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**ESTABLISHING A REGIONAL OFFSETTING**

**PROGRAM FOR EMISSIONS REDUCTION**

**COMPLIANCE IN MASSACHUSETTS:**

**CHALLENGES & OPPORTUNITIES**

# ACKNOWLEDGMENTS

We are grateful for the continued engagement of our member businesses and institutions on this important topic and thank the Barr Foundation for their generous support, which has made this research possible.

## REPORT TEAM

**Written By:** Isabella Gambill, Senior Policy Advisor on Climate, Energy, & Resilience

**Editing:** Yve Torrie, Director of Climate, Energy, & Resilience

Kate Dineen, Executive Vice President

Shweta Movalia, Former Intern

**Design Team:** Turner Skenderian, Marketing, Membership, & Communications Manager

Christine Yi, TMA Marketing & Programming Coordinator

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A Better City represents a multi-sector group of nearly 130 business leaders united around a common goal: to enhance the Greater Boston region's economic health, competitiveness, equitable growth, sustainability, and quality of life for all communities. By amplifying the voice of the business community through collaboration and consensus-building, A Better City develops solutions and influences policy in three critical areas: 1. transportation and infrastructure, 2. land use and development, and 3. energy and the environment. A Better City is committed to building an equitable and inclusive future for the region that benefits and uplifts residents, workers, and businesses in Greater Boston.

# EXECUTIVE SUMMARY

Across the nation, municipalities and states are taking bold action to set binding greenhouse gas emissions reduction targets—many endeavoring to achieve “net zero emissions” by 2050. In general, “net zero emissions” commitments aim to strike a balance between minimizing the volume of greenhouse gas emissions produced to the extent possible (direct emissions reduction) and the volume of greenhouse gas emissions that are avoided or removed from the atmosphere (indirect emissions reduction). As local governments develop implementation strategies to achieve these net zero by 2050 targets, significant questions arise about how to define the “net” part in net zero emissions, which leads to discussions about what percentage of indirect emissions reduction can be compensated for by tools like carbon offsets.

Carbon offsets, depending on project type and size, represent a fixed amount of carbon credits that can be purchased or sold to interested buyers to “offset” the buyer’s emissions. One carbon credit is meant to represent one metric ton of carbon dioxide that has been avoided or permanently removed from the atmosphere elsewhere. Although offset verification and best practices have been established by carbon registries like Gold Standard and Verified Carbon Standard, there is no universal price for carbon and there are no widely-adopted best practices, resulting in fragmented markets, price volatility, and inconsistent delivery of carbon emissions avoided or removed through offset projects.

Here in Massachusetts, the City of Boston has committed to achieving net zero emissions by 2050, allowing up to 10 percent of city-wide emissions to be compensated for by strategies like carbon offsets. Similarly, the Commonwealth of Massachusetts recently set a statutory mandate to reach net zero by 2050, allowing for potentially up to 15 percent of state-wide emissions to be compensated for by offsets come 2050.

While lawmakers have affirmed that the Commonwealth cannot feasibly achieve net zero emissions without offsets, the topic of offsets remains opaque and controversial. Some stakeholders are adamantly against carbon offsets, some are wary but intrigued, some are neutral, and others stand ready to purchase offsets once best practice recommendations become available. Many community-based and advocate organizations oppose offsets as tools that may perpetuate existing injustices. Many within the business community, however, see offsets as a necessary tool to help decarbonize buildings like hospitals, data centers, and labs that are energy intensive and operate 24/7.

Both the City and State are in the early stages of defining and developing programs to enable the use of offsets for compliance with emissions reduction targets. Even international policymakers like the United Nations Framework Convention on Climate Change (UNFCCC) are grappling with best practice recommendations for carbon offsetting. In recognition of this lack of universal standards and practices for offsetting, it is important to begin the conversation now about the role of carbon offsets in Massachusetts so that the state is well-positioned to reach its emissions reduction targets in partnership with the business community and local communities in the Commonwealth.

This report, therefore, is intended to provide an introduction to carbon offsets as a first step in a broader stakeholder dialogue about what effective, transparent, and equitable carbon offsetting practices for emissions reduction compliance could look like in Massachusetts. What baseline requirements should be considered for carbon offsetting best practices? What should carbon offset allowances for emissions reduction compliance look like by sector? And what should robust offset stakeholder engagement accomplish in the next 5-10 years? We know that offsets are likely to be a part of our City- and State-level climate solutions in the coming decade, and we must begin a robust stakeholder engagement process now to help address ongoing technical challenges and controversies around offsets, *before* offset allowances become available for emissions reduction compliance.

This report examines carbon offset types, projects, and best practices, and evaluates existing carbon markets. It then moves to explore carbon offsets in the Commonwealth as a transitional tool toward decarbonization and offers the following recommendations for the Commonwealth and City of Boston to consider:

## NEAR-TERM RECOMMENDATIONS

1. Publish Offsetting Best Practice Guidance and Clarify the Relationship Between Offsets and RECs in Achieving Massachusetts' Climate Commitments
2. Consider Establishing a Customized Carbon Offsetting Verification Scheme
3. Establish Sector-Specific Offsets Guidelines That Encourage Cross-Sector Collaboration and the Transfers of Carbon Credits
4. Expand the Carbon Sequestration Task Force
5. Prioritize Equitable Clean Energy Workforce Development

## MID- TO LONG-TERM RECOMMENDATIONS

1. Establish an Offsetting Governance and Enforcement Framework That Incentivizes Decarbonization
2. Establish a Financial Disbursement Mechanism for Anticipated Offset Allowance Auction Proceeds
3. Explore the Role of Mitigation Banking in Scaling Up Offsetting



# INTRODUCTION

The City of Boston and the Commonwealth of Massachusetts have both established the science-based climate target of net zero emissions by 2050. The path to decarbonization, or net zero emissions, will include reducing direct emissions from buildings, transportation, waste, and energy supplies, while also using tools like carbon offsets to compensate for the remaining indirect emission reductions that cannot be eliminated onsite.<sup>1</sup> The Carbon Free Boston report and the City of Boston Climate Action Plan (CAP) Update in 2019 stated that up to 90 percent of carbon emissions in Boston could be eliminated with existing technologies, with the remaining 10 percent accounted for by mechanisms like carbon offsets.<sup>2</sup> At a Commonwealth-level, the Baker Administration recently defined “net zero by 2050” to include 85 percent direct emissions reductions, with an option for tools like offsets compensating for the remaining 15 percent of state-wide emissions.<sup>3</sup>

