed account of her unsuccessful attempts to secure weatherization improvements for a client with mobility issues and dementia, which resulted in the client's need for relocation. According to the PCA, the relocation experience was so traumatic for the client that their health further deteriorated, necessitating a move to a nursing home facility.

**+ A few PCAs also shared perceptions that the changes in climate may be contributing to poor air quality or increases in allergens, which could be contributing to worsening respiratory health among clients and PCAs.**

A few PCAs shared observations and personal experiences related to worsening respiratory conditions, including issues with asthma, bronchial infections, and allergies. They noted that these conditions appear to worsen around periods of intense heat or cold and may be related, but suggested that they were not certain and want to learn more about the potential relationship.

**+ PCAs feel that they have few alternatives to traveling during severe weather to provide care to their clients, despite acknowledging the increased difficulty and risks. They feel committed to providing that care regardless of the weather, but often feel penalized for going out of their way to help their client.**

Many clients depend on PCAs to perform daily tasks (i.e. eating, dressing, and personal hygiene). These activities require trust and familiarity, so clients may be reluctant to accept care from an alternate care provider. A few PCAs described relying upon a property manager or a temp PCA that lives near the client to check in on a client during the storm, if the primary PCA is unable to visit. However, focus groups participants expressed that missing a commitment with a client is not a realistic option for the majority of PCAs.

Most PCAs will travel through a storm, even when expressly told not to by local authorities or when public transportation options are unreliable or unavailable. They acknowledged the possibility that they are putting their own safety at risk, but rationalized that risk in terms of their clients' wellbeing. PCAs expressed particular frustration at the lack of accommodation they experienced for their need to travel during severe weather. Road closures and snow emergencies can create additional barriers to PCAs' ability to get to their clients. They may be unable to find parking near their clients' home or face a traffic fine for traveling or parking in prohibited areas. They perceive these barriers as penalty for providing a critical and necessary service, and specifically requested some form of identification for their vehicles to facilitate their travel during a storm.

**+ PCAs often spoke about their role in relation to first responders and other emergency personnel. They suggested not feeling adequately prepared in the event of a climate-related emergency, but understood that their role in such a scenario would be critical. They specifically focused on the acute risks imposed by a potential power outage, including the loss of power to clients' medical devices.**

In addition to concerns shared about clients' ability to meet their daily needs, PCAs talked about the potential consequences of loss of power to a clients' medical devices in the event of a storm. They described how the loss of power to specific medical devices could create need for an

*"We are not recognized as emergency personnel in the same way doctors, EMTs are recognized. PCAs put their lives in danger for their clients. They are the lifeline to their clients. 911 sometimes doesn't go because they have too much to do. Especially during a power outage. Sometimes clients don't want anybody else."*

*"Emergency responders needs information that we have (oxygen tanks, medications)."*

immediate intervention by the PCA or need for emergency healthcare services. The risk of a trip to the emergency department was one of the primary reasons PCAs felt they need to be with their clients in the event of a storm. They expressed concern that a first responder, unaware of their client's health history and needs, may inadvertently put their clients at higher risk. PCAs suggested that in an emergency, they would likely be the purveyors of that health-related information.

## Barriers to Resilience within Home Health Care

**+ Participants expressed interest in receiving more information and training in relation to climate change. Specifically, they are looking to develop knowledge and skills related to emergency preparedness and the connections between health and climate change.**

The focus group was the first time this particular group of PCAs had been brought together to consider the relevance of climate change to their work. PCAs were most prepared to talk about the impact of severe weather on their work, but speculated about other ways in which climate change may have an impact on their personal health, that of their clients, and their general ability to perform their work. They expressed interest in the examples provided by the facilitator of climate health training provided to home healthcare workers in other parts of the country. Several indicated during and after the focus group session that they would be interested in similar training opportunities locally. Some asked that the facilitators come and speak about climate change again, and many others specifically requested emergency preparedness training and related equipment.

**+ As indicated by several PCAs, clients often need financial assistance for utilities and access to free or low-cost home weatherization.**

Many of the focus group participants' clients live in homes that compromise their health and wellbeing during periods of extreme high or low temperatures. Clients and PCAs are forced to cope with the unsafe living conditions or relocate to a more habitable unit, an option that is particularly difficult for individuals with low incomes and mobility issues. Alternatively, services providers and agencies can facilitate access to utility assistance and weatherization services.

**+ PCA's are frustrated that they do not have formal recognition as part of their client's emergency response team. They specifically asked for personal identification to be carried on their person and placed on their vehicle, so that they can more easily attend to their clients during a severe weather event.**

PCA's feel that the lack of recognition undermines the health and safety of their clients, especially during emergencies. It contributes to the barriers they experienced when trying to travel through a storm to their client or when trying to communicate with other health and emergency personnel responding to a client's health emergency. They feel that a form of identification – whether it's a badge or vehicle tags – can quickly communicate the role that they provide for their clients, as caretakers and purveyors of information critical to the proper delivery of healthcare for their client.

