Providence-Warwick Metropolitan Statistical Area

Priority Climate Action Plan

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DEFINITIONS AND ACRONYMS

Comprehensive Climate Action Plan (CCAP): A report that builds off of the original research and initiatives identified in the PCAP, giving a more in-depth review of the significant GHG sources/sinks and sectors, establishing GHG emission reduction goals and targets, and identifying strategies and measures to address the highest priority sectors.

Greenhouse Gasses (GHG): Naturally occurring gasses that trap heat in the atmosphere. These gasses most often include Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and other Fluorinated Gasses. Each gas remains in the atmosphere for different lengths of time, and larger concentrations of these gasses at once causes the climate to warm and change.

Low Income and Disadvantaged Communities (LIDACs): Communities with residents that have low incomes, limited access to resources, and disproportionate exposure to environmental or climate burdens.

Million Metric Tons (MMT) of Carbon Dioxide Equivalent (CO_2e): Unit for measuring GHG emissions. *For reference, 0.028 MMT of emissions is 0.2% of the entire Providence-Warwick MSA region's total 2020 annual emissions, and the equivalent of replacing 100 megawatts (MW) of electricity with solar energy. This is enough energy to power roughly 17,300 homes.*

Metropolitan Statistical Area (MSA): A geographical area based on a central urbanized area with close economic ties, defined by the 2020 U.S. Census.

Priority Climate Action Plan (PCAP): Narrative report that includes a focused list of near-term, high-priority, and implementation-ready measures to reduce GHG pollution and an analysis of GHG emissions reductions.

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EXECUTIVE SUMMARY

The US Environmental Protection Agency (EPA) Climate Pollution Reduction Grants (CPRG) program was created through the Inflation Reduction Act of 2022 and aims to reduce Greenhouse Gas (GHG) emissions, as well as other harmful pollutants, across the United States. The CPRG planning program is taking place in two primary phases, known as the Priority Climate Action Plan (PCAP), and the Comprehensive Climate Action Plan (CCAP).

This document, the PCAP, identifies GHG emission sectors and reduction actions that are implementation ready and will create significant reductions in GHG emissions short-term. The CCAP, estimated to be released in Summer 2025, will expand upon the work of the PCAP, going into a more thorough analysis of what the impacts of implementation will be based on the PCAP identified GHG reduction actions.

Southeastern Regional Planning and Economic Development District (SRPEDD) is participating in this important work by leading the planning process for the Providence-Warwick Metropolitan Statistical Area (MSA). The Providence-Warwick MSA covers the entire State of Rhode Island, as well as the 27 municipalities within Southeastern Massachusetts that are served by SRPEDD, as these communities share a high level of economic and social integration.

To identify the needs of the Providence-Warwick MSA, SRPEDD worked alongside various volunteer municipal stakeholders and the public. In doing so, SRPEDD was able to identify 12 high priority, implementation ready, GHG reduction measures that not only reflect the needs of the community but will also create measurable reductions in annual GHG emissions if implemented.

Table 1. PCAP GHG Reduction Measures for the Providence-Warwick MSA

Sector	Reduction Measure
Transportation	**T1.** Support light-duty electric vehicle transition.
	T2. Reduce commuter emissions.
	T3. Adopt small-scale roadway interventions across the entire region.
	T4. Develop and adopt a "Green Port" strategy to reduce emissions from shipping and fishing.

Electricity Generation	**E1.** Implement regional grid upgrades to improve capacity for renewable electricity.
	E2. Provide clean energy workforce training.
Buildings (Residential & Commercial)	**B1.** Fund and streamline incentive programs for building decarbonization.
	B2. Fund and streamline energy efficiency incentive programs.
Waste Management & Materials	**W1.** Improve container reuse and recycling programs.
	W2. Reduce the organic waste stream.
Agriculture & Working Lands	**A1.** Support trees' capacity to remove and store carbon.
	A2. Support local food growth and distribution.

1.0 Introduction

The Climate Pollution Reduction Grants (CPRG) program provides funding opportunities to states, local governments, tribes, and territories to develop and implement plans for reducing Greenhouse Gas (GHG) emissions and other harmful pollutants throughout the United States. In support of this program, Southeastern Regional Planning and Economic Development District (SRPEDD) applied for, and was awarded, a grant on behalf of the Providence-Warwick Metropolitan Statistical Area (MSA) to reduce GHG emissions throughout the region.

1.1 CPRG Overview

Through the Inflation Reduction Act of 2022, Congress provided tools to pursue GHG pollution reductions, creating the CPRG program. In implementing the CPRG program, the Environmental Protection Agency (EPA) seeks to achieve three broad objectives[1]:

1. Tackle damaging climate pollution, while supporting the creation of good jobs and lowering energy costs for families.

2. Accelerate work to address environmental injustice and empower community-driven solutions in overburdened neighborhoods.

3. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.

The CPRG process is taking place in two main phases. Phase one is the creation of this document, a Priority Climate Action Plan (PCAP), which identifies priority GHG reduction sectors and actionable climate pollution reduction measures. Phase two, estimated to be released in Summer 2025, is the Comprehensive Climate Action Plan (CCAP), which will build and expand upon the climate pollution reduction priorities identified in the PCAP.

1.2 PCAP Overview

The first phase of the CPRG program, the creation of this PCAP, includes twelve identified pollution reduction measures, which are based on a shared vision generated by the stakeholders of the Providence-Warwick MSA. The identified GHG reduction measures that are expected to have the greatest positive impact on our region are detailed in section 2.2 GHG Reduction Measures and fit within the six key sectors identified by the EPA. The six key sectors include:

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[1] Environmental Protection Agency (EPA), Climate Pollution Reduction Grants Program: Formula Grants for Planning - Program Guidance for States, Municipalities, and Air Pollution Control Agencies

- ⌂ Buildings (residential and commercial)
- 🚌 Transportation
- 💡 Electricity Generation
- 🏠 Agriculture and Working Lands
- ♻ Waste Management and Materials
- 🏭 Industrial Processes

Additionally, as required by the EPA, this PCAP includes a GHG inventory, a low-income and disadvantaged communities (LIDAC) benefits analysis, and a review of authority to implement the proposed actions.

1.3 Scope of the PCAP

The geographic scope of this PCAP covers the Providence-Warwick MSA, which encompasses the State of Rhode Island as well as the 27 municipalities in Southeastern Massachusetts that comprise the SRPEDD region (Figure 1). Within this planning area is approximately 1,750,000 people, according to the 2020 U.S. Census. For many within the Providence-Warwick MSA, cross-border trips are part of daily life - be it from commuting to and from work, exploring various commercial corridors throughout the region, or visiting friends, family, or cultural destinations. Similar cross-border trends can be seen with natural resources as well, such as the City of Fall River in Massachusetts supplying water across state lines to Tiverton, Rhode Island.

Across the varying landscapes seen throughout the Providence-Warwick MSA we face many common challenges, climate change top among them. The development of this PCAP was used as a starting point to create a unified vision to reduce GHG's throughout the region.

Figure 1. Boundary of the Providence-Warwick Metropolitan Statistical Area
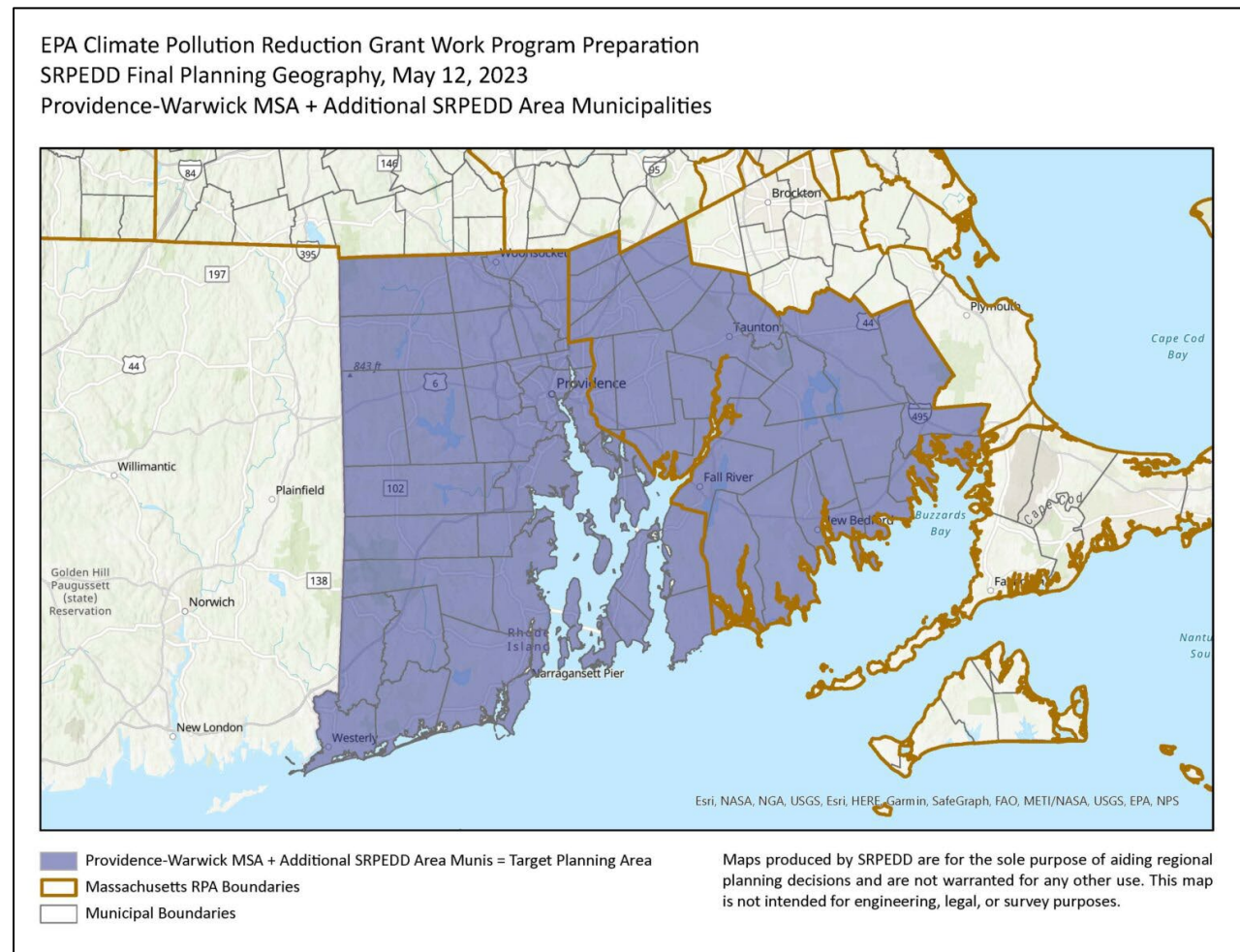
1.4 Approach to Developing the PCAP