A Better City’s 130 member businesses and institutions understand that acting proactively to decarbonize in the near-term future is essential to avoiding catastrophic climate impacts. As emissions reduction policies and pathways are discussed within the City and Commonwealth, carbon offsets have become an area of interest for members, especially to members in the commercial, industrial, and institutional buildings sector. Offsets are of particular interest to the owners and operators of large buildings that have unique energy-intensive and energy reliability needs and operate 24/7, such as hospitals, data centers, and labs. Members have explained that while it is imperative to pursue energy efficiency measures, as well as onsite renewable energy and offsite renewable energy procurement, hard-to-decarbonize buildings would also benefit from a small offset allowance for the emissions that will be difficult, if not impossible, to eliminate. Conversely, some members are concerned that carbon offsets provide an easy option for building owners to “buy their way out” of essential decarbonization investments like deep energy retrofits, and that purchasing offsets could take capital away from needed energy efficiency investments.

While some members feel that offsets should only be used for emissions reduction compliance five to ten years from now to ensure that deep emissions reductions are prioritized in the near-term, others have expressed frustration that offsets are not recognized as a more accepted option for emissions reduction and carbon removals in the context of global climate change, and are concerned that we are leaving carbon removals on the table by not allowing offsetting to be scaled up more immediately. Despite such differences, a majority of members believe that offsetting should be used as a tool in the decarbonization toolbox moving forward, and all members are interested in learning more about offsets as they potentially become a part of emissions reduction compliance in Massachusetts.

Considering the potential for 10 percent of Boston-wide and 15 percent of Massachusetts-wide emissions reduction to be compensated for through the purchase of offsets, coupled with the existing controversy around whether or not offsets should even be used for emissions reduction compliance, as well as a spectrum of experiences and comfort levels among members on offsetting, carbon offsets will continue to be a topic of debate as we implement net zero commitments. Communicating offsetting best practices and prioritizing such best practices in a regional offsetting program design upfront will be vital in averting unintentional harm to local communities, in avoiding offsets as a form of greenwashing, and in mitigating reputational risk for companies and individuals that purchase offsets.

To help understand offset best practices and avoid the unintentional harm that many existing offset projects have been known to promote, this report looks at ways that carbon offsets could be considered as a component of compliance under emissions reduction programs. As such, it introduces:

- What counts as a carbon offset
- Carbon offset project types
- Carbon offset best practices
- An evaluation of the carbon market

The report then moves to explore carbon offsets in the Commonwealth as a transitional tool toward decarbonization and offers five near-term recommendations and three mid- to long-term recommendations to consider for implementing carbon offsetting for emissions reduction compliance in Massachusetts.

## WHAT COUNTS AS A CARBON OFFSET?

Carbon offsets are certificates or credits, where one carbon credit represents a metric ton of carbon dioxide (or its equivalent in other greenhouse gases), that is permanently reduced, avoided, or removed from the atmosphere in one location in order to compensate for emissions occurring elsewhere.<sup>4</sup> Offsets can be bought voluntarily or used to comply with established greenhouse gas emissions reduction targets.<sup>5</sup> Independent third-party carbon registries like Verified Carbon Standard (also known as Verra)<sup>6</sup>, Gold Standard<sup>7</sup>, American Carbon Registry<sup>8</sup>, and the Climate Action Reserve<sup>9</sup> verify offset projects available on the carbon market through their own best practice methodologies. These verified carbon credits, or offsets, can then either be sold or retired. Once retired, a carbon credit is taken off the market and cannot be traded or swapped again.

While carbon offsets have been available for purchase on international carbon markets for over a decade, the price per ton can vary considerably since there is not yet an established universal price for carbon. Some projects that offer rigorous independent third-party verification alongside a wide range of project co-benefits may see pricing anywhere from \$45-80+ per carbon credit (metric ton of CO<sub>2</sub>), while other projects that do not provide such rigorous verification and co-benefit generation may cost only \$3-10 per carbon credit. Price volatility continues to be a challenge for offsetting, and until economy-wide carbon pricing is established in a way that offers some degree of cost certainty, carbon offsetting may struggle to scale up. Ideally, once offsetting best practices are established for emissions reduction compliance in Massachusetts, there should be

more clarity around the types of carbon offset projects required and the associated price range for such projects.

It is also important to note that offset projects can account for carbon *removal* from the atmosphere or compensate for carbon emissions *avoided* elsewhere. Technological carbon *removal* projects like direct air capture and storage are additional, permanent, and verifiable, but can be hard to find and are often expensive. Non-profit Carbon180, for example, promotes paying \$1,000/ton for direct air capture and storage. Stripe, a corporate climate action leader has paid anywhere from \$100-800/ton for carbon removal offset projects that were verified for additionality and permanence—a price tag that many buyers would still consider too high.<sup>10</sup> Alternatively, landfill gas and methane avoidance projects such as those available through the Clean Development Mechanism (CDM) are examples of offset projects that hinge upon emissions *avoidance* rather than removal.<sup>11</sup> Although CDM offset projects as defined in Article 12 of the Kyoto Protocol were recommended by the United Nations Framework Convention on Climate Change (UNFCCC) as promoting offset best practices, there is ongoing controversy as to the efficacy of these CDM projects. Certified emission reduction credits (CERs) as available through the CDM may involve a rural electrification project using solar panel installation or the installation of more energy-efficient boilers—both examples of carbon *avoidance* vs. carbon *removal* projects.<sup>12</sup> Increasingly, carbon removal is a top priority for many offset stakeholders, both domestically and internationally. As such, carbon markets would benefit from orienting themselves around carbon dioxide emissions *removal* whenever possible.