## Factors Enabling Resilience of Personal Care Aides and Clients

**+ PCA's share a strong attitude of needing to be present and resilient for clients no matter the circumstances. Their dedication to their clients and pride in their work motivates PCA's to persevere in a stressful and oftentimes poorly resourced work environment.**

PCA's descriptions of some of the challenges of their work – insufficient supplies, high transportation costs, clients' unsafe living conditions – contrasted with repeated expressions of empathy and deep dedication to their clients. PCAs take pride in the wellbeing of their clients, especially in the times in which their care has resulted in a marked improvement in their client's health status. It should be noted that several of the PCAs participating in the focus group provide care to a family member. There was broad agreement within the group that climate change would not stop PCAs from providing necessary care to their clients, even if it makes their job more difficult. PCAs shared a strong commitment to their clients.

**+ Focus group participants are members of the 1199 SEIU Healthcare Workers union. The union functions as a source of information, training, and mobilization that can be leveraged to distribute messages about climate change and build adaptive capacity among PCAs.**

*“The Green Justice Caucus deals with things like this, so that is a group to get involved in - to make a difference in these issues. If we have more information about environmental justice, the more we can offer resources to those we care for, work together with organizations who are devoted to issues of climate justice. We have to organize.”*

A few participants talked about how membership in the union has facilitated their access to information, training, and organizing that has resulted in higher wages for PCAs and connections to mobilization efforts around broader social issues that impact PCAs' wellbeing. The union recently developed a Green Justice Caucus to engage union members around climate and environmental justice issues and to mobilize across organizations around these issues. Union staff and active members encouraged their fellow PCAs at the focus group to become more involved in union activities, specifically the Green Justice Caucus. The union also has an education fund to support PCA training that staff and active members suggested could be used to develop PCAs knowledge and preparedness around climate change.

**+ Temp or “relief” PCAs may be able to provide additional support to clients when the client's primary PCA is unable to travel to them in the event of a storm or emergency.**

“Relief PCAs” are home healthcare workers that can be hired on a temporary basis to fill in when a client's primary PCA is sick or unable to travel to the client. Focus group participants indicated that their ability to rely on relief PCAs is largely dependent on the preferences of the clients. Many PCAs suggested that their client would not be comfortable accepting help from an alternate PCA. Some of the daily tasks with which PCAs provide assistance are intimate in nature and require a lot of trust. However, a few PCAs did suggest relying on relief PCAs that live near a client to check in on the client in the event of a storm or similar circumstance in which they were unable to personally attend to a client. One PCA suggest that training and protocols on use of relief PCAs in storm situations may be a helpful way to provide continuity of care to clients.

## Farming

### Climate Impacts on Farmworkers and Farming Operations

*Agriculture is an inherently unpredictable industry, and farmers have always adapted to changing weather conditions. Climate change is bringing about unprecedented climate extremes which Massachusetts farmers are struggling to adapt to, and which are impacting crop and livestock productivity. Changing conditions are simultaneously challenging the viability of farm operations, as well as spurring farmers to adopt innovative adaptive techniques and practices.*

**+ There was broad consensus that less predictable temperatures compromise crop planting, production and harvests.**

Farmers described difficulties related to milder winters, hotter summer temperatures, later frosts, and greater variation in temperatures at the start and end of growing seasons. This variability in weather conditions from year to year is making it more difficult for farmers to schedule planting and risks crop loss or damage.

For example, orchardists reported fruit crop damage related to mild winter and early spring conditions. The trees bud early, which exposes trees to damage from spring frost. Vegetable farmers are also having a difficult time determining when to plant, given erratic weather conditions that differ from the historic planting period. Planting too early or too late can expose the plant to damage and create issues with plant sugaring cycles, resulting in a lower quality crop.

At the other end of the growing season, first frosts have been arriving later in the year. This shift has both benefits and drawbacks. Cool weather crops may mature later in the season, allowing farmers to maintain sales later into the season. However, some plants also require frost in order to mature. Some farmers experienced problems with crops maturing too late or not at all. If the cranberry crop matures too late, for example farmers may risk missing the critical Thanksgiving marketing window on which they depend.

Extreme variation of temperature also makes it hard to maintain even temperature in greenhouses, which can result in higher energy costs and impacted harvests.

*“First frosts have been getting later. To a certain extent, that’s been good for us. We do a lot of cold crops that like that cool weather, so we have later harvests and more sales. This year was total opposite. We have field of cabbage that we plant same date for the last ten years that never made it to maturity.”*

*“You’re just not really certain when the season really started. You get a warm spell, and then it’s cold again. There’s just no predicting – it’s too erratic now.”*

**+ Participants provided more nuance to the idea that climate change will provide farmers with longer growing seasons. Erratic weather conditions and high summer heat can undercut the perceived benefit of a longer season.**

Since the 1980's the "growing season" has extended by about ten days. However, participants suggested that the perceived longer season is compromised by increased unpredictability at the beginning and end of the growing season. Participants also suggested that an increase in high-heat days in the middle of the summer creates conditions too hot for some crops to grow. Even some warm weather crops (e.g. tomatoes) stop production in response to extreme heat. Crops that mature too early because of high-heat require adjustments to harvesting and farmworker schedules. Increasing high temperature days may limit farmers to growing crops that can tolerate high heat.