Considering the Providence-Warwick MSA crosses state lines, it is important to look at both Massachusetts and Rhode Island when planning for this region. Each state has undertaken individual efforts to quantify climate pollution, set reduction targets, and plan intended measures to reduce climate pollution. Massachusetts has issued three reports that build on its existing GHG inventory to chart a pathway for climate action: the *Decarbonization Roadmap* published in December 2020, the *Clean Energy Climate Plan for 2025-2030* published in June 2022, and the *Clean Energy Climate Plan for 2050* published in December 2022. Rhode Island on the other hand, conducts annual GHG inventories, and recently issued the *Rhode Island 2022 Climate Update Report*.

At the local level, communities in the Providence-Warwick MSA are at varying places in their thinking around municipal and communitywide climate pollution reduction; some have local energy committees; some have gone so far as to develop local GHG

inventories and have started to think about potential actions toward GHG reduction; and some have vocal constituencies that continue to question the reality of climate change.

To ensure this PCAP reflected the needs of those within the Providence-Warwick MSA as well as the greater needs of Rhode Island and Massachusetts, SRPEDD staff undertook a review of various municipal planning documents such as Master Plans, Municipal Vulnerability or Municipal Resilience Plans, Green Communities Energy Reduction Plans, and Local Resilience Plans, noting any identified GHG reduction related actions within them. Following the review, SRPEDD engaged with a Municipal Leadership Team, comprised of volunteer municipal representatives from across the Providence-Warwick MSA, who helped review and expand upon the identified actions within those documents.

Through discussions with the Municipal Leadership Team, SRPEDD staff were able to identify 21 potential GHG reduction measures that reflect the needs of the region. Those 21 potential measures were posted on the SRPEDD website for public comment from February 9, 2024, through February 29, 2024, and presented at two public workshops on February 13, 2024, and February 15, 2024, where participants were given an overview of the project process and were able to participate in a rank voting activity on those potential measures. The draft list of potential GHG reduction measures and public meeting transcript were also made available on the website in the three most popular non-English languages spoken across the planning region (Portuguese, Spanish and French/Haitian Creole) to invite wider participation in the public input process. Project materials and public meeting announcements were shared on social media and through the participating Municipalities' and partners' networks. Additionally, community-based organizations that engage and/or represent low income and disadvantaged community members were directly invited to provide input. This outreach and community engagement will continue to be expanded upon in the upcoming CCAP planning process.

The public feedback received highlighted 13 of the 21 potential GHG reduction measures as top priorities. SRPEDD staff presented the remaining 13 measures to the Municipal Leadership Team, who established the final 12 measures included in this PCAP, selected for their significance to the region and ability to reduce GHG's if implemented.

2.0 PCAP Elements

The following sections of the PCAP identify a baseline GHG Inventory using 2020 GHG emissions, aligning the regional GHG inventory with the most recent State of Rhode Island GHG Inventory. The 2020 baseline further aligns with the most recent motor vehicle and building census for the State of Massachusetts, enabling more accurate carbon reduction estimates for priority carbon reduction measures. Concerns regarding the representativeness of 2020 due to changes in activity during COVID-19 are

mitigated as this PCAP does not include projections or goals. The development of projections and goals is a planned community engagement activity during the development of the CCAP.

2.1 Greenhouse Gas (GHG) Inventory

The Providence-Warwick MSA GHG inventory is a novel regional resource. No such inventory has ever been undertaken for the Massachusetts-based portion of the CPRG Planning Area. Meanwhile, the State of Rhode Island has conducted annual state-wide GHG inventories since 2014, with the most recent inventory completed for 2020. To ensure timeliness, the Providence-Warwick MSA GHG inventory for the PCAP is a preliminary inventory and is intended to be updated with more detailed and complete information through town-level data provided by municipalities during the development of the CCAP. The preliminary regional GHG inventory combines GHG emission estimates from the 27 Southeastern Massachusetts towns within the SRPEDD planning area with the State of Rhode Island GHG inventory. To ensure relevance, the preliminary regional GHG inventory is focused on four priority sectors comprising over 90% of the regional emissions: Buildings, Transportation, Electricity Generation, and Municipal Solid Waste.

The Providence-Warwick MSA preliminary GHG inventory follows the Global Protocol for Community-Scale Greenhouse Gas inventories. Anthropogenic emission estimates are calculated for primary GHGs and reported in CO_2 equivalent (CO_2e) units. Power emission estimates use electricity consumption to maintain consistency with State of Rhode Island GHG inventory. Massachusetts town electricity consumption data are assigned emission factors according to electricity generation fuel mix specific to each investor-owned utility and municipal utility. Transportation emission estimates for on-road vehicles are assigned to the jurisdiction of vehicle registration. This choice maintains consistency with State of Rhode Island GHG inventory and prevents double counting of vehicle miles traveled (VMT) by commuters crossing state boundaries and traveling between Massachusetts towns. Building emission estimates include heating for residential, commercial, and industrial buildings and exclude waste processes for industrial buildings. Data sources and calculations are provided in Appendix A: GHG Emissions Inventory Methodology.

2.1 GHG Inventory by Sector and Gas

The total reported GHG emissions for 2020 are 14.57 million metric tons (MMT) CO_2e. The total emission contribution from each of the four sectors can be seen in Figure 2, as well as in the following breakdown:

- **Transportation** sources contribute the largest percentage (43%) of the region's emissions. Highway vehicles produce the majority of emissions: 5.84 of 6.21 MMT CO_2e.

- **Building** heating contributes the second largest percentage (37%). Residential building heating is the primary source, producing 3.17 of 5.30 MMT CO_2e. Commercial and industrial building heating emission is 2.13 MMT CO_2e.

- **Electricity Generation** sector is a much smaller percentage (20%) of the region's emissions. Electricity consumption produces 2.85 MMT CO_2e.

- **Municipal Solid Waste** sector is the smallest of the four sectoral contributions (1%) of the region's emissions. Municipal Solid Waste produces 0.20 MMT CO_2e.

Additionally, the total reported GHG emissions for the Providence-Warwick MSA can be broken down by type. The total emission contribution from each of the three emission types can be seen in Figure 3, as well as in the following breakdown:

- **Carbon Dioxide (CO_2)** is the largest percentage (94%) of the region's emissions.
- **Methane (CH_4)** is the second largest percentage (5%) of the region's emissions.
- **Nitrous Oxide (N_2O)** is the smallest percentage (1%) of the region's emissions.

Figure 3. Greenhouse Gas Emissions by Sector 2020
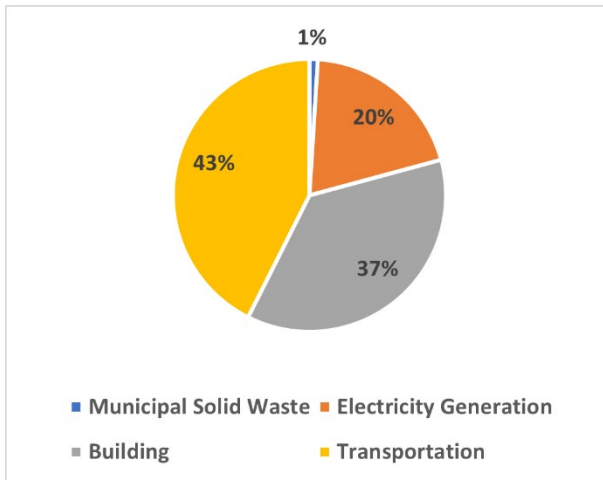
Figure 2. Greenhouse Gas Emissions by Gas 2020
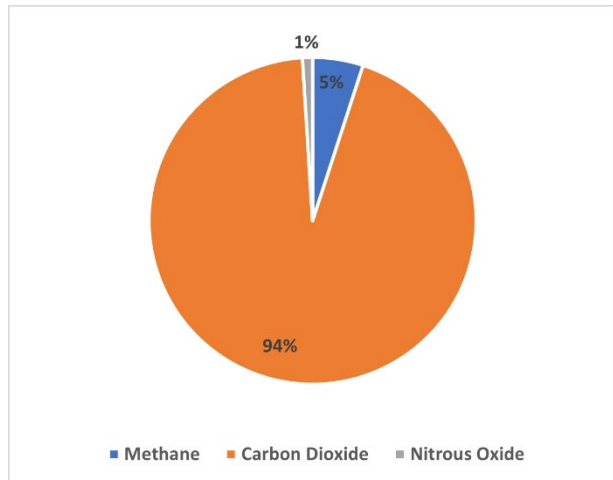
2.2 GHG Reduction Measures

Potential implementation actions were sourced from existing municipal planning documents throughout the region and then vetted with the Municipal Leadership Team. The expanded action list was refined and prioritized in further conversations with the

Municipal Leadership Team and with the public. The final actions were selected, not only for their potential to have a significant impact on GHG emissions in the near term, but for their readiness for implementation and expected co-benefits associated with their implementation. A summary of the full action list can be found in Appendix B: PCAP GHG Reduction Measures Summary Table.