## COMPLIANCE VS. VOLUNTARY OFFSETS

The domestic and global markets for carbon offsets fall into two categories: voluntary and compliance. Voluntary offsets can be bought by companies hoping to achieve internal climate action plan goals and/or by individuals hoping to compensate for their personal emissions, like air travel. There are various national and international carbon registries that seek to simplify the carbon market for buyers by verifying

and selling different types of offset projects, scales, and locations, all for voluntary purchase by buyers seeking to achieve their climate commitments. On the compliance side, covered entities may purchase offsets to meet legally binding emissions reduction policies, like in the European Union’s Emissions Trading Scheme (ETS), the California Air Resources Board (CARB), or the Regional Greenhouse Gas Initiative (RGGI), which are explored in later sections on international and domestic carbon markets.

## OFFSETS VS. RECs

Although offsets can operate similarly to Renewable Energy Credits (RECs) in that they can contribute to indirect emissions reduction efforts, there are key differences between offsets and RECs. The goal of a carbon offset is the removal

or avoidance of carbon emissions, measured as a metric ton of carbon dioxide (CO<sub>2</sub>) emissions sequestered (removed from the atmosphere), or avoided elsewhere. The goal of RECs is the generation of renewable electricity, measured in the generation of megawatt hours (MWh) of renewable energy.

Offset projects are often confused with Renewable Energy Credits (RECs), especially renewable energy offsets, as they have overlapping goals. In comparing offset projects to REC projects, it can be helpful to think of the two tools in a Venn diagram, where both offsets and RECs have their own unique attributes and characteristics, but also have a degree of overlap with similar goals. Below provides additional Offsets vs RECs comparisons for reference.

**FIGURE I:** Key Differences Between Offsets & RECs

TOPIC OF DIFFERENCE	OFFSETS	RECs
<b>PURPOSE OF CREDITING MECHANISM</b>	Provide support for emission reduction activities through supplemental revenue that increases the financial viability and thus feasible scope of GHG mitigation projects	Provide mechanism to drive market demand for renewable energy and increased rates development
<b>APPROPRIATE GHG ACCOUNTING APPLICATION</b>	May be credited towards the owner’s scope 1, 2, or 3 emissions	May be credited towards the owner’s scope 2 emissions from electricity usage only
<b>MEASUREMENT UNIT</b>	Metric tons of CO <sub>2</sub> or CO <sub>2</sub> equivalent	Megawatt hours
<b>TYPES OF QUALIFYING PROJECTS</b>	Any project that is certified to reduce or avoid emissions including projects devoted to: <ul style="list-style-type: none"> <li>· Energy efficiency</li> <li>· Renewable energy</li> <li>· Carbon capture and storage</li> <li>· Methane or industrial gas mitigation</li> </ul>	Renewable energy generation projects
<b>RIGHTS CONVEYED</b>	Right to claim reducing or avoiding GHG emissions outside the owner’s operations	Right to claim use of zero-emission electricity, or to avoid the emissions associated with conventional electricity use
<b>CERTIFICATION CRITERIA</b>	Credible offsets will satisfy the P.A.V.E.R. criteria and often additional criteria such as the generation of co-benefits and contemporary relevance	Not required to test additionality

**SOURCE:** MIT Sloan (2018): A study of carbon offsets and RECs to meet Boston’s mandate for carbon neutrality by 2050.<sup>13, 14</sup>

# TYPES OF CARBON OFFSET PROJECTS

There are various types of carbon offset projects that can participate in carbon offsetting programs. They include: renewable energy; carbon sequestration; biological carbon sequestration; geologic carbon sequestration; energy efficiency; methane capture; and/or industrial gas capture/mitigation. Depending on the specific needs and goals of carbon offsetting in New England, these offset typologies could be customized and expanded to fit the New England landscape. The four most commonly used types of carbon offset projects globally are<sup>15</sup>:

- **FORESTRY & CONSERVATION:** Credits are created from either the carbon captured by new trees (i.e. tree planting projects) or through carbon sequestered in existing forestland and natural lands. Although forestry and conservation offset projects do not often offer the cheapest price per ton of carbon, they do offer significant project co-benefits like the provision of ecosystem services, biodiversity improvements, and socio-economic co-benefits for local communities. A program that promotes forestry and conservation offset projects is the Reducing Emissions from Deforestation and Degradation (REDD) system. Generally speaking, the REDD program hinges on the international exchange of offset credits, with polluting entities (often in higher-income countries) paying to offset their emissions through the purchase of REDD credits that then support forest management and protection in lower-income countries.

- *International Example:* Existing forestry and conservation offset projects are based all over the world, and include examples like conserving existing forests, replanting mangrove forests, or “re-wilding” rainforests.

- *Domestic Context:* While tree planting-based offset projects are often seen as less reliable in delivering carbon credits as quickly or effectively as other types of projects, in Massachusetts and throughout the Northeast, our strong presence of existing wildlands and woodlands could provide a powerful backbone for regional conservation-based offset projects.

- **RENEWABLE ENERGY:** These offset projects help to build or maintain renewable energy sites like solar, wind, and hydropower. By investing in renewable energy offset projects, buyers are increasing the renewable energy available on the grid, creating clean energy jobs, helping to decarbonize the economy, and improving the renewable energy sector’s growth in the region.

- *International Example:* The Bokhol Plant in Senegal, one of the largest solar projects in West Africa, provided 160,000 people with access to renewable energy, saved the government \$5 million annually, and contributed to local clean energy workforce development. Profits from the sale of carbon credits (in the unit of metric tons of carbon dioxide) from this project were fed back into local community projects.<sup>16</sup>

- *Domestic Context:* In Massachusetts and in the Northeast, we have made bold commitments to the expansion of our renewable energy portfolio as we continue to decarbonize and electrify our buildings and transportation systems. Offsets that promote renewable energy projects in Massachusetts may help to scale up and incentivize our renewable energy transition.





- **COMMUNITY PROJECTS:** A common example of a community offset project is introducing energy-efficient methods or technologies to local communities, usually in lower-income countries and underserved communities around the world.

- *International Example:* The Darfur Sudan Cookstove Project replaced traditional charcoal-based cooking methods with low smoke stoves, significantly reducing cooking-related emissions and improving air quality and health outcomes for local community members.

- *Domestic Context:* While most examples of community offset projects are not within the United States, the model of community-based projects could be explored and expanded to direct offset project investment within our most vulnerable environmental justice communities, particularly those suffering from disproportionate air pollution and poor air quality.