**+ Unpredictable weather conditions make it more difficult to complete on-farm improvements.**

Participants suggested that unpredictable weather and bouts of extreme precipitation or extreme heat can make it more difficult to complete any on-farm construction or improvement projects. The activities described ranged from adding fencing to installation of solar arrays. These interruptions are especially difficult for farmers completing projects with grant funding that includes tight timelines.

**+ Farm operations may be inadequately protected to deal with the impact of extreme heat on worker health.**

Massachusetts does not enforce heat-related illness protections to the extent they are implemented in other agricultural states, such as California. Participants acknowledge that high heat poses potential health risks to farmworkers, beyond making summertime work generally more difficult. Participants reported having to pause fieldwork more frequently because of unsafe heat conditions.

**+ Mild winters, storms, and humidity are contributing to the introduction of new pests to the region and growth of existing pests for which there are few natural protections.**

Mild winters and humidity from increased rainfall have combined to create ideal conditions for the growth of certain pests. Participants reported having more issues with ticks carrying Lyme Disease, and that both livestock and farmworkers and increasingly bitten and contracting Lyme Disease. They also talked about dealing with livestock parasites. Excessive exposure of moisture to food sources and hooves could be contributing to increased incidence of parasites. Participants also theorized that seasonal storms may be driving up pests from other regions into the area.

**+ Increased precipitation and drought conditions pose fieldwork challenges, and compromise soil health and harvests.**

Participants talked about the difficulty of carrying out farm activities during periods of persistent precipitation. Farmers are dealing with soil erosion, soil conditions that are too wet for planting or harvesting, muddy conditions that make it difficult to carry out farm construction projects.

Generally, the increased precipitation has contributed to excessive humidity that compromises crop and hay storage. Crops and hay are increasingly spoiling in storage.

Participants also described issues related to increasing drought conditions. In the last few years, drier weather has characterized the early-mid spring period. Last year, parts of the state actually went into a short period of drought. Dry conditions require farmers to install and maintain irrigation at the same time that they are planting and harvesting. Come later summer and early fall, the conditions are too wet, which then makes it difficult to harvest and plant fall crops.

**+ Sea level rise and coastal storms combine to damage coastal cranberry bogs. Some farmers anticipate having to eventually abandon their farm.**

One participant, a coastal cranberry farmer, talked at length about past battles and current issues with sea level rise and coastal storms that have resulted in road and equipment damage and saltwater intrusion into cranberry bogs. Saltwater is damaging to cranberry crops. The participant anticipates having to suspend operations in a few years as storm damage increases in frequency and makes his business unviable.

*“That storm took a road out and took out a piece of the bog - had to rebuild the road and rebuild part of the bog. Two months later, we’re going through the same thing. Talk about being kicked when you’re down.”*

**+ Customers expect consistency. The cumulative impacts of climate change on farmers’ ability to consistently bring products to market may undermine farmers’ efforts to sustain a stable base of customers.**

Customers are not necessarily aware of the conditions that affect a farmer’s ability to consistently provide a variety of produce and agricultural products at farmer’s markets, CSAs or through other direct-to consumer markets. Where climate change may result in smaller or no harvests of certain crops, and customers expect a variety of seasonal farm products, focus group participants described the increased risk of losing customers when harvests fall short of expectations.

**+ Climate change impacts on farms locally and regionally have economic and supply chain impacts.**

Where climate change impedes farmers from producing on-farm, they may need to source products from other farms or sources. If impediments are experienced broadly, this can lead to greater demand for products, supply shortages, and increased costs. The example provided by a participant was that a combination of high heat and humidity prevented her from growing and then storing her hay. What she did grow molded and was unusable, and consequently she had to buy in hay. The broad increase in demand for hay led to good quality hay being very expensive. Where agriculture is an industry with narrow profit margins, this is an example of climate impacts may compromise the viability of farm operations.

## Barriers to Resilience within Farming

**+ Farmers need help understanding what changes to anticipate, including which crops varieties and livestock are more suitable for a changing climate.**

Participants were interested in more information about crop varieties that will be more resilient to anticipated pest and fungal pressures. The Extension Service describes that it can advise on farm practices, but doesn't have the capacity at present to advise on what specific crops and livestock species will be resilient and adaptive to changing conditions. It recognizes that farmers will need better predictors of these changes.

**+ Some participants voiced frustration with the lack of consensus and coordination around climate action. They would like to see greater public and governmental focus on adaptation that is more reflective of their own sense of urgency.**

*"All the people in this room are doing the best we can, but everyone needs to be working on this. People hear that so and so is losing his bog, and they just go back to what they were doing. We need people working together on a huge public awareness campaign."*

While participants easily articulated a number of impacts and resilience strategies, they also acknowledged that climate change has not emerged as a widespread and consistent topic of conversation across the industry. They also lamented the lack of public awareness of agricultural climate impacts and consensus on climate action.

Participants stated that they would like to see more awareness building campaigns and coordination to address climate change, especially in consideration of the time it could take to implement widespread industry changes.