Each recommended GHG reduction measure has been evaluated for its potential to reduce the region's GHG emissions, measured as permanent reductions in annual emissions in 2030 and 2050 (from the 2020 inventory baseline, without considering projections of changes to the GHG inventory between 2020 and 2050). The development of GHG emissions goals and projections is an activity planned for community engagement during the development of the CCAP, and preliminary goals are used in this PCAP. To provide preliminary goals, the 2030 and 2050 reduction measures are consistent with the State of Massachusetts statutory limits for 2030 and 2050 of 50% and 85% below 1990 level, respectively. The percentage reduction is the ratio of the reduction measure to the 2020 baseline.

Transportation

GHG Reduction Action T1: Support light-duty electric vehicle transition.

Potential Project Examples:

- Improve charging infrastructure availability.
- Grid upgrades and solar canopies to support demand.
- Battery waste disposal and vehicle retirement programs.
- Municipal and private incentives for the purchase of both new and used electric vehicles.

Estimated GHG Emissions Reductions:

- **By 2030:** 0.56 MMT CO_2e, 3.8% of total 2020 emissions.
- **By 2050:** 3.12 MMT CO_2e, 21% of total 2020 emissions.

The reduction measure is calculated by 1) aggregating the light-duty, residential vehicle miles traveled (VMT) separately for gasoline and diesel by model year in each town 2) converting the vehicle miles traveled to gallons of gasoline and diesel by applying fuel economy values 3) estimating the baseline for fuel emissions 4) using assumed electrical vehicle efficiency values to calculate electricity use for VMT 5) calculating avoided emissions as difference between baseline and electric emissions.

Calculations assume the current activity for 2030:

- 15% of light-duty, residential VMT from all-electric vehicles.

Calculations assume the current activity for 2050:

- 75% of light-duty, residential VMT from all-electric vehicles.
- 100% of heavy-duty VMT from all electric vehicles.

Implementing Agencies:

- Municipalities.
- State transportation agencies (MassDOT & RIDOT).
- Municipal & regional electricity utilities (National Grid, RI Energy).
- Car dealerships.

Implementation Schedule and Milestones:

- Identify charging infrastructure availability gaps (1-2 years).
- Identify & fund grid infrastructure upgrades (3-5 years).
- Construct charging & grid infrastructure (5+ years).
- Supplement & expand existing incentive programs (2-4 years).
- Establish vehicle retirement and battery disposal programs with dealerships (3-5 years).

Metrics for Tracking Progress:

- Number of light duty, residential vehicles purchased with the aid of programs supporting this action.

- Massachusetts VMT census for light duty, residential between 2025 and 2030.

Funding Sources:

- Mass EVIP (MA).
- MOR-EV (MA).
- DRIVE EV (RI).
- ElectrifyRI (RI).
- EPA CPRG Implementation Grants.

GHG Reduction Action T2: Reduce commuter emissions.

Potential Project Examples:

- Expand regional public transit options, paired with well-planned equity-focused transit-oriented development zoning.
- Employee incentives to encourage remote work and taking public transit, carpooling or biking to work (i.e., "transit passes").

- Help schools transition to electric buses or alternative fuels and improve walkability to encourage more walkers.
- Expand and improve regional bike lane networks and fund e-bike incentives.

Estimated GHG Emission Reductions:

- **By 2030:** 0.14 MMT CO_2e, 2.75% of Massachusetts transportation sector emissions and 0.95% of total emissions.
- **By 2050:** 0.28 MMT CO_2e, 4.5% of Massachusetts transportation sector emissions and 1.9% of total emissions.

The reduction measure is calculated by 1) using the baseline for light-duty, residential fuel emissions 2) removing VMT from 35,000 participants in commute-avoidance, carpooling, or regional transit 3) calculating avoided emissions as difference between baseline and reduced VMT emissions.

Calculations assume the current activity for 2030:

- 17,500 participants no longer use their vehicle to commute to work.

Calculations assume the current activity for 2050:

- 35,000 participants no longer use their vehicle to commute to work.

Implementing Agencies:

- States.
- Regional transit authorities (RIPTA, GATRA, SRTA, MBTA).
- Municipalities / school districts.

Implementation Schedule and Milestones:

- Assess public transportation needs & develop regional public transit strategy (3-5 years).
- Implement public transit expansions, paired with municipal zoning updates (5+ years).
- Develop/expand employee incentive programs (4-6 years).
- Assess sidewalk and bike lane needs & develop regional multi-modal transport strategy (3-5 years).

Metrics for Tracking Progress:

- Number of participants who switch from using their vehicle to commute to work to carpool, work from home, or regional transit with the aid of programs supporting this action.

- Massachusetts VMT census for light duty, residential between 2025 and 2030.

Funding Sources:

- EPA Clean Bus Program.
- Wave to Work (RI).
- Complete Streets.
- EPA CPRG Implementation Grants.

GHG Reduction Action T3: Adopt small-scale roadway interventions across the entire region.

Potential Project Examples:

- Traffic signal improvements and other efficiency measures.
- Complete Streets.
- Vision Zero and road reconfiguration projects to improve safety and multi-modal options.

Estimated GHG Emissions Reductions: Data already existing but requires time to gather, will be collected during the working groups for the CCAP.

Calculations assume the current activity for 2030:

- None.

Calculations assume the current activity for 2050:

- None.

Implementing Agencies:

- Municipalities on local roads.
- State transportation agencies for state roads (RIDOT, MassDOT).

Implementation Schedule and Milestones:

- Local & regional traffic studies & efficiency planning (2-5 years).
- Roadway improvement construction (5+ years).

Metrics for Tracking Progress:

- None.

Funding Sources:

- Complete Streets.
- Regional Greenhouse Gas Initiative.
- EPA CPRG Implementation Grants.

GHG Reduction Action T4: Develop and adopt a "Green Port" strategy to reduce emissions from shipping and fishing.

Potential Project Examples:

- Reduce/eliminate in-port emissions from vessels (i.e., idling while loading/unloading).
- Fund decarbonization and energy efficiency improvements to land-based operations.
- Prepare for/support the offshore wind industry.
- Support electrification and alternative fuel programs for vessels.

Estimated GHG Emissions Reductions: Data already existing but requires time to gather, will be collected during the working groups for the CCAP.

Calculations assume the current activity for 2030:

- None.

Calculations assume the current activity for 2050:

- None.

Implementing Agencies:

- Municipalities.
- Port Authorities.

Implementation Schedule and Milestones:

- Develop local & regional "Green Port" strategies (2-4 years).
- Install port & vessel retrofits (5+ years).

Metrics for Tracking Progress:

- None.

Funding Sources:

- EPA Clean Ports Program.
- Mass Economic Seaport Council (MESC).

Electricity Generation

GHG Reduction Action E1: Implement regional grid upgrades to improve capacity for renewable electricity.

Potential Project Examples:

- Fund infrastructure and distribution improvements.
- Fund and expand grid resiliency grant programs.
- Fund engineering competition(s) to improve technology around efficient energy generation.

Estimated GHG Emission Reductions:

- **By 2030:** 0.28 MMT CO_2e, 10% of electricity generation sector emissions and 2.0% of total emissions.
- **By 2050:** 0.84 MMT CO_2e, 30% of electricity generation sector emissions and 10.0% of total emissions.

The reduction measure is calculated by 1) using emissions factor for Massachusetts investor-owned electric utility 2) assuming the combination of grid emissions and installed solar array reaches the equivalent of 1,000 megawatt (MW) solar generation (1,400,000-megawatt hour (MWh) total reduction) 3) applying the emissions factor to the energy reduction.

Calculations assume the current activity for 2030:

- Equivalent of 1,000 MW installed solar capacity achieved through combination of solar installation and grid efficiency improvements.

Calculations assume the current activity for 2050:

- Equivalent of 3,000 MW installed solar capacity achieved through combination of solar installation and grid efficiency improvements.

Implementing Agencies:

- Municipal & regional electricity utilities (National Grid, RI Energy).
- States (MA DOER, RI OER).

Implementation Schedule and Milestones:

- Grid infrastructure assessment & strategic planning (3-5 years).

Metrics for Tracking Progress:

- Number and capacity of installed solar arrays.

- Electric grid distribution efficiency incremental improvement after the time of grid upgrades.

Funding Sources:

- Grid Resilience and Innovative Partnerships (GRIP) Program (MA).
- EPA CPRG Implementation Grants.

GHG Reduction Action E2: Provide clean energy workforce training.

Potential Project Examples:

- Fund programs in schools and for adults in phasing out careers.

Estimated GHG Emissions Reductions: Data already existing but requires time to gather, will be collected during the working groups for the CCAP.

Calculations assume the current activity for 2030:

- None.

Calculations assume the current activity for 2050:

- None.

Implementing Agencies:

- States (MA DOER, RI OER).
- Universities/colleges, technical/vocational high schools.

Implementation Schedule and Milestones:

- Launch of training programs & school curriculums (2-5 years).