- **WASTE TO ENERGY:** These offset projects involve capturing methane and converting it into electricity. Waste to energy offset projects could involve capturing landfill gas or, in some cases, methane emissions associated with human or agricultural waste.

- *International Example:* Vietnam is training local communities to build and operate biogas digesters that turn methane emissions into affordable, clean, and sustainable energy.

- *Domestic Context:* Given the considerable impact of cattle and pig farming on methane emissions in the United States, waste to energy offset projects could be particularly impactful in minimizing the climate impacts of our agricultural sector across the United States. Although our options for waste to energy projects within New England may be limited, this type of offset project could be a powerful tool for offset buyers seeking to reduce national emissions, and/or emissions associated with their food supply and waste stream.

## NATIONAL SCALE OFFSET PROJECTS

There are some national carbon offsetting companies that provide opportunities to purchase carbon credits generated solely by offset projects located within the United States. Such companies may become increasingly popular as carbon offsets for compliance seek to emphasize local projects, either within the Northeast region or within the United States. Companies like The Carbon Trust have provided offset projects for both voluntary and compliance purposes and have a portfolio of 95 carbon projects in ten different sectors.<sup>17</sup> Similarly, Native Energy connects offset purchasers to projects that implement community-based regenerative agriculture projects with clear local co-benefit provisions.<sup>18</sup> While Native Energy offers a standard offset portfolio with projects that have been verified by registries like Gold Standard, Verified Carbon Standard, and the Climate Action Reserve, they also offer a new model for community-based offset investment projects known as “Help Build” offsets. Although potentially controversial, the “Help Build” carbon offset model allows buyers to purchase offsets from a project in advance (pre-emissions reduction). This helps finance the construction of new projects that will contribute to their specific project’s associated emissions reduction and provides the community with emissions reduction infrastructure that could be applied to multiple other projects. With clients like Clif Bar and Ben & Jerry’s, Native Energy’s community-based offset model is quickly scaling up into a national leader.

Companies like Amazon, BlackRock, J.P. Morgan Chase & Co., and Disney have also been exploring the potential for small-scale forestry and conservation-based offset projects, to tap into carbon removals that also promote local community and workforce development. The Family Forest Carbon Program, for example, which is a partnership between The Nature Conservancy and the American Forest Foundation, connects companies seeking to reduce their emissions with small-scale and rural family forest owners in their offsetting projects.<sup>19</sup> While typical forestry or conservation-based offset projects occur on properties over 5,000 acres, this program seeks to build and support carbon credit projects on properties ranging from

20-1,000 acres, which is the size range of the majority of privately owned forestland properties in the U.S. Particularly as our opportunities for carbon removal and carbon sequestration have their limitations within Massachusetts and even within the Northeast region, it will become all the more important for carbon registries to be creative in the provision of carbon credits for emissions reduction compliance.

## CARBON OFFSET BEST PRACTICES

### PAVER+ & SDGs

Carbon registries are independent third-party entities that verify carbon offset projects through their own best practice methodology. Whether for compliance or voluntary-based carbon offset projects, Gold Standard, Verified Carbon Standard, Climate Action Reserve, and the American Carbon Registry are the most trusted carbon verification registries, as their projects align with the World Resources Institute’s PAVER criteria and/or the U.N. Sustainable Development Goals, which are regarded as the foundation of offsetting best-practices.<sup>20</sup>

The World Resources Institute’s PAVER framework suggests that emissions reductions associated with offsets must be:

**PERMANENT:** Last in perpetuity, and cannot be reversed

**ADDITIONAL:** Not have occurred without the purchase of an offset project

**VERIFIED:** Be confirmed to deliver associated carbon credits and co-benefits as described, based on ongoing performance monitoring by an independent third-party verifier

**ENFORCEABLE:** Be backed by contracts or legal instruments that define their creation and ensure exclusive ownership

**REAL:** Represent actual emissions reductions that are not remnants of incomplete or flawed accounting elsewhere. Double counting, in which more than one entity claims carbon offset benefits from the same project, must be avoided

While the PAVER framework is a key baseline that many carbon registries employ in both national and international carbon markets, verification best practices often include additional parameters and are referred to as “PAVER+.” The “plus” component of PAVER+ can include additional co-benefits of offsetting projects, such as local employment, positive healthcare outcomes, and biodiversity enhancements, among others.

The United Nations’ 17 Sustainable Development Goals (SDGs), established in 2015, provide additional guidance for optimizing offsetting project co-benefits (see Figure 2.)<sup>21</sup> For example, the carbon registry Gold Standard explicitly calls out the incorporation of SDGs into their best practices, by reporting that, “for each [metric] ton of carbon avoided, its projects deliver up to \$177 of additional value towards the Sustainable Development Goals.”<sup>22, 23</sup> The ability to specifically call out the SDG framework in offset registries offers consistency and the ability to compare across offsetting projects and registries.

**FIGURE 2:** United Nations’ Sustainable Development Goals



**SOURCE:** Japan University English Model United Nations (2016): JUEMUN and SDGs <sup>24</sup>

Another important component of offset verification that is not captured in the PAVER or SDG frameworks is the need to avoid leakage. If an offset project sequesters or avoids emissions in one area, only to have those emissions and negative environmental impacts shift beyond the offset project site or “leak” elsewhere, then the offset project is undermined by project leakage. For example, if a carbon offset project is promoting carbon removal through the permanent protection of a forest from logging, leakage would occur if the loggers simply moved to a forest parcel adjacent to the protected offset project.<sup>25</sup> Particularly in the context of regional offsetting programs, avoidance of leakage across jurisdictional boundaries is vital both at the individual offset project level, as well as at the regional program scale.

## CARBON MARKET EVALUATION

### INTERNATIONAL CARBON OFFSETTING MARKETS

Many international offsetting stakeholders have been anxiously watching the U.N. Conference of the Parties (COP) process, as Article 6 of the Paris Agreement involves three separate pathways for “voluntary cooperation” towards country-specific climate goals for emissions reduction. The second pathway under Article 6, and the most relevant to offsetting, would create a new international carbon market governed by a U.N. body, which could allow for the trading of emissions reductions (in the form of carbon credits) anywhere in the world by both the public and private sectors. These carbon credits, sold on what could become a more universal carbon market, could be generated by a renewable power plant, upgrades in energy efficiency, and/or habitat restoration—similar to existing carbon offsetting projects sold within more fragmented voluntary and compliance markets today.<sup>26, 27</sup> However, due to the ongoing threats of the coronavirus pandemic, COP26 and its Article 6-related negotiations have been postponed until November 1-12, 2021. In the meantime, there are several existing international markets that have had varying degrees of success.