**+ Regulations, specifically composting regulations, may be making it more difficult for farmers to adopt some adaptive practices. Participants suggested that current regulations may not adequately account for changing climate conditions.**

Composting retains moisture and protects against crop damage during drought conditions, but according to focus group participants, new Massachusetts composting regulations have made it really hard to embrace composting as an adaptive practice for organic farms. These regulations are primarily concerned with food safety and phosphorus contamination of waterways. Cranberry farmers and dairy farmers have some exceptions that support their use of composting, but organic farmers feel that the application of these regulations discourages their use of composting. Technical assistance providers have been trying to work with farmers to interpret the regulations, but acknowledged that the regulations are difficult to interpret and restrictive. Participants recognized that phosphorus pollution is a legitimate cause for concern that requires mitigation, but that farmers do not necessarily have the same level of resources to implement mitigation practices as other regulated entities (e.g. golf courses). Participants also talked about how current regulations may not adequately reflect climate conditions that could impact a farmers' ability to comply, such as extreme precipitation and premature snow melt.

## Factors Enabling Resilience of Farming Operations

**+ Participants anticipate that farmers will increasingly utilize more greenhouses and controlled environments to protect crops from highly variable weather conditions.**

*“One thing I’ve done and see done on a more global scale is greenhouses and protected environments. You hate to see these cities of plastic, but an enclosed structure is going to produce so much more than an unprotected area.”*

Greenhouses and other controlled environments, such as high tunnels help provide temperature and precipitation protection for crops. High tunnels, specifically, can be outfitted with heaters to ensure a consistent temperature, including in the winter when temperatures may swing wildly. Farmers are looking to other regions and countries to identify potential adaptive practices related to controlled environments (e.g. Netherlands). These controlled environments can also extend the growing season to support more production with less land area. Participants recognized that implementation will need to consider the protections for point source pollution.

**+ Farmers have been increasingly adopting cover-cropping, silvopasture, and no-till practices as a way to protect soil health from extreme precipitation and other climate impacts.**

Cover-cropping, silvopasturing and no-till are not new practices. However, with increased threats to soil health from extreme precipitation and other climate conditions, more farmers are embracing these practices. Participants felt that it has become necessary to protect soils. More and more farmers are turning to a combination of cover-cropping and no-till agriculture, which involves keeping a cover crop and planting into it. No till requires special machinery and new approaches to planting. Farmers have been working with technical assistance providers and farm grant programs to access training and financing for equipment. Silvopasturing, an agroforestry approach, combines orchards with forage and livestock production. Through this approach, woody biomass of the trees sequesters carbon, shady conditions improve forage quality and protect livestock from high-heat, in addition to other co-benefits.

**+ Solar arrays take care of electricity costs and assist with climate mitigation.**

Massachusetts Department of Agricultural Resources (MDAR) and Rural Energy for America Program (REAP) solar grants and incentives have allowed farmers to add solar arrays to farm operations to cut down on energy use and costs. In certain scenarios, farmers may be able to get money back for energy production over their own use. These sorts of clean energy programs have helped farmers reduce their carbon footprint and enhance the overall viability of their farm operations.

**+ Policies that support local food production, like institutional purchasing of local food, support the overall viability and resilience of smaller scale agriculture.**

Participants view policies that support local food production, including institutional purchases by universities and others, as supportive of farm operations’ resilience. These policies also support awareness building of sustainability and resilience efforts being carried out directly by farmers, including crop diversification, soil conservation, composting, and food waste reduction.

**+ Participants identified grant and technical assistance programs that have been supportive of their adaptation and resilience efforts.**

Participants identified a number of public agencies and technical assistance providers that have been supportive of their resilience and adaptation efforts. These include Natural Resources Conservation Services, MDAR Agricultural Environment Enhancement Program and the Agricultural Climate Resiliency & Efficiencies Program, and the United States Department of Agriculture REAP program. These programs help unlock training and funding to support adoption of cover cropping, silvopasture, no-till systems and practices, controlled atmosphere bins for crop storage, solar arrays, etc.

## FISHING TRADES

### Climate Impacts on the Fishing Trades

*Climate change is creating significant changes in marine ecosystems and the fish and shellfish found in Massachusetts waters. The local seafood industry is building markets for newly-appearing and lesser-known fish that are now abundantly available. Despite these adaptations, regulations are not keeping up with current and changing conditions, and there is a need for regulatory reform and enforcement that is responsive to climate change impacts.*

**+ Warming ocean temperatures are contributing to a northward shift in the range of many species. Participants report seeing a greater abundance of southern, commercially viable species in New England waters, even as some local species are on the decline, and migrating elsewhere.**

Focus group participants generally expressed optimism at the abundance and diversity of commercially viable species available in New England. They took issue with what they see as a common, but misinformed media message that New England's fisheries are experiencing some sort of existential crisis or decline. They clarified that local fisheries are more accurately experiencing a transition, and that fishermen and clients alike have to be prepared for that transition. There are several historically abundant species that have become less viable (e.g. cod), but that other commercial species are increasingly abundant due to a general northern migration of certain species' ranges. Some of these species include dogfish, skate, mackerel, and fluke.