Metrics for Tracking Progress:

- None.

Funding Sources:

- National Grid scholarship for clean energy careers.
- Massachusetts Clean Energy Center.
- EPA CPRG Implementation Grants.

Buildings

GHG Reduction Action B1: Fund and streamline incentive programs for building decarbonization.

Potential Project Examples:

- Fund residential and municipal heat pump conversions and any prerequisite electrical system upgrades, prioritizing low-income and disadvantaged homeowners and renters.
- Supplement energy efficiency audit programs to fund all-inclusive home audits that consider safety, efficiency and electrification potential.

- Support homeowners and renters in navigating and participating in existing incentive programs.

Estimated GHG Emission Reductions for Multi-Family Homes:

By 2030: 0.06 MMT CO_2e, 1.0% of buildings heating sector emissions and 0.4% of total emissions.

By 2050: 0.12 MMT CO_2e, 2.2% of buildings heating sector emissions and 0.8% of total emissions.

The reduction measure is calculated by 1) aggregating the number of multi-family buildings 2) converting the gallons of fuel oil consumed with an assumed consumption per unit 3) estimating the baseline for fuel oil emissions 4) using assumed heat pump efficiency for electricity usage 5) calculating avoided emissions as difference between baseline and electric emissions.

Estimated GHG Emissions Reductions for Single-Family Homes:

By 2030: 0.26 MMT CO_2e, 5.0% of buildings heating sector emissions and 2% of total emissions.

By 2050: 0.86 MMT CO_2e, 16.2% of buildings heating sector emissions and 5.8% of total emissions.

The reduction measure is calculated by 1) aggregating the number of single-family detached buildings 2) converting the gallons of fuel oil consumed with an assumed consumption per unit 3) estimating the baseline for fuel oil emissions 4) using assumed heat pump efficiency for electricity usage 5) calculating avoided emissions as difference between baseline and electric emissions.

Calculations assume the current activity for 2030:

- **Multi-Family:** 50% of multi-family houses using fuel oil in 2020 convert to all-electric heating.

- **Single-Family:** 30% of single-family detached houses using fuel oil in 2020 convert to all-electric heating.

Calculations assume the current activity for 2050:

- **Multi-Family:** 100% of multi-family houses using fuel oil in 2020 convert to all-electric heating.

- **Single-Family:** 100% of single-family detached houses using fuel oil in 2020 convert to all-electric heating.

Additional co-pollutant benefit reductions are also expected across the region, as shown in Table 2.

Table 2. Additional co-pollutant benefit reductions for Action B1

Pollutant	By 2030	By 2050
Sulfur Dioxide (SO_2)	0.021 MT	0.229 MT
Nitric Oxide (NO_x)	0.626 MT	1.923 MT
Carbon Monoxide (CO)	0.165 MT	0.53 MT
Particulate Matter (PM)	0.013 MT	0.041 MT

Implementing Agencies:

- States (MA DOER, RI OER).
- Municipalities.
- Local & regional residential assistance organizations.

Implementation Schedule and Milestones:

- Workforce training for all-inclusive home auditors (2-5 years).
- Development of assistance programs for homeowners & renters (2-4 years).
- Launch all-inclusive audit programs (3+ years).
- Expanded incentive programs (3+ years).

Metrics for Tracking Progress:

- Number of participants who switch from fuel oil to all-electric heating.
- American Community Survey estimates of housing tenure by heating fuel for occupied housing units.

Funding Sources:

- MA incentive programs: Mass Save.
- RI incentive programs: Efficient Buildings Fund, Home Energy Rebate Program, Clean Heat RI program.
- Massachusetts Community Climate Bank.
- Massachusetts Department of Energy Resources (DOER) Green Communities competitive grants (municipal projects).
- EPA CPRG Implementation Grants.

GHG Reduction Action B2: Fund and streamline energy efficiency incentive programs.

Potential Project Examples:

- Fund weatherization retrofits and upgrades for residential and municipal buildings, prioritizing low income and disadvantaged homeowners and renters.
- Create funding and support programs to help builders comply with new stretch code requirements (MA).
- Support homeowners and renters in navigating and participating in existing incentive programs.

Estimated GHG Emissions Reductions:

By 2030: 0.023 MMT CO_2e by 2030, 0.4% of buildings residential heating sector emissions and 0.16% of total emissions

By 2050: 0.069 MMT CO_2e by 2050, 1.3% of buildings residential heating sector emissions and 0.47% of total emissions.

The reduction measure is calculated by 1) calculating the 2021 electricity (10,770 MWh) and natural gas (846,782 Therms) savings for residential from Mass Saves efficiency measures 2) calculating triple savings 3) calculating reduced emissions using emissions factor for investor-owned utility 2) calculating avoided emissions as difference between baseline electric and natural gas emissions.

Calculations assume the current activity for 2030:

- Triple the participation in Mass Saves efficiency measures across both investor-owned utility and municipal utility.

Calculations assume the current activity for 2050:

- Triple above 2030 involvement the participation in Mass Saves efficiency measures across both investor-owned utility and municipal utility.

Implementing Agencies:

- States (RI OER & MA DOER).
- Municipalities.
- Local & regional residential assistance organizations.

Implementation Schedule and Milestones:

- Development of assistance programs for homeowners & renters (2-4 years).
- Expanded incentive programs (3+ years).

Metrics for Tracking Progress:

- Number of participants who sign up for electricity and natural gas saving measures.
- Savings for electricity (MWh) and natural gas (Therms) usage.

Funding Sources:

- MA incentive programs: Mass Save.
- RI incentive programs: Efficient Buildings Fund, Home Energy Rebate Program, Clean Heat RI program.
- Massachusetts Community Climate Bank.
- Massachusetts Department of Energy Resources (DOER) Green Communities competitive grants (municipal projects).
- EPA CPRG Implementation Grants.

Waste Management

GHG Reduction Action W1: Improve container reuse and recycling programs.

Potential Project Examples:

- Public education & infrastructure improvements to improve recycling operations.
- Expand bottle deposit & return systems.
- Fund reuse and refill systems.
- Regionalization of municipal recycling programs and procurement processes to improve efficiency.

Estimated GHG Emissions Reductions:

By 2030: 0.006 MMT CO_2e, 0.04% of regional GHG emissions.

By 2050: 0.006 MMT CO_2e, 0.04% of regional GHG emissions.

Calculations assume the current activity for 2030 and 2050:

- 3% diversion of MA container waste away from landfill and combustion.

Implementing Agencies:

- Municipalities.
- States (MA DOER & RI OER).

Implementation Schedule and Milestones:

- Launch public education campaign with outreach materials for municipalities (1-3 years).
- Container deposit and reuse system audit & feasibility assessment(s) (2-5 years).
- Launch regional partnerships & resources for municipal recycling programs (2-4 years).

Metrics for Tracking Progress:

- Number of locations that implement reuse and return programs. Estimates of containers (tons) not going to landfill or combustion.

Funding Sources:

- MA Efficiency & Regionalization Grant Program.
- EPA CPRG Implementation Grants.

GHG Reduction Action W2: Reduce the organic waste stream.

Potential Project Examples:

- Enable municipal or regional curbside food scrap collection / drop off and composting programs.
- Construct industrial composting and/or anaerobic digester facilities to manage large scale and industrial wastes.
- Implement "food rescue" redistribution programs to avert food waste while simultaneously addressing food insecurity in low-income communities.

Estimated GHG Emissions Reductions: Data already existing but requires time to gather, will be collected during the working groups for the CCAP.

Calculations assume the current activity for 2030:

- Forthcoming.

Calculations assume the current activity for 2050:

- Forthcoming.

Implementing Agencies:

- Municipalities.
- Regional private food scrap collections organizations.
- Private/industrial companies.

Implementation Schedule and Milestones:

- Regional food waste diversion feasibility assessment (1-3 years).
- Launch local/regional food waste diversion programs (3+ years).
- Construct large scale food waste processing facilities (3-5 years).

Metrics for Tracking Progress:

- Tons of food waste diverted from landfills.

Funding Sources:

- Municipal Officials Resource Recovery Grants (RI).
- EPA CPRG Implementation Grants.

Agriculture and Working Lands

GHG Reduction Action A1: Support trees' capacity to remove and store carbon.

Potential Project Examples:

- Expand urban tree canopy.
- Protect existing trees through local bylaws/ordinances.
- Provide outreach and funding to replace lawns with native plants.

Estimated GHG Emissions Reductions:

- **By 2030:** 0.03 MMT CO_2e, 0.2% of total emissions
- **By 2050:** 0.12 MMT CO_2e, 0.8% of total emissions.

The reduction measure is calculated by 1) using emissions factors for urban canopies from the EPA State Inventory Tool 2) calculating the added carbon storage for acres of urban canopy prevented from being removed or expanded through new tree plants.

Calculations assume the current activity for 2030:

- 2,000 acres of protected urban canopy or expansion through new tree plants added during every year in 2025 to 2029 (10,000 acres total).

Calculations assume the current activity for 2050:

- 2,000 acres of protected urban canopy or expansion through new tree plants added during every year in 2030 to 2049 (40,000 acres total).

Implementing Agencies:

- Municipalities.
- State agencies.

Implementation Schedule and Milestones:

- Develop regional tree planting strategy & plan (1-3 years).
- Expand funding through existing programs to fund tree planting (3+ years).
- Local bylaw/ordinance review & revisions (2-5 years).

Metrics for Tracking Progress:

- Number of trees planted in disadvantaged communities and in new and redeveloped land.

- Number of acres of trees prevented from being removed.