### EUROPEAN UNION EMISSIONS TRADING SCHEME

The European Union’s Emissions Trading Scheme (EU-ETS) remains as the largest carbon trading market in the world and continues to face extended scrutiny.<sup>28</sup> EU-ETS was launched in 2005, and from the beginning, skeptics have pointed out that the designated emissions cap across the EU was too high to have a significant impact on emissions reduction. In fact, the 2007 cap was actually 8.3 percent *higher* than verified 2005 greenhouse gas emissions across the EU.<sup>29</sup> For the EU-ETS to be more effective, critics argue that greater priority must be given to alternative policy options like regulation, taxation, and subsidies, while also closing dangerous loopholes proven to exist within the EU-ETS.

### AUSTRALIAN CARBON CREDIT UNIT & EMISSIONS REDUCTION FUND

The Australian Carbon Credit Unit (ACCU) market and its associated Emissions Reduction Fund awards government contracts to projects that promote carbon emissions reductions (through planting trees, flaring landfill gas, energy efficiency, etc.), but has been met with criticism and is at risk of running out of funding.<sup>30, 31</sup> With high transaction costs, high administrative capacity needs, and limited development of the secondary Australian market (which would allow individuals to trade credits voluntarily outside the government contracts associated with ACCU), Australia has not seen the uptake in offsetting practices as intended. Even with considerable flaws, the Australian government extended and rebranded funding for the ACCU under a new name: Climate Solutions Fund.<sup>32</sup> Without substantial improvements to the administrative technology involved in ACCU, it is unlikely that Australia will see substantial improvement to its offsetting regime under the Climate Solutions Fund.

### DOMESTIC CARBON OFFSETTING MARKETS

Carbon offsets and the trading of carbon credits have been in place nationally in fragmented systems, largely in California through their cap-and-trade scheme, and in the Northeast through the Regional Greenhouse Gas Initiative (RGGI). There have been additional attempts to

set up offsetting markets that were unsuccessful, such as the Chicago Climate Exchange. The newly established Transportation and Climate Initiative Program (TCI-P) commits to cap and reduce emissions from transportation and to invest associated TCI-P proceeds into decarbonizing and improving public transit in the region.<sup>33</sup> As the Commonwealth considers offsetting approaches for Boston and Massachusetts, it is important to learn from current and previous programs.

## **CALIFORNIA AIR RESOURCES BOARD (CARB)**

California's Cap-and-Trade program, launched in 2013, is among a suite of major policies that the state is using to reduce its state-wide greenhouse gas emissions. According to the California Air Resources Board's (CARB) 2017 Scoping Plan Update, California is combining technologically feasible and cost-effective climate solutions to achieve a reduction of at least 40 percent of state-wide emissions in California below 1990 levels by 2030 and at least 80 percent reduction of greenhouse gas emissions from 1990 levels by 2050.<sup>34, 35</sup> The CARB program's covered entities include about 450 businesses that are responsible for around 85 percent of California's total greenhouse gas emissions, including large electric power plants, large industrial plants, and fuel distributors (e.g. natural gas and petroleum). Offsets promoted by the CARB are limited to emissions-reduction projects located within the United States, require independent verification, and restrict offset project types to forestry, dairy digesters, destruction of ozone-depleting substances, and mine methane capture.

Authorized stakeholders can use compliance offset credits to account for a small percentage of their overall compliance obligation, with this allocated percentage decreasing over time. Beginning in 2021, at least half of offset projects used for compliance must provide direct environmental benefit to the state of California.<sup>36, 37</sup> Since the first auction of CARB allowances in November 2012 that saw the advance auction price of a carbon credit as ten dollars, auction reserve prices have varied dramatically.

Although the CARB's influence on air pollution control has resulted in improved air quality across the state, the CARB continues to face considerable criticism as emissions from oil and gas in California continue to rise.<sup>38</sup> Perhaps one of the larger flaws of the California Cap-and-Trade program is that participating entities are put at a competitive disadvantage compared to out-of-state rivals, meaning that production (and its associated emissions) can "leak" outside of California's cap to surrounding jurisdictions.<sup>39</sup>

California has also linked its system with the Western Climate Initiative, a collaboration with the Canadian provinces of Quebec and Nova Scotia. By linking the economy-wide emissions trading schemes in California, Quebec, and Nova Scotia, businesses in one jurisdiction can use emission allowances (or offsets) issued by the other for compliance.<sup>40</sup> This increases the number of businesses under the cap, which reduces compliance costs by creating more options for companies to reduce their emissions. A result of this international partnership has been the creation of the largest carbon market in North America and one of the largest in the world.<sup>41</sup>

## **REGIONAL GREENHOUSE GAS INITIATIVE (RGGI)**

The Regional Greenhouse Gas Initiative (RGGI) was the first mandatory market-based program established in the United States aimed at the reduction of greenhouse gas emissions. RGGI is a regional effort currently covering Massachusetts, Connecticut, Delaware, Maine, Maryland, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia, and it specifically targets capping and reducing greenhouse gas emissions in the power sector.<sup>42</sup> Participating RGGI states developed an offsets platform called the RGGI CO2 Allowance Tracking System (RGGI COATS), which tracks project regulatory status and the allocation of offset allowances, and also provides public access to project documentation. Offset project types that are allowed within the RGGI system include: landfill methane capture, sulfur hexafluoride capture, forestry projects, afforestation (tree planting in areas without pre-existing forest cover), end-use efficiency, and/or avoided agricultural methane—with sulfur hexafluoride capture, end-use efficiency, and

afforestation being removed from the 2017 RGGI program review process.<sup>43</sup> Since the 2017 review, states have been moving to implement more state-specific RGGI regulations that will adhere to state-specific emissions reduction timelines. Participating RGGI states sell the majority of emission allowances through auctions and use the proceeds from those auction sales to fund energy efficiency, renewable energy, and other programs that result in consumer benefits across the region.<sup>44</sup>