**+ However, some of the species that have recently migrated into New England waters or that are experiencing an increase in population are having disruptive impacts local ecosystems and populations of commercial species. Fisheries groups are currently working to establish commercial uses for some of these species.**

Some of the species that participants discussed are broadly recognized as invasive species with potentially detrimental impacts on local ecosystems and fisheries. They include green crabs, periwinkles, triggerfish, and lion fish. Their populations have grown dramatically in the last few years. New England green crabs are a hybridized species that is considered to be more climate

tolerant and aggressive. They prey upon the larvae of lobsters and other commercial species, and they damage eel grass habitat, which is a nursery for many commercial species. Triggerfish and lion fish are tropical species. Lion fish specifically, have recently emerged in Long Island Sound and are rumored to have appeared in the Gulf of Maine. Lion fish also prey upon commercial species. Participants noted that there are currently a lot of federal dollars and new initiatives targeted at addressing impacts of lion fish and green crabs. One key strategy is developing new markets for these invasive species.

**+ The frequency of emergency shellfish closures has increased following extreme precipitation events. Participants suggested that more shellfish growing areas are also being included in the closures than in years past.**

Shellfish beds are filtering ecosystems and the “last barrier before water rushes out to sea, water from roadways, farmland.” As such, they are highly susceptible to contamination from storm water run-off. Warming temperatures have also contributed to better conditions for the growth of bacteria. There were multiple shellfish closures in 2018 triggered by bacterial contamination of shellfish beds following heavy rainfall events. Several of these were statewide closures, which represents a relatively new phenomenon that has only emerged in the last two or three years. Closures now sometimes includes the Monomoy National Wildlife Refuge, which is located far from any industry or urban development. Participants were skeptical that state agencies are actually monitoring Monomoy to confirm the presence of contamination. These broad closures have seeded frustration and distrust within the shellfish industry.

**+ Fishing and processing facilities may be vulnerable to sea level rise and storm surge.**

One participant suggested that sea level rise may increasingly put fishing operations at risk by damaging and prohibiting access to coastal facilities. He shared that recent storms created business interruptions by blocking access roads and temporarily flooding facilities on piers, leaving debris (e.g. seaweed) that needed to be cleaned up before operations could continue. He was able to absorb some of the lost productivity because he had facilities elsewhere that were not damaged and able to continue processing deliveries. However, fishermen reliant on the damaged facilities were temporarily left without a place to deliver their catch.

## **Barriers to Resilience within the Fishing Trades**

**+ The mismatch between regulatory catch limits and the change in distribution of commercial species is maladaptive and a source of frustration for many in the fishing industry.**

Participants feel that industry regulations are outdated and do not adequately reflect the current and anticipated impacts of climate change. According to participants, catch limits are based on historic population trends that are inconsistent with current observations of species abundance.

*“The challenge I have is that the regulations are built on the distribution of fish populations from 30 years ago, so we have abundant fish stocks that we’re not able to harvest because the regulations don’t account for the reality that the distribution will move north.”*

One participant used the fluke harvest to illustrate this point. Local fishermen must observe seasonal as well as daily catch limits. The daily fluke catch limits for local fishermen is 300 lbs. a day, whereas the catch limit for North Carolina fishermen is 10,000 lbs. a day. These limits reflect the historic abundance of fluke in the mid-Atlantic. However, fluke have become much more abundant in New England as its range has shifted north. Local fishermen have been reaching their catch limit much earlier in the day and earlier in the season. The harvest is over by July, at which point many people working that harvest may be out of a

job. However, by July, there is still plenty of fluke in New England and depleted stocks in the mid-Atlantic. North Carolina fishermen are driving their boats up to New England to continue fishing, while the local fluke fishery has essentially closed.

**+ Participants suggested that discussion within the industry about climate change is still somewhat limited and affected by tension between fishermen and the scientific and regulatory community.**

As an industry that is constantly adapting to changing environmental condition, there is still not broad awareness about the way in which climate change may be uniquely affecting the industry. Additionally, it is not apparent that it is an issue that is widely discussed among fishermen as much as it is discussed among fisheries scientists and others working at the edges of the industry. There is history of tension between fishermen and the scientific and environmental advocacy community, fueled by battles over perceptions of and regulations related to overfishing as well as more recent shellfish closures and conflicts related to seal population protections. That tension is not universal, but it is a barrier among some in the industry that may make it more difficult to collectively address climate issues.

**+ The fishing industry workforce is aging, while many barriers exist for potential new entrants. These barriers include misperceptions about the industry.**

Participants expressed concern that not enough young people are entering the fishing trades to replace the aging workforce. They acknowledged that fishing can be a particularly challenging industry to enter. Depending on the specialty, there can be very high gear costs and permits for many species are difficult and expensive to acquire. Permits for several of the most commercially popular species are essential closed to new entrants, numbering only in the couple hundred. A new fisherman would have to purchase the permit from an existing permit holder (i.e. closed permit). Even in specialties where permits may be more abundant, the process for applying may be labyrinthine. It may be hard to find the application, know when to apply, understand the conditions, etc. The regulations may be difficult to understand and scare away new entrants. Participants suggested that new entrants need significantly more support to get started.

Participants also felt that the media has undermined the potential growth of the workforce by misrepresenting the state of the industry. Stories about problems facing the industry or alleging the decline of the trade are abundant and discouraging. The media can instead help to publicize

emerging practices within the industry and opportunities to get engaged (e.g. publicizing the start of the season and availability of permits).