Funding Sources:

- Providence Tree Program.
- MA Greening the Gateway Cities Program.
- Keep Mass Beautiful.
- EPA CPRG Implementation Grants.

GHG Reduction Action A2: Support local food growth and distribution.

Potential Project Examples:

- Funding and support for farmers.
- Facilitate partnerships between restaurants / grocery stores and local growers, prioritizing distribution to "food desert" areas.

Estimated GHG Emissions Reductions: Data already existing but requires time to gather, will be collected during the working groups for the CCAP.

Calculations assume the current activity for 2030:

- None.

Calculations assume the current activity for 2050:

- None.

Implementing Agencies:

- States.
- Municipalities.
- Regional agricultural groups.

Implementation Schedule and Milestones:

- Facilitate discussions between local grower, food distributors and restaurants (1-3 years).
- Launch local food distribution systems & grower support systems (3+ years).

Metrics for Tracking Progress:

- None.

Funding Sources:

- Resilient Food Systems Infrastructure (RFSI) Program (MA).
- US Department of Agriculture.

- EPA CPRG Implementation Grants.

2.3 Low Income Disadvantaged Communities Benefits Analysis

The implementation of any of these PCAP measures are anticipated to benefit the Low Income and Disadvantaged Communities (LIDAC's) within the Providence-Warwick MSA. These LIDAC communities were identified using the Climate and Economic Justice Screening Tool (CEJST), which is a tool developed by the Council on Environmental Quality, to discern areas of populations that are often either overburdened or underserved.

CEJST was used as the primary source for the PCAP based on the scope and impact of the 12 actions proposed having broad ramifications. This coupled with EPA guidance, the short PCAP planning timeline, and lack of readily available tract-level data, such as USDA food access classifications, made CEJST the most useful tool at this stage. Use of EJScreen, along with other state and federal data sources will be further employed during CCAP to increase accuracy and depth of analysis.

LIDAC Identification and Climate Impacts and Risks

105 Census Tracts were identified in the Providence-Warwick MSA, located within Bristol County, MA; Kent County, RI; Newport County, RI; Providence County, RI; and Washington County, RI (Figure 4). The total population of these tracts is nearly 416,000. Many of these tracts are in and around population centers in Providence, RI; New Bedford, MA; Taunton, MA; Pawtucket, RI; and Fall River, MA (see Table 3 for a full list). Residents of these tracts have higher than average energy burdens, asthma rates, and unemployment likelihood.

The actions in this PCAP would help ease the energy burden through better efficiency; decrease GHG emissions and improve air quality through reductions in fossil fuel use; and provide cleaner, more efficient ways to commute to work. These proposed actions would also provide opportunities for workforce training and transition to help boost employment and the local economy.

Figure 4. CEJST Identified LIDAC's in the Providence-Warwick MSA
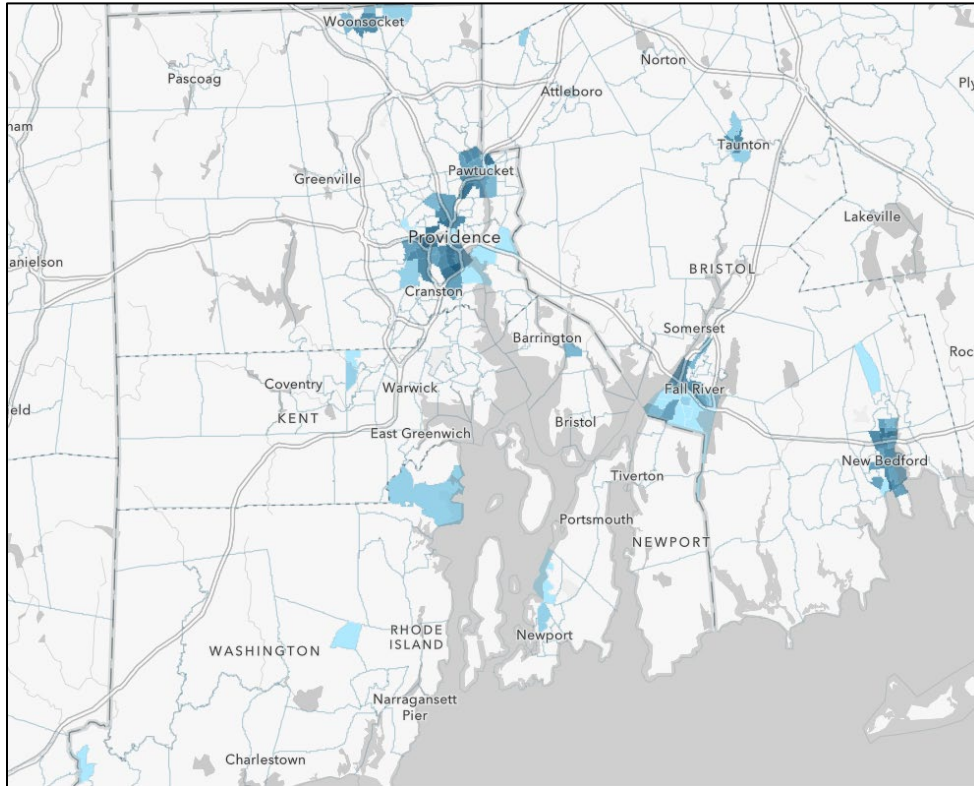
Table 3. CEJST Identified LIDAC's by Census Tract in the Providence-Warwick MSA

Municipality	Census Tract(s)
Attleborough, MA	25005631400
Central Falls, RI	44007010800, 44007010900, 44007011000, 44007011100
Cranston, RI	44007014100, 44007014700
East Providence, RI	44007010300, 44007010400
Fall River, MA	25005640100, 25005640200, 25005640300, 25005640400, 25005640500, 25005640600, 25005640700, 25005640800, 25005640901, 25005641000, 25005641101, 25005641200, 25005641300, 25005641400, 25005641500, 25005641600, 25005641900, 25005642000, 25005642200
Middletown, RI	44005040200
New Bedford, MA	25005650102, 25005650400, 25005650500, 25005650600, 25005650700, 25005650800, 25005650900, 25005651100, 25005651200, 25005651300, 25005651400, 25005651600, 25005651700, 25005651800, 25005651900, 25005652000, 25005652300, 25005652400, 25005652500, 25005652600, 25005652700
Newport, RI	44005040500
North Attleborough, MA	25005630101
North Kingstown, RI	44009050103

Pawtucket, RI	44007015100, 44007015200, 44007015300, 44007015400, 44007016000, 44007016100, 44007016400, 44007016600, 44007016700, 44007017100
Providence, RI	44007000101, 44007000102, 44007000200, 44007000300, 44007000400, 44007000500, 44007000600, 44007000700, 44007000800, 44007000900, 44007001000, 44007001100, 44007001200, 44007001300, 44007001400, 44007001600, 44007001700, 44007001800, 44007001900, 44007002000, 44007002200, 44007002600, 44007002700, 44007002800, 44007002900, 44007003100
South Kingstown, RI	44009051400
Taunton, MA	25005613600, 25005613800, 25005614000
Warren, RI	44001030500
West Warwick, RI	44003020300, 44003020400
Westerly, RI	44009050801
Woonsocket, RI	44007017400, 44007017600, 44007017900, 44007018000, 44007018100, 44007018200, 44007018300, 44007018400

LIDAC Engagement

Direct engagement with LIDAC communities was limited during the PCAP phase because of timeline restrictions. However, representatives of those communities were engaged as much as possible during the PCAP planning phase. Each municipality containing a LIDAC community was invited to participate in the Municipal Leadership Team that guided the development of the PCAP, and municipal representatives from New Bedford and Taunton, MA, and North Kingstown, Providence and Warren, RI, participated. Furthermore, SRPEDD directly reached out to known community organizations that engage LIDAC community members to invite their participation in public engagement initiatives, as described earlier in section 1.4 Approach to Developing the PCAP. Several of these community representatives did attend the public meetings or connected with the project team otherwise, and through those interactions we were able to obtain valuable feedback on the proposed actions and their potential impact on LIDAC communities in the region.

Moving forward into the CCAP, we plan to have deeper engagement through in-person meetings with community organizations and community members to ensure we are hearing and addressing their needs. We will keep an open line of communication throughout the CCAP process, building on the connections that will hopefully continue through implementation. With this valuable input, we also expect to be able to drill down on equitable and just solutions for specific areas of the region, which will help municipalities hit Justice40 goals and serve all members of their communities.

Estimated Benefits of GHG Emission Reduction Measures to LIDACs

Transportation

T1. Support light-duty electric vehicle transition.

> **Affected Tracts:** All.

> **Expected Benefits:**

> - **Environmental:** While the impact of this action is more indirect in LIDAC communities, it is nonetheless significant. Low-income populations in the affected tracts are disproportionately burdened by hazardous waste site exposure (over 50% of the population in every tract) and high asthma rates. Preventing further contamination through proper battery disposal and reduction of GHG emissions help break the cycles of environmental injustice moving forward in these communities.

T2. Reduce commuter emissions.

> **Affected Tracts:** Same as T1.

> **Expected Benefits:** Same as T1.

T3. Adopt small-scale roadway interventions across the entire region.

> **Affected Tracts:** All.

> **Expected Benefits:**

> - **Air Quality and asthma rates:** Asthma rates in these tracts are higher than average for low-income populations. Reducing GHG emissions and improving air quality through these reduction measures will have a high impact on low-income residents.
> - **Economic development and improved quality of life:** The identified tracts have higher than average unemployment rates. Actions like these bring employment and development opportunities through the implementation phase and well into the future. They also provide safer, cleaner living environments, helping to address environmental and economic injustices in the region.