Since it was established in 2009, RGGI has resulted in millions of dollars in savings for energy consumers in the region (with anticipated billions more in savings to come), has created thousands of new clean energy jobs, has improved regional air pollution and healthcare, and has cut the region's power carbon pollution in half.<sup>45</sup>

## **TRANSPORTATION & CLIMATE INITIATIVE PROGRAM (TCI-P)**

The newly established Transportation and Climate Change Initiative Program (TCI-P)<sup>46</sup> aims to tackle regional transportation emissions in the Northeast and Mid-Atlantic region through a cap-and-invest program. A milestone was reached on December 21, 2020, when a Memorandum of Understanding was signed by Massachusetts, Connecticut, Rhode Island, and Washington, DC, committing signatories to cap and reduce emissions from the transportation sector in the region 26 percent by 2032. The three New England states account for 73 percent of transportation emissions and 75 to 80 percent of the GDP in New England.<sup>47</sup> Implementation of the TCI-P is estimated to generate \$1.8 billion over 10 years to invest in solutions to reduce emissions associated with transportation. By 2032, resulting health and safety benefits from the TCI-P are projected to equal \$550 million.<sup>48</sup> The proceeds from the TCI-P would ideally be reinvested into necessary upgrades to various Northeastern transportation systems. It is worth noting that as of June 2021, Connecticut's Governor Ned Lamont announced that Connecticut will not be implementing the TCI-P this year, after failing to pass state legislation that would have incorporated the TCI-P into the Governor's FY21 State Budget Proposal.<sup>49</sup> Although Governor Lamont noted that Connecticut may revisit the

inclusion of the TCI-P in their 2022 state budget, the state legislature's failure to advance TCI-P legislation in the near-term speaks to the ongoing uncertainty and complexity surrounding TCI-P implementation.

## **CHICAGO CLIMATE EXCHANGE (CCX)**

The Chicago Climate Exchange (CCX) was North America's sole voluntary greenhouse gas emissions reduction and trading scheme that linked emission sources in North America and offset projects in Brazil. From 2003 to 2010, CCX traded allowances amongst participating companies, with each committing to reduce their emissions 6 percent by 2010. The Exchange traded emissions across six different greenhouse gases: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. While there are many reasons experts reference for CCX's failure, in July 2010, it was claimed that CCX would cease trading carbon credits at the end of 2010 due to inactivity in the domestic carbon markets.<sup>50</sup> CCX also abandoned additionality claims as an offsetting principle due to false positives. For a host of reasons, therefore, CCX was never able to recover from its collapse in 2010, and remains a cautionary tale for policy makers and offsetting stakeholders alike.

# **THE COMMONWEALTH CONTEXT**

## **MASSACHUSETTS' NET ZERO EMISSIONS BY 2050 LETTER OF DETERMINATION**

On April 22, 2020, Secretary of Energy and Environmental Affairs Kathleen A. Theoharides released the Baker Administration's letter of determination for net zero emissions by 2050 in Massachusetts that defined "net zero" as requiring direct emissions reductions of at least 85 percent by 2050. This leaves up to 15 percent of state-wide emissions to be compensated for through indirect emissions reductions, like carbon offsets, renewable energy credits (RECs), power purchase agreements (PPAs), and more.<sup>51</sup>

This letter of determination was met with some controversy, with environmental and clean

energy advocates lamenting that 85 percent direct emissions reductions was not sufficient to combat climate change in Massachusetts, and with some business advocates and representatives of large buildings conversely lamenting that the 85 percent direct emissions threshold would be extremely difficult for some to achieve (e.g. large buildings that operate 24/7, have specific and energy-intensive uses, require multiple redundancies of backup generation in the event of blackout events, and/or are designated historic buildings).

Massachusetts will have to determine best practices for indirect emissions reduction compliance, by addressing various concerns from stakeholders while also creating a tool that ensures that carbon offsets are pursued in an equitable, transparent, and effective way, and that enables win-win scenarios for businesses, local communities, and environmental advocates alike.

## **MASSACHUSETTS' INTERIM CLEAN ENERGY & CLIMATE PLAN FOR 2030**

In December 2020, Secretary Theoharides unveiled the Commonwealth's draft Interim Clean Energy and Climate Plan for 2030, which establishes the roadmap for Massachusetts to achieve its climate and clean energy goals over the next 10 years. Strategy L4 of the Interim Clean Energy and Climate Plan for 2030 (2030 CECP) states that the Commonwealth will, "Develop Sequestration Accounting and Market Frameworks for Achieving Net Zero in 2050." Under this framework, the Baker Administration affirms that the strategy, "will require the ability to track and verify the annual removal from the atmosphere and storage of as much as 14.2 million metric tons of CO<sub>2</sub> by resources in, or attributable to, the Commonwealth." The 2030 CECP further states that Massachusetts' natural and working lands are projected to be able to provide no more than about half of the annual carbon sequestration that will be required by 2050.<sup>52</sup>

The 2030 CECP also asserts that the Baker Administration is actively working with the U.S. Climate Alliance to develop a regional carbon sequestration accounting or market framework to

help scale up carbon sequestration in New England over the next decade. In this ongoing, multi-state effort to design a viable carbon sequestration market, the U.S. Climate Alliance and Northeast states will need to define requirements for a potential regional carbon sequestration market like eligibility, registry, measurement, crediting, monitoring, and enforcement. The Baker Administration anticipates having this framework developed by 2025. Additionally, the Executive Office of Energy and Environmental Affairs will convene an inter-agency Carbon Sequestration Task Force in 2021 that will help guide updates to the Commonwealth's greenhouse gas emissions inventory as early as 2023. The Carbon Sequestration Task Force will help to advise the Administration on the design framework for a regional carbon market and will also lead stakeholder engagement around regional carbon sequestration market design. Although the Carbon Sequestration Task Force is only comprised of state agencies as currently drafted, A Better City strongly recommends that it be expanded to include practitioners in the carbon sequestration and nature-based climate solutions space, as a viable regional market will require the expertise of local conservation organizations, businesses, and community-based organizations to be as effective, transparent, and equitable as possible.