## Factors Enabling Resilience within the Fishing Trades

**+ Fishing operations, researchers, chefs, and new non-profits are collaborating to grow or develop markets for new seafood products as an economic development and adaptation strategy, including markets for invasive species.**

*“Part of the strategy for preparing for climate change is asking about what else can be grown or harvested in this region. We’re learning how to harvest, sell, and prepare green crab. You have to beat the pavement and call up this person, that person – who might be a potential buyer?”*

Participants described collaborative initiatives and individual efforts to create or expand markets for kelp and invasive species, such as the green crab. Developing markets for invasive species serves two purposes. It helps fishermen control the population of species that are destructive to commercial species and their habitats. It also provides fishermen with an opportunity to grow into a market where species are experiencing population growth as some species they’ve traditionally harvested experience decline, either because of climate change or other factors. Participants also talked about kelp aquaculture as a potential adaptation strategy. Kelp has many culinary and industrial uses and can be grown in the winter, offseason for the shell fishing industry. One

participant explained that kelp aquaculture can also potentially augment incomes for weir fishermen, whose industry has been negatively affected by Cape’s growing seal population.

Efforts to develop new markets must overcome a number of barriers, such as building public demand for these products, recruiting fishermen, ensuring those fishermen have access to processing facilities, technical assistance, and the right gear. Any new equipment can present a prohibitive barrier to entry for fishermen. Advocates for these new products must also work with regulatory bodies to ensure programming and regulation support the development of these new products. Funding, public agency technical assistance, and the emergence of new non-profits specifically dedicated to helping fishermen overcome some of these barriers are helping to facilitate and build momentum for the growth of these markets.

**+ New, flexible procurement partnerships are enabling the fishing industry to adapt to unpredictable conditions and to develop markets for species that the industry is working to make more commercially viable.**

The mismatch between clients’ expectations of a year-round supply of a small number of commercial species and a fishery that is constantly in flux has been a persistent challenge for the industry. This expectation is even more untenable given the redistribution of species ranges. Fishermen need clients to adapt their preferences and embrace changes in what is available

*“It’s important to be knowledgeable of what we consume. Nothing I’ve interacted with in nature has been at a steady state. Accepting that and being logical is important. We need to eat what the ocean provides us. The problems of today are going to change, with or without climate change.”*

seasonally and even within seasons. Participants are optimistic that new, flexible procurement contracts with institutional buyers, such as schools and universities, have allowed them to advance this culture shift in client preferences. In one example, the institution and the wholesaler agree on a set price, but the wholesaler is provided flexibility in determining the product to deliver each week. That allows wholesaler and fishermen alike the ability to adapt to what is available and abundant as weather and environmental conditions change.

Schools and universities have also been a good place to test client tastes for new species and products. At a school setting, the wholesaler may show up a day before the cafeteria serves a new seafood option, do a bit of education about the fish species, and provide students with samples. This practice has been effective in encouraging students to embrace new foods.

## Construction

### Climate Impacts on Construction Workers and Operations

*The construction industry is vital to the region's transition to climate resilient buildings and infrastructure. The industry feels prepared with the skillset to respond to the demand for resilience projects, provided an adequate supply of workers and political will to fund new work. Project scheduling has been most affected by changing climate conditions. Less predictable seasonal conditions and milder winters are allowing construction operations to extend work into the winter and early spring, a time when construction activities would have previously slowed.*

**+ There was broad consensus that less predictable seasonal conditions are making project scheduling more difficult. However, warmer winter temperatures are allowing operations to extend certain construction activities later into the year.**

The loss of predictability in seasonal conditions was a frequent topic of discussion during the focus group. Participants described observing a general shift in winter weather conditions towards later in the year and a trend towards milder winters. They also talked about impacts associated with wide day to day temperature swings. A short and unanticipated peak of very low temperature days may interrupt weeks of consistent mild temperatures.

These changes have impacted the construction trades both positively and negatively. Generally warmer and later winters have allowed operations to continue certain activities later into the year, including earth work and pouring cement. Whereas, construction

*"The planning process has changed. There is no real seasonal look at construction."*

*"Certain construction activities are phased out over several days. Can you start something that has other steps when the weather is 60, but then its 20 three days later?"*

*"Clients think you can do things with the unexpected warm weather, but you can't just shoe horn everything in two days if it's a week's work."*

operations typically experienced a slowdown - and associated layoffs - in January and February, warmer conditions in 2019 have allowed many operations to continue through February. Participants broadly viewed this expansion of the work calendar positively. It is much easier and less costly to do construction in mild winter conditions. Participants also suggested that changing seasonal conditions have introduced new challenges. For one, client expectations have changed. Clients perceive that construction operations can now complete more work in a shorter timeline. However, many construction activities must be phased out over several days, and any variability in temperatures within those few days can complicate certain processes. An unexpected cold snap could create a delay. Participants expressed frustration that their ability to plan projects has been compromised as temperatures have become less predictable.