T4. Develop and adopt a "Green Port" strategy to reduce emissions from shipping and fishing.

Affected Tracts: 25005650102, 25005650400, 25005650500, 25005650600, 25005650700, 25005650800, 25005650900, 25005651100, 25005651200, 25005651300, 25005651400, 25005651600, 25005651700, 25005651800, 25005651900, 25005652000, 25005652300, 25005652400, 25005652500, 25005652600, 25005652700, 44005040200, 44005040500, 44007000101, 44007000102, 44007000200, 44007000300, 44007000400, 44007000500, 44007000600, 44007000700, 44007000800, 44007000900, 44007001000, 44007001100, 44007001200, 44007001300, 44007001400, 44007001600, 44007001700, 44007001800, 44007001900, 44007002000, 44007002200, 44007002600, 44007002700, 44007002800, 44007002900, 44007003100, 44007010300, 44007010400, 44007010800, 44007010900, 44007011000, 44007011100, 44007014100, 44007014700, 44007015100, 44007015200, 44007015300, 44007015400, 44007016000, 44007016100, 44007016400, 44007016600, 44007016700, 44007017100, 44007017400, 44007017600, 44007017800, 44007017900, 44007018000, 44007018100, 44007018200, 44007018300, 44007018400

Expected Benefits:

- **Economic development and improved quality of life:** The identified tracts have higher than average unemployment rates. Actions like these bring employment and development opportunities through the implementation phase and well into the future. They also provide safer, cleaner living environments, helping to address environmental and economic injustices in the region.
- **Environmental:** While the impact of this action is more indirect in LIDAC communities, it is nonetheless significant. Low-income populations in the affected tracts are disproportionately burdened by hazardous waste site exposure (over 50% of the population in every tract listed) and high asthma rates. Reducing pollution will help to correct some of these environmental injustices moving forward.

Electricity Generation
E1. Implement regional grid upgrades to improve capacity for renewable electricity.

Affected Tracts: All

Expected Benefits:

- **Air Quality and asthma rates:** Asthma rates in the listed tracts are higher than average for low-income populations. Reducing GHG emissions and

improving air quality through these reduction measures will have a high impact on low-income residents.

E2. Provide clean energy workforce training.

Affected Tracts: All.

Expected Benefits:

- **Economic development and improved quality of life:** As mentioned above, the identified tracts have higher than average unemployment rates. Actions like these bring employment and development opportunities through the implementation phase and well into the future. They also provide safer, cleaner living environments, helping to address environmental and economic injustices in the region.

Buildings
B1. Fund and streamline incentive programs for building decarbonization.

Affected Tracts: All.

Expected Benefits:

- **Energy Burden:** More than 50% of the residents of these tracts are considered to have an energy burden, with many tracts at 70-90%. Improving building efficiency, providing solar options, and heat pumps will in these areas will lower energy costs, decreasing this percentage significantly.
- **Air Quality and asthma rates:** Asthma rates in the listed tracts are higher than average for low-income populations. Reducing GHG emissions and improving air quality through these reduction measures will have a high impact on low-income residents.

B2. Fund and streamline energy efficiency incentive programs.

Affected Tracts: Same as B1.

Expected Benefits: Same as B1.

Waste Management

W1. Improve container reuse and recycling programs.

Affected Tracts: All.

Expected Benefits:

- **Environmental:** While the impact of these actions is more indirect in LIDAC communities, it is nonetheless significant. Low-income populations in the affected tracts are disproportionately burdened by hazardous waste site exposure (over 50% of the population in every tract listed) and preventing further contamination through proper battery disposal and reduction of GHG emissions helps break the cycles of environmental injustice moving forward in these communities.

W2. Reduce the organic waste stream.

Affected Tracts: Same as W1.

Expected Benefits: Same as W1.

Agriculture and Working Lands

A1. Support trees' capacity to remove and store carbon.

Affected Tracts: All

Expected Benefits:

- **Environmental:** While the impact of this action is more indirect in LIDAC communities, it is nonetheless significant. Low-income populations in the affected tracts are disproportionately burdened by high asthma rates. Reduction of GHG emissions and improving air quality help break the cycles of environmental injustice moving forward in these communities.

A2. Support local food growth and distribution.

Affected Tracts: 25005640300, 25005650102, 44001030500, 44003020400, 44007000101, 44007010400, 44007010800, 44009050103, 44009051400.

Expected Benefits:

- **Economic:** The affected tracts were identified using the USDA ERS Food Access Atlas as falling into the low access category at 1 mile for urban

areas and 10 miles for rural areas. Helping to fill this gap with locally produced food serves the dual purpose of easing this burden for LIDAC residents and strengthening the local economy. Studies have shown that money spent on food produced locally is much more likely to stay in and boost the local economy.

- **Air Quality:** Using more local food prevents food miles and the GHG emissions associated with the transportation of food from long distances.
- **Quality of Life:** Fresh food options can be scarce in low-income communities. Providing for programs and partnerships that enable fresh, local food distribution in the LIDAC tracts would ease that scarcity.

2.4 Review of Authority to Implement

As a regional planning and technical assistance entity, SRPEDD can play an important role in supporting planning and project development efforts, as well as facilitating regional collaboration to move the identified GHG reduction measures towards implementation. However, in most cases SRPEDD will not be the entity responsible for ultimate implementation. Partnership with municipalities and/or the States of RI and MA will often be required to advance actions.

SRPEDD will begin engaging local, regional and state stakeholders and implementing authorities throughout the CCAP planning phase in order to further scope out implementation actions and appropriate timelines and milestones. Table 4 outlines those ultimately responsible for implementing each proposed GHG reduction measure, along with proposed steps for obtaining implementing authority with those agencies.

Table 4. Implementing authority for GHG reduction measures

GHG Reduction Measure	Implementing Agencies	Milestones for Obtaining Implementing Authority
T1. Support light-duty electric vehicle transition**.**	Municipalities. State transportation agencies (MassDOT, RIDOT). Municipal and regional electricity utilities (National Grid, RI Energy). Car dealerships.	Work with state transportation agencies to identify existing charging infrastructure availability gaps (1-2 years). Partner with municipalities to implement upgrades on local roads and states for state roads (5+ years). Work with states to secure additional funding to supplement existing incentive programs (2-4 years). Collaborate with states and car dealerships to establish vehicle retirement and battery disposal programs (3-5 years).

T2. Reduce commuter emissions**.	States. Regional transit authorities (RIPTA, GATRA, SRTA, MBTA). Municipalities / school districts.	Work with regional transit authorities and states to assess public transportation needs & develop regional public transit strategy (3-5 years). Assist regional transit authorities in identifying funding to implement public transit expansions (5+ years). Assist municipalities in adopting local zoning updates (5+ years). Work with municipalities and states to assess sidewalk and bike lane needs & develop regional multi-modal transport strategy (3-5 years).
T3. Adopt small-scale roadway interventions across the entire region**.	Municipalities on local roads. State transportation agencies for state roads (RIDOT, MassDOT).	Work with municipalities and states to implement local & regional traffic studies & efficiency planning (2-5 years). Assist municipalities and states in funding roadway improvement construction (5+ years).
T4. Develop and adopt a "Green Port" strategy to reduce emissions from shipping and fishing**.	Municipalities. Port authorities.	Work with local port authorities to develop local & regional "Green Port" strategies (2-4 years). Assist local port authorities & municipalities to fund and install port & vessel retrofits (5+ years).
E1. Implement regional grid upgrades to improve capacity for renewable electricity**.	Municipal & regional electricity utilities (National Grid, RI Energy). States (MA DOER, RI OER).	Work with regional electricity utilities on grid infrastructure assessment & strategic planning (3-5 years).
E2. Provide clean energy workforce training**.	States (MA DOER, RI OER). Universities/colleges, technical/vocational high schools.	Support schools in adopting training programs & school curriculums (2-5 years).
B1. Fund and streamline incentive programs for building decarbonization**.	States (MA DOER, RI OER). Municipalities. Local & regional residential assistance organizations.	Work with municipalities and private organizations to develop assistance programs for homeowners & renters (2-4 years). Work with states to expand incentive programs (3+ years).
B2. Fund and streamline	States (RI OER & MA DOER).	Work with municipalities and private organizations to develop assistance programs

	Municipalities. Local & regional residential assistance organizations.	for homeowners & renters (2-4 years). Work with states to expand incentive programs (3+ years).
energy efficiency incentive programs**.**	Municipalities. Local & regional residential assistance organizations.	for homeowners & renters (2-4 years). Work with states to expand incentive programs (3+ years).
W1. Improve container reuse and recycling programs**.**	Municipalities. States (MA DOER & RI OER).	Partner with municipalities on public outreach (1-3 years). Work with states to assess container deposit and reuse system feasibility (2-5 years). Facilitate regional collaboration for regionalization (2-4 years).
W2. Reduce the organic waste stream**.**	Municipalities. Regional private food scrap collections organizations. Private/industrial companies.	Work with municipalities, private collection companies & states to assess food waste diversion feasibility (1-3 years). Work with municipalities & private companies to develop local/regional programs (3+ years).
A1. Support trees' capacity to remove and store carbon**.**	Municipalities. State agencies.	Work with states and municipalities to develop regional tree planting strategies (1-3 years). Help states secure funding to expand funding for existing tree planting programs (3+ years). Assist municipalities with local bylaw/ordinance review & revisions (2-5 years).
A2. Support local food growth and distribution**.**	States. Municipalities. Regional agricultural groups.	Facilitate partnerships & agreements between local grower, food distributors and restaurants (1-3 years).