## **CITY OF BOSTON'S CLIMATE ACTION PLAN UPDATE OF 2019 (CAP UPDATE)**

In the Fall of 2019, the City of Boston announced its Climate Action Plan (CAP) update. In addition to setting the city-wide target of 50 percent emissions reduction by 2030 and net zero emissions by 2050, the CAP update included the intention to pursue carbon offsetting in the City of Boston over the next five years.<sup>53</sup> More specifically, the City of Boston will:

- 1.** Develop guidelines for carbon offsets relevant to future City policies and programs
- 2.** Explore a local carbon offset market, in partnership with neighboring municipalities and regional partners
- 3.** Evaluate the role of urban forestry and resilience benefits of local carbon offsets.<sup>54</sup>

The City of Boston also hinted at their preferred offsetting strategies and best practices in the Carbon Free Boston Social Equity Report below.

As Figure 3 below illustrates, the City affirms that “if not done thoughtfully, purchasing offsets introduces a potential ‘moral hazard,’ or potential negative impact on communities that produce offsets.”<sup>55</sup> In order to best mitigate the potential moral hazard of offsetting projects, the City suggests best practices that include the PAVER framework (Permanent, Additional, Verifiable, Enforceable, and Real), as well as the additional parameters of co-benefit generation and contemporary relevance. To our knowledge, the City has not yet specified types of offsetting projects that would be permitted.

There will be significant challenges to pursuing offsetting projects that prioritize local environmental and other co-benefits at a scale that matches the negative impacts of greenhouse gas emissions within Boston. While it might be faster and more efficient to buy offsets from projects located in other parts of the world, such practices may allow for a continuation of “business as usual.” As stated in the Carbon Free Boston Social Equity Report, “the purchase of carbon offsets from elsewhere raises equity concerns about the ‘fairness’ or ‘justness’ of a wealthy locale, like Boston, purchasing the right to pollute from less affluent and privileged areas of the country or the world. The offset strategy must be used carefully to avoid outsourcing Boston’s emissions reduction responsibility.”<sup>56</sup>

**FIGURE 3:** Carbon Offsetting Strategies within Carbon Free Boston’s Social Equity Report<sup>57</sup>

## Main Findings

- Some emissions are very difficult to eliminate completely. To reach carbon neutrality by 2050, Boston may have to purchase rights to emission reductions that are implemented elsewhere.
- Offsets can be purchased from emissions reductions that take place inside or outside of Boston and often are reductions from: energy efficiency, renewable energy, carbon sequestration (biological and geological), or methane and industrial gas mitigation.
- If not done thoughtfully, purchasing offsets introduces a potential “moral hazard,” or potential negative impacts on communities that produce offsets.
- The City should establish offset principles and standards that ensure all offsets are:
  - **Permanent:** emission reductions are non-reversible and last in perpetuity;
  - **Additional:** goes beyond what would have been done otherwise in a business-as-usual scenario;
  - **Verifiable:** emission reductions are measurable, confirmed, and monitored;
  - **Enforceable:** what counts as an emission reduction and offset purchase is clearly defined to avoid double counting;
  - **Real:** emission reduction being purchased does not lead to emissions increases elsewhere, i.e., the offset program generates net emission reductions;
  - **Co-benefit generation:** offset projects should be designed to facilitate emission reductions that also entail social, health, economic, or environmental benefits; and
  - **Contemporary relevance:** emission reductions being purchased should commence during the present time-period to ensure that they are real and verifiable.

## CAPTURING LOCAL STAKEHOLDER PERSPECTIVES

At the onset of research for this report, the Energy and Environment team at A Better City performed an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) associated with carbon offsets and the carbon market. A rigorous stakeholder engagement process was then conducted with A Better City members, partner organizations, offset technical experts, and colleagues across sectors. A detailed summary of the findings from the initial SWOT analysis and stakeholder engagement can be found in Appendix A.

In summary, on one side, stakeholder feedback confirmed:

- There is debate about the effectiveness of offsetting practices because they do not necessitate a reduction in direct emissions.
- Some say that while intended to be a last resort in the decarbonization process, offsets can be used to justify delays in necessary action like deep energy retrofits, cleaning the grid, and electrifying buildings in addition to transportation systems.
- If offsetting protocols are not designed to be transparent and stringent enough to promote carbon removal coupled with deep direct emissions reductions, then they can be used to maintain the status quo.
- There are environmental justice and equity concerns around allowing pollution in one area, by justifying sequestration and ecological enhancement elsewhere.<sup>58</sup> With legacies of environmental racism and environmental justice communities bearing the brunt of the negative impacts from source and non-point source pollution, carbon offsetting could potentially contribute to the further harm of already marginalized and at-risk communities.
- As carbon offsetting's primary currency is metric tons of carbon dioxide, projects can skew towards opportunities for carbon sequestration at fast rates and low cost, while failing to deliver on local co-benefits. For example, eucalyptus plantations are

known to be extremely fast-growing trees that can sequester carbon dioxide on a faster time horizon than other tree species, however they usually become an invasive species, provide no biodiversity or minimal ecosystem co-benefits, and do not integrate opportunities for community development.<sup>59</sup>

- Without accounting for the offset co-benefits alongside carbon dioxide emissions removal or avoidance, offsetting could promote a host of unintended negative consequences. Several stakeholders in our outreach said it may prove more effective not to see offset project "co-benefits" as add-on best practices to carbon offset projects, but instead, to promote these non-carbon benefits as central and core components of successful offset projects.

On the other hand, carbon offsets can also offer a tool that helps to scale up carbon removals from the atmosphere, while providing opportunities for needed investment in local economic growth and community benefits.

- Some argue that offsets are an important and necessary climate solution to pursue as soon as possible, particularly since we already know that we have too many carbon dioxide emissions in our atmosphere and will need to achieve aggressive carbon removals if we hope to avoid catastrophic climate impacts.<sup>60,61</sup> According to the Intergovernmental Panel on Climate Change (IPCC), in order to maintain a 1-degree Celsius warming scenario, we need to maintain our carbon dioxide emissions at or below 350 parts per million (ppm) of carbon dioxide in our atmosphere. With 2019 estimates of around 409ppm of CO<sub>2</sub> in our atmosphere, we will need to seriously consider carbon removals from the atmosphere in order to mitigate as much climate risk as possible moving forward, and offsets that emphasize carbon removals rather than carbon avoidance can help us to course-correct from our current trajectory of 1.5C warming, towards a 1-degree Celsius warming scenario.