**+ Participants described innovations in resilient construction practices as well as ongoing and anticipated climate change driven updates to land use regulation and building codes. Participants anticipate additional work opportunities with growing demand for resilience infrastructure.**

Participants generally expressed enthusiasm for changes in industry resilient construction practices, especially clean energy innovations, which they see as a common sense approach to new construction. Participants explained that building for resiliency is not a significant departure from the way in which they already work, because these innovations rely on similar technical construction expertise as traditional projects. They provided many detailed examples of the types of resiliency projects with which they have been involved as well as other types of projects they anticipate doing more of as municipalities increasingly plan for climate impacts and adapt regulations. These include building and road retrofits, updating wastewater systems, sea walls, higher elevation construction, etc. They do observe that climate driven changes to building codes and regulations are driving up the cost of construction and extending already long permitting processes. However, these are impacts primarily borne by the developer, not the construction operations.

Despite the enthusiasm participants expressed for these projects, some also expressed skepticism at governments' commitment to implementing resilience planning. It is not currently apparent that governments have set aside adequate funding to implement these projects.

**+ A few participants talked about increased vigilance related to worker heat exposure, but this was not a particularly strong concern among participants. Participants expressed confidence in workplace safety practices.**

Participants named worker heat exposure and heat-related illness as a potential climate change impact on the construction trades. Generally, participants expressed confidence in the ability of existing practices to protect workers. The Occupation Safety and Health Administration (OSHA) requires that employers keep workers safe from excessive heat exposure. Participants described construction workers' early work schedules as well as existing worker safety training, policies and procedures as protective factors against worker heat exposure. Participants suggested that current conditions did not merit a change in worker schedules, and that workers were more likely to adjust their schedules to avoid traffic congestion than hot weather.

**+ More frequent and severe storms are likely to drive costs for construction operations and increase the risk of work interruptions.**

Participants briefly noted a number of additional challenges, most related to storm events. A few of these impacts appeared isolated to the experience of one or a few construction sub-specialties or focus group participants. They may have been mentioned once or twice, but were not discussed broadly by the group. These impacts include:

- Increased cost of insurance due to risk of flooding and wind damage;
- Loss of power at the worksite during or following a storm;
- Storm water pollution at the worksite following an extreme precipitation event.

## Barriers to Resilience within the Construction Trades

### **+ The construction workforce is aging, which undermines construction operations' readiness to respond to the growing demand for resilience infrastructure.**

While participants were hopeful about the potential increase in demand for their services, they suggested that the industry would not be ready to scale up quickly enough to meet a sudden influx of new resilient infrastructure projects. The construction workforce is aging – the average age of plumbers and electricians is about 50 - and fewer young people are entering the industry than is necessary to replace retiring workers. The gap between outgoing and incoming workers is more pronounced in the licensed trades. Participants were reluctant to go into detail about why fewer people were entering the construction trades, but emphasized the strengths of the career and need to develop a pipeline to meet the demand for a skilled workforce. One participant suggested that some contractors may have challenges meeting the demand for additional workers if resilience projects are not adequately phased out over time.

### **+ Participants have concerns about the cost, reliability, and convenience of adopting clean energy equipment, despite their openness to making the transition.**

Participants anticipate that there will soon be greater external pressure to adopt cleaner energy equipment on worksites (e.g. low-emission vehicle fleets). However, one participant suggested that the industry “is not really spending a lot for the time spent discussing [clean energy technologies].” Participants identified a number of challenges with transitioning their equipment, specifically their vehicle fleets. They feel that new technologies are not necessarily geared towards construction. There are few places where they would be able to charge equipment and growing concerns about worksite power outages, especially during and following storm events, that makes construction operators even more wary about adopting additional electric-powered equipment. Cost is also a barrier. Participants view cleaner technologies as significantly more expensive to adopt traditional technologies, but they recognize the potential for long term savings.

### **+ Participants are unsure about the long-term impacts of climate change on their industry, and the perceived lack of public consensus on impacts and solutions adds to their uncertainty.**

Another factor contributing to the lack of planning for climate change within the industry is the uncertainty participants expressed about the long-term impacts of climate change on construction. Participants recognize several ways in which climate change is already affecting environments – melting icebergs, rising sea levels, temperature extremes. However, they view projections of

future impacts and proposed solutions as politicized, still undefined, and open to debate. They also lack clear and convincing information about how climate change will impact construction, specifically. Impacts experienced in the last few years still feel like a temporary transition between historic conditions and an unknown state. They are willing to engage seriously with climate change, but feel that they do not have adequate information to understand when and how to prepare.

*“It’s not an exact science. Sometimes you don’t know what to believe, but it’s obvious something is going on.”*

*“It hasn’t gotten to the point where there is widespread adjustment. It’s still somewhat in flux.”*

**+ Participants are looking for decisive government action on climate change, and they are concerned that only a crisis will motivate such action.**

Participants were not equally optimistic about the potential pipeline of new resilient infrastructure projects. Some participants were clearly skeptical about the likelihood that many of the talked about projects would soon materialize. They see state and local agencies monitoring, talking about, and planning for climate change, but feel that few governments have invested adequate funding to significantly implement resiliency planning. There was broad support for the idea that only a crisis would motivate governments to take adequate measures to change regulations and fund needed infrastructure.