2.5 Intersection with Other Funding Availability

The simple way to fund climate pollution reduction actions is through partnerships with existing programs (for example, existing incentive programs operated through the MA Department of Energy Resources (DOER) and the RI Office of Energy Resources (OER)). In some cases, the existing programs can provide administrative and technical resources. Examples of ways to leverage existing programs include:

- Refilling an existing program with CPRG funding for programs that have expired.
- Expanding an existing program with CPRG funds and limit the added funds to Providence-Warwick MSA region.
- Duplicate an existing program with CPRG funds.
- Match an existing program with CPRG funds.

The alternative funding option is to administer a program through SRPEDD, including maintaining the funding for distribution, establishing criteria for funding distribution,

distributing the funding and reporting to ensure the funding is applied as intended, as well as EPA receiving the information needed on the fate of the funding.

3.0 Next Steps

The second phase of the CPRG process is the creation of the Comprehensive Climate Action Plan (CCAP), which is estimated to be released in Summer 2025. The CCAP will build on the original research of this PCAP, with a more thorough analysis of the impacts of implementation of the climate pollution reduction action measures identified in this document. As required by the EPA, the CCAP will include the following sections:

- An expanded GHG inventory.
- GHG emission projections.
- GHG reduction targets.
- Further quantification of GHG reduction measures.
- A more detailed benefit analysis for the full geographic scope and population covered by the plan.
- A more thorough low-income and disadvantaged communities benefits analysis.
- A review of authority to implement.
- A plan to leverage other federal funding.
- A workforce planning analysis.

During the development of the CCAP, as well as during any implementation of these identified GHG reduction action measures, SRPEDD will continue to engage with local municipal stakeholders and the general public across the Providence-Warwick MSA in order to ensure the success of climate pollution reduction across our region.

Appendix A: GHG Emissions Inventory Methodology

The greenhouse gas emissions inventory included herein was conducted under a Quality Assurance Project Plan (QAPP), prepared by SRPEDD on 10/16/2023, as amended 12/11/2023 and approved by EPA in January 2024. This QAPP can be found on SRPEDD's CPRG project webpage at: https://srpedd.org/cprg/. The process for calculating GHG emissions is detailed in the following sections.

Regional

This Providence-Warwick MSA GHG emissions inventory for the PCAP combines the state of Rhode Island GHG emissions inventory with emissions from 27 Southeastern Massachusetts towns. The 27 Massachusetts towns are: Acushnet, Attleboro, Berkley, Carver, Dartmouth, Dighton, Fairhaven, Fall River, Freetown, Lakeville, Mansfield, Marion, Mattapoisett, Middleborough, New Bedford, North Attleboro, Norton, Plainville, Raynham, Rehoboth, Rochester, Seekonk, Somerset, Swansea, Taunton, Wareham, Westport.

The state of Rhode Island GHG Inventory is produced by the Department of Environmental Management and is available at the following URL. https://dem.ri.gov/environmental-protection-bureau/air-resources/greenhouse-gas-emissions-inventory

The following boundary definitions and data sources ensure the inventory calculations avoid double counting.

Transportation

Transportation GHG emissions are assigned to the location of registration for vehicles and for transit in Massachusetts are assigned the Massachusetts region rather than by municipal location. Emission factors are obtained from the Intergovernmental Panel on Climate Change reports. The regional transportation GHG emission is the sum of Rhode Island, each Massachusetts town, and Massachusetts transit.

Vehicle miles traveled are utilized by Rhode Island within the EPA Motor Vehicle Emissions Simulator. Gallons of fuel consumed are estimated using assumed miles per gallon for a list of combinations of vehicle type and vehicle model year.

Vehicle miles traveled by vehicle type and vehicle model year are obtained from the Massachusetts Vehicle Census for each Massachusetts town. Miles per gallon

estimates by vehicle type and vehicle model year are obtained from tables in EPA Motor Vehicle Emissions Simulator.

Transit total gallons of fuel consumed are obtained from Southeast Regional Transit Authority and Greater Attleboro-Taunton Regional Transit Authority.

Electricity

Electricity GHG emissions are assigned to the location of electricity consumption. Emission factors are obtained from state agencies. The regional electricity consumption GHG emission is the sum of Rhode Island and each Massachusetts town.

A combination of market-based and location-based approaches is used by the state of Rhode Island. The method is based on registry of renewable energy credits to determine the amount of Rhode Island electricity assigned to renewable generation. The remainder of electricity consumption is obtained from the grid and is assigned the relevant grid emissions factor.

The location-based approach is used for the 27 towns in Massachusetts. Each town reports electricity consumption either sourced from investor-owned utility generation or municipal generation. Electricity consumption is reported for each Massachusetts town and GHG emissions are assigned to the town using the state reported emissions factor of either the investor-owned utility generation or municipal utility generation.

Double counting when combining electricity GHG emission estimates is avoided because the Massachusetts towns do not consume electricity more than the generation of electricity in the state of Massachusetts. The Massachusetts town electricity boundary does not extend into the regional electricity grid that is sourced by Rhode Island, preventing overlap in electricity reports.

Data sources include the following:
- State of Rhode Island GHG Inventory electricity consumption emissions.
- Mass Save Data monthly electricity consumption by town.
- Massachusetts Department of Public Utilities Municipal Light Plant annual returns.
- Massachusetts Department of Environmental Protection retail sellers of electricity emission factors.
- Massachusetts Department of Environmental Protection percent of sales reported as non-emitting.

Heating

Heating GHG emissions are assigned to the location of fuel consumption. Emission factors are obtained from Intergovernmental Panel on Climate Change reports. The regional heating GHG emission is the sum of Rhode Island and each Massachusetts town.

Fuel consumption is collected by Rhode Island for natural gas and is estimated by the Energy Information Administration for deliverable fuels including fuel oil, propane, and kerosene.

Fuel consumption is reported for natural gas to the Department of Public Utility and publicly available for each Massachusetts town. Fuel oil consumption is estimated by building type and number of occupants. Residential building data are obtained from the American Community Survey (i.e., 2020 Federal Census). Commercial, institutional, and industrial building data are obtained from the Massachusetts Department of Economic Research. The estimate of fuel consumed by building type and number of occupants is provided by the state.

Data sources include the following.
- State of Rhode Island GHG Inventory heating emissions.
- Mass Saves Data natural gas reports by town.
- Massachusetts Department of Economic Research data for commercial, institutional, and industrial buildings and occupancy.
- American Community Survey data for residential buildings.

Municipal Solid Waste

Municipal solid waste GHG emissions are assigned to the region. Emissions factors are obtained from the Intergovernmental Panel on Climate Change reports. The regional municipal solid waste GHG emission is the sum of Rhode Island and Massachusetts region.

Rhode Island municipal solid waste data are provided by the state's primary landfill, the Central Landfill in Johnston.

Massachusetts region municipal solid waste GHG emissions are estimated with population scaling of state emissions. The EPA State Inventory Tool solid municipal waste landfill and combustion tables are utilized for state-level emissions. The Massachusetts region data are estimated by calculating the ratio of region population to state population and multiplying by the state emissions.