Participants pointed to their experiences with hot work regulations and to the opioid epidemic’s impact on the construction trades to illustrate their point. According to OSHA, hot work is any work that involves burning, welding, using fire- or spark-producing tools. It took a tragedy to create momentum for hot work regulations and training. They also feel that government agencies have been slow to respond to the impacts of the opioid crisis on construction. One participant suggested that even the opioid crisis examples demonstrates that even in the context where there’s consensus on whether an issue is at a crisis point, there is not a clear and adequate response. Several participants lamented that loss of life seems to be most effective in instituting change.

**+ Participants’ descriptions of anticipated climate-related industry changes suggest that they do not feel empowered to determine how their industry will adapt. They are anticipating that regulatory bodies and clients will signal the changes the need to occur in the construction industry.**

*“There is an interest [in climate change] in the industry. Contractors now more than ever really want to be responsive to their clients. They want to deliver the project and meet the standards clients want. In general, contractors want to be aware of what’s going on, even if they don’t see a defined role for themselves.”*

Industry partners and regulators have a large role in determining how the construction industry prepares for and reacts to climate change. The industry is largely responsive to the requests of their clients, who in turn are responsive to the building codes and land use regulations adopted by government agencies. Construction is also a heavily regulated industry. They are used to receiving guidance and direction from regulatory agencies, even

though participants acknowledged a broad sense of regulatory fatigue.

Repeatedly, participants minimized their own role in instituting changes within the industry and the environment in which the industry works. There was broad support for the idea that their role in affecting regulatory change is limited to consultation and that changes led by the industry would be less impactful than those made by clients and governments. Participants also expressed a general interest within the industry to learn more about climate change and be amenable to client and regulatory change.

## **Factors Enabling Resilience within the Construction Trades**

### **+ Construction is an industry that promotes the resilience of its workers through living wages, job security, and many opportunities for skill development.**

Participants expressed strong satisfaction with the training and employment opportunities provided by construction. They also expressed confidence that the current skill set was adaptable to the emerging needs of resilient construction practices. Participants emphasized that these jobs are in high demand and do not typically require a four year college degree.

### **+ Construction operations have implemented practices at worksites to protect the health of workers and to enhance the sustainability of their worksites. They are open to adopting new practices to ensure their workers remain safe and operations viable.**

Participants described recycling practices and heat exposure protocols as demonstration of the resilience and adaptation strategies that their industry has already adopted. They felt that the industry has greatly benefitted from these and related changes, but acknowledged that many were promulgated by regulation. There is general regulatory fatigue within the industry, but participants expressed their willingness to adopting practices necessary to ensure the continued safety of their workers and the sustainability of their operations. Specifically, participants are open to exploring and anticipate future mandates related to the use of clean energy equipment within their operations.

### **+ Licensing boards have been effective in quickly instituting changes across the industry through new curriculum and licensing requirements.**

Participants identified this curriculum as a possible vehicle for communicating information and training related to climate change. However, climate change is not currently integrated into the curriculum. Participants pointed to the integration of hot work (i.e. worksite fire risk) training into licensing requirements as an examples of the licensing boards instituting industry-wide change. A lethal worksite fire in 2015 motivated the adoption of this training. There was a clear urgency to institute new training that does not yet exist with climate change. Even so, participants anticipate that the licensing boards will be monitoring climate issues and related policy. If the boards can generate consensus on climate impacts and industry solutions, there may be new curriculum.

## ART INSTALLATION AND NEXT STEPS

### Schools of Thought on Climate Change: Stories from Land and Sea

The MAPC project team and collaborating artists developed an art installation to share findings from the focus groups. The installation, titled “Schools of Thought on Climate Change: Stories from Land and Sea,” integrates storytelling with public art to represent focus group participants’ unique perspectives on climate change and actions they are undertaking in their workplaces and communities to prevent, prepare for, or adapt to climate change.



Artist Carolyn Lewenberg and MAPC Artist-in-Residence Hortense Gerardo worked with the project team to come up with the idea for the installation: sculpted hanging koi-inspired fish fashioned from materials in each industry. Koi fish symbolism is common in both Japanese and Chinese culture. They are often associated with ideas of determination and resilience in the face of adversity, given their ability to swim against currents and travel upstream.

Members of MAPC’s public health, economic development, and arts and culture departments worked with Lewenberg and a second artist, Nia Holley, who together crafted four separate groups of fish using gloves and materials from each industry: for example, burlap for farmers, gauze and scrubs for home health care workers, fishing nets for those in the fishing industry, and orange safety netting for construction workers.

In the installation, the koi hang among lanterns printed with quotes from the focus groups. Viewers can read how climate change effects people’s livelihoods: species migration, storm damage to soils and equipment, power outages, and extreme heat risks to both outdoor workers and consumers of home healthcare. Viewers can also learn about actions people are taking to respond and prepare: clean energy adoption, worker safety training, and partnering with institutional buyers to develop markets for new seafood products, including invasive species. In the future, the installation will include an audio component: people will be able to hear from focus group participants in their own voices.

The installation was first featured at the Wake Up the Earth festival in the Jamaica Plain neighborhood of Boston in May 2019. The installation will continue to travel to a small number of additional sites through the summer and fall.