Appendix B: PCAP GHG Reduction Measures Summary Table

Sector	Reduction Measure	Project Examples	Estimated 2030 Reductions	Estimated 2050 Reductions	Implementing Agencies	Implementation Schedule and Milestones	Metrics for Tracking Progress	Potential Funding Sources
Transportation	T1. Support light-duty electric vehicle transition.	Improve charging infrastructure availability. Grid upgrades and solar canopies to support demand. Battery waste disposal and vehicle retirement programs. Municipal and private incentives for electric vehicle purchases.	15% of light-duty residential vehicle miles traveled from all-electric vehicles, reducing 0.56 MMT CO2e (3.8% of total 2020 emissions).	75% of light-duty residential and 100% of heavy-duty vehicle miles traveled from all-electric vehicles, reducing 3.12 MMT CO2e (21% of total 2020 emissions).	Municipalities. State transportation agencies (MassDOT, RIDOT). Municipal and regional electricity utilities (National Grid, RI Energy). Car dealerships.	Identify charging infrastructure availability gaps (1-2 years). Identify & fund grid infrastructure upgrades (3-5 years). Construct charging & grid infrastructure (5+ years). Supplement & expand existing incentive programs (2-4 years). Establish vehicle retirement and battery disposal programs with dealerships (3-5 years).	Number of light duty, residential vehicles purchased with the aid of programs supporting this action. Massachusetts VMT census for light duty, residential between 2025 and 2030.	Mass EVIP (MA). MOR-EV (MA). DRIVE EV (RI). ElectrifyRI (RI). EPA CPRG Implementation Grants.
	T2. Reduce commuter emissions.	Expand regional public transit options, paired with well-planned equity-focused transit-oriented development zoning. Employee incentives to encourage remote work and taking public transit, carpooling or biking to work (i.e. "transit passes"). Help schools transition to electric buses or alternative fuels and improve walkability to encourage more walkers. Expand and improve regional bike lane networks and fund e-bike incentives.	17,500 participants no longer use their vehicle to commute to work, reducing 0.14 MMT CO2e (2.75% of Massachusetts transportation sector emissions and 0.95% of total 2020 emissions).	35,000 participants no longer use their vehicle to commute to work, reducing 0.28 MMT CO2e (4.5% of Massachusetts transportation sector emissions and 1.9% of total 2020 emissions).	States. Regional transit authorities (RIPTA, GATRA, SRTA, MBTA). Municipalities / school districts.	Assess public transportation needs & develop regional public transit strategy (3-5 years). Implement public transit expansions, paired with municipal zoning updates (5+ years). Develop/expand employee incentive programs (4-6 years). Assess sidewalk and bike lane needs & develop regional multi-modal transport strategy (3-5 years).	Number of participants who switch from using their vehicle to commute to work to carpool, work from home, or regional transit with the aid of programs supporting this action. Massachusetts VMT census for light duty, residential between 2025 and 2030.	EPA Clean Bus Program. Wave to Work (RI). Complete Streets. EPA CPRG Implementation Grants.
	T3. Adopt small-scale roadway interventions across the entire region.	Traffic signal improvements and other efficiency measures. Complete Streets. Vision Zero and road reconfiguration to improve safety and multi-modal options.	TBD.	TBD.	Municipalities on local roads. State transportation agencies for state roads (RIDOT, MassDOT).	Local & regional traffic studies & efficiency planning (2-5 years). Roadway improvement construction (5+ years).	None.	Complete Streets. Regional Greenhouse Gas Initiative. EPA CPRG Implementation Grants.
	T4. Develop and adopt a "Green Port" strategy to reduce emissions from shipping and fishing.	Reduce/eliminate in-port emissions from vessels (i.e. idling while loading/unloading). Fund decarbonization and energy efficiency improvements to land-based operations. Prepare for/support the offshore wind industry. Support electrification and alternative fuel programs for vessels.	TBD.	TBD.	Municipalities. Port authorities.	Develop local & regional "Green Port" strategies (2-4 years). Install port & vessel retrofits (5+ years).	None.	EPA Clean Ports Program. Mass Economic Seaport Council (MESC).
Electricity Generation	E1. Implement regional grid upgrades to improve capacity for renewable electricity.	Fund Infrastructure and distribution improvements. Fund and expand grid resiliency grant programs. Fund engineering competition(s) to improve technology around efficient energy generation.	Equivalent of 1,000 MW installed solar capacity achieved through combination of solar installation and grid efficiency improvements, reducing 0.28 MMT CO2e (10% of electricity generation sector emissions and 2.0% of total 2020 emissions).	Equivalent of 3,000 MW installed solar capacity achieved through combination of solar installation and grid efficiency improvements, reducing 0.84 MMT CO2e (30% of electricity generation sector emissions and 10.0% of total emissions).	Municipal & regional electricity utilities (National Grid, RI Energy). States (MA DOER, RI OER).	Grid infrastructure assessment & strategic planning (3-5 years).	Number and capacity of installed solar arrays. Electric grid distribution efficiency incremental improvement after the time of grid upgrades.	Grid Resilience and Innovative Partnerships (GRIP) Program (MA). EPA CPRG Implementation Grants.
	E2. Provide clean energy workforce training.	Fund programs in schools and for adults in phasing out careers.	TBD.	TBD.	States (MA DOER, RI OER). Universities/colleges, technical/vocational high schools.	Launch of training programs & school curriculums (2-5 years).	None.	National Grid scholarship for clean energy careers. Massachusetts Clean Energy Center. EPA CPRG Implementation Grants.

Sector	Reduction Measure	Project Examples	Estimated 2030 Reductions	Estimated 2050 Reductions	Implementing Agencies	Implementation Schedule and Milestones	Metrics for Tracking Progress	Potential Funding Sources
Buildings (Residential & Commercial)	**B1.** Fund and streamline incentive programs for building decarbonization.	Fund residential and municipal heat pump conversions and any prerequisite electrical system upgrades, prioritizing low-income and disadvantaged homeowners and renters. Supplement energy efficiency audit programs to fund all-inclusive home audits that consider safety, efficiency & electrification potential. Support homeowners and renters in navigating and participating in existing incentive programs.	50% of multi-family houses and 30% of single-family detached houses using fuel oil in 2020 convert to all-electric heating, reducing 0.32 MMT CO_2e (6% of buildings residential heating sector emissions and 2.4% of total 2020 emissions). Additional co-pollutant benefits include reductions across the region in SO_2, NO_x, CO, PM of 0.021 MT, 0.626 MT, 0.165 MT, and 0.013 MT, respectively.	100% of multi-family houses and 100% of single-family detached houses using fuel oil in 2020 convert to all-electric heating, reducing 0.98 MMT CO_2e (18.4% of buildings residential heating sector emissions and 6.6% of total 2020 emissions). Additional co-pollutant benefits include reductions across the region in SO_2, NO_x, CO, PM of 0.229 MT, 1.923 MT, 0.53 MT, and 0.041 MT, respectively.	States (MA DOER, RI OER). Municipalities. Local & regional residential assistance organizations.	Workforce training for all-inclusive home auditors (2-5 years). Development of assistance programs for homeowners & renters (2-4 years). Launch all-inclusive audit programs (3+ years). Expanded incentive programs (3+ years).	Number of participants who switch from fuel oil to all-electric heating. American Community Survey estimates of housing tenure by heating fuel for occupied housing units.	MA incentive programs: Mass Save. RI incentive programs: Efficient Buildings Fund, Home Energy Rebate Program, Clean Heat RI program. Massachusetts Community Climate Bank. Massachusetts Department of Energy Resources (DOER) Green Communities competitive grants (municipal projects). EPA CPRG Implementation Grants.
	B2. Fund and streamline energy efficiency incentive programs.	Fund weatherization retrofits and upgrades for residential and municipal buildings, prioritizing low income and disadvantaged homeowners and renters. Create funding and support programs to help builders comply with new stretch code requirements (MA). Support homeowners and renters in navigating and participating in existing incentive programs.	Triple the participation in Mass Saves efficiency measures across both investor-owned utility and municipal utility, reducing 0.023 MMT CO_2e (0.4% of buildings residential heating sector emissions and 0.16% of total 2020 emissions).	Triple above 2030 involvement the participation in Mass Saves efficiency measures across both investor-owned utility and municipal utility, reducing 0.069 MMT CO_2e (1.3% of buildings residential heating sector emissions and 0.47% of total 2020 emissions).	States (RI OER & MA DOER). Municipalities. Local & regional residential assistance organizations.	Development of assistance programs for homeowners & renters (2-4 years). Expanded incentive programs (3+ years).	Number of participants who sign up for electricity and natural gas saving measures. Savings for electricity (MWh) and natural gas (Therms) usage.	MA incentive programs: Mass Save. RI incentive programs: Efficient Buildings Fund, Home Energy Rebate Program, Clean Heat RI program. Massachusetts Community Climate Bank. Massachusetts Department of Energy Resources (DOER) Green Communities competitive grants (municipal projects). EPA CPRG Implementation Grants.
Waste Management & Materials	**W1.** Improve container reuse and recycling programs.	Public education and infrastructure improvements to improve recycling operations. Expand bottle deposit and return systems. Fund reuse and refill systems. Regionalization of municipal recycling programs and procurement processes to improve efficiency.	3% diversion of MA container waste away from landfill and combustion, reducing 0.006 MMT CO_2e (0.04% of total 2020 emissions).	3% diversion of MA container waste away from landfill and combustion, reducing 0.006 MMT CO_2e (0.04% of total 2020 emissions).	Municipalities. States (MA DOER & RI OER).	Launch public education campaign with outreach materials for municipalities (1-3 years). Container deposit and reuse system audit & feasibility assessment(s) (2-5 years). Launch regional partnerships & resources for municipal recycling programs (2-4 years).	Number of locations that implement reuse and return programs. Estimates of containers (tons) not going to landfill or combustion.	MA Efficiency & Regionalization Grant Program. EPA CPRG Implementation Grants.
	W2. Reduce the organic waste stream.	Enable municipal or regional curbside food scrap collection / drop off and composting programs. Construct industrial composting and/or anaerobic digester facilities to manage large scale and industrial wastes. Implement "food rescue" redistribution programs to avert food waste while simultaneously addressing food insecurity in low-income communities.	TBD.	TBD.	Municipalities. Regional private food scrap collections organizations. Private/industrial companies.	Regional food waste diversion feasibility assessment (1-3 years). Launch local/regional food waste diversion programs (3+ years). Construct large scale food waste processing facilities (3-5 years).	Tons of food waste diverted from landfills.	Municipal Officials Resource Recovery Grants (RI). EPA CPRG Implementation Grants.
Agriculture & Working Lands	**A1.** Support trees' capacity to remove and store carbon.	Expand urban tree canopy. Protect existing trees through local bylaws/ordinances. Provide outreach and funding to replace lawns with native plants.	2,000 acres of protected urban canopy or expansion through new tree plants added during every year in 2025 to 2029 (10,000 acres total), reducing 0.03 MMT CO_2e (0.2% of total 2020 emissions).	2,000 acres of protected urban canopy or expansion through new tree plants added during every year in 2030 to 2049 (40,000 acres total), reducing 0.12 MMT CO_2e (0.8% of total 2020 emissions).	Municipalities. State agencies.	Develop regional tree planting strategy & plan (1-3 years). Expand funding through existing programs to fund tree planting (3+ years). Local bylaw/ordinance review & revisions (2-5 years).	Number of trees planted in disadvantaged communities and in new and redeveloped land. Number of acres of trees prevented from being removed.	Providence Tree Program. MA Greening the Gateway Cities Program. Keep Mass Beautiful. EPA CPRG Implementation Grants.
	A2. Support local food growth and distribution.	Funding and support for farmers. Facilitate partnerships between restaurants / grocery stores and local growers, prioritizing distribution to "food desert" areas.	TBD.	TBD.	States. Municipalities. Regional agricultural groups.	Facilitate discussions between local grower, food distributors and restaurants (1-3 years). Launch local food distribution systems & grower support systems (3+ years).	None.	Resilient Food Systems Infrastructure (RFSI) Program (MA). US Department of Agriculture. EPA CPRG Implementation Grants.