- Offsets can promote the transition to a renewable energy supply and support local workforce development.
- If carbon offsets can be used as a transitional tool in our decarbonization processes at the individual, City-, and State-levels, then they can also help to spur carbon removals and coordinated accounting and market frameworks across state borders.
- If done properly, then carbon offset best practices in Massachusetts could provide a national model to follow for offsets used in emissions reduction compliance.

## THE CHALLENGE OF EXISTING LARGE BUILDINGS & DECARBONIZATION

According to the Carbon Free Boston Report, Boston’s building stock accounts for 85 percent of city-wide emissions. Addressing emissions reductions within the building sector will, therefore, need to be a cornerstone of Boston’s decarbonization strategy.<sup>62</sup> The 2019 CAP Update states that, to achieve carbon neutrality in Boston, 86,000 buildings will need to be retrofitted between now and 2050, 80,000 of which are residential and 6,000 of which are commercial.<sup>63</sup> Although totaling only 6,000 of the 86,000 buildings, commercial buildings account for close to half the square footage.<sup>64</sup> In addition, 85 percent of projected building’s square footage in Boston in 2050 already exists today and of this, over 60 percent of the square footage and 84 percent of buildings were built before 1950 and prior to the establishment of building codes. For these existing buildings, a deep energy retrofit, defined as a building renovation that achieves an energy use reduction of at least 50 percent, will be required to achieve decarbonization.<sup>65</sup> Deep energy retrofits can reduce city-wide emissions in Boston by up to 40 percent using technologies that are already commercially available.<sup>66</sup>

There are sectors and types of buildings in which 100 percent or even 90 percent direct emissions reductions will be incredibly challenging, if not impossible to achieve, even after pursuing deep energy retrofits. Many A Better City member companies and institutions own or operate some

of these building types—including healthcare facilities, labs, and data centers, to name a few. These member companies and institutions have reported that:

1. Deep energy retrofits, which require substantial upfront investments, will place a large financial burden on building owners and carbon offsets could provide some flexibility as a transitional tool in meeting emissions reduction goals.
2. Until the ISO New England grid can provide cleaner energy and increased capacity to account for future electrification of buildings and transportation, the option of carbon offsetting will be especially helpful in closing the emissions reduction gap.





# GENERAL RECOMMENDATIONS FOR OFFSETTING IN THE COMMONWEALTH

## SHORT-TERM RECOMMENDATIONS

A Better City recommends that the Commonwealth, in consultation and coordination with the City of Boston, consider the following short-term recommendations to begin to design and implement carbon offsetting for emissions reduction compliance in Massachusetts. We recommend that these steps be considered in the next 1-2 years in order to provide ample time for robust stakeholder engagement and to ensure that we establish the local infrastructure and capacity required for an effective, verifiable, equitable, transparent, and permanent offsetting program in our region.

**I. Publish Offsetting Best Practice Guidance and Clarify the Relationship Between Offsets and RECs in Achieving Massachusetts' Climate Commitments:** As it will take several years for a regional offsetting verification scheme to be fully operational, the Commonwealth and the City of Boston should collaborate to publish carbon offsetting best practices in the near future to help guide interested offset buyers toward the most effective carbon offset projects. Additionally, since there is often confusion between carbon offsets and Renewable Energy Credits (RECs), it would be helpful for City and State administrations to clarify how these tools will interact and relate to one another for emissions reduction compliance. If stakeholders were provided with a decision-making matrix that helped to detail baseline requirements for offsetting best practices, as well as additional non-carbon offset benefits and their associated trade-offs, then that would help to boost regional investment in carbon offsetting, ensure consistency and clarity, and increase familiarity prior to offsetting becoming a piece of emissions

reduction compliance in Massachusetts. A Better City’s initial best practice recommendations for carbon offsetting in Massachusetts are included in Figure 4, below. In addition to best practice

guidance, there are also supplementary considerations included “for further discussion” in ongoing stakeholder engagement around offsetting.

**FIGURE 4:** A Better City’s Initial Best Practice Recommendations for Offsetting

<p><b>PERMANENCE</b></p>	<p>Requires the land and associated carbon sequestration that an offset project relies on to be permanently protected. In Massachusetts, this could dovetail well with the robust private ownership and private land protection of forestland, wetlands, and other property.</p> <p><i>For further discussion:</i> Decide whether to require the retirement of development rights on offset project land through mechanisms like conservation easements, donation of land to a land trust, etc. Land leases, even if they are in the order of 50-100-year leases, are not sufficient for achieving offset project permanence. This clause would ensure that carbon sequestration efforts and their associated credits are not undermined by future development.</p>
<p><b>ADDITIONALITY</b></p>	<p>Requires additional emissions reductions that would not have occurred without the purchase of the offset project.</p> <p><i>For further discussion:</i> Develop a baseline defining “additional” emissions reductions and co-benefits. For example, to demonstrate additionality, a project must meet the baseline requirement plus 2-3 demonstrated co-benefits (like local economic development, healthcare co-benefits, local employment co-benefits, etc.). Alongside this baseline definition, distinguish between how we define “additionality” as it relates to offsets vs. RECs, if appropriate.</p>
<p><b>VERIFIABLE</b></p>	<p>Requires offset projects be independently verified. In Massachusetts, each offset project developer could partner with a conservation NGO for ongoing stewardship and maintenance of an offset-relevant property in perpetuity.</p> <p><i>For further discussion:</i> Develop stakeholder-approved local expertise that can be tapped into for independent third-party verification.</p>
<p><b>ENFORCEABLE</b></p>	<p>Requires clearly and exclusively defined ownership of an offset property and the associated carbon reductions. This should help to avoid double counting. There are considerable capacity and logistical considerations to be addressed around enforceability.</p> <p><i>For further discussion:</i> Ensure enforcement is transparent and consistent across a potential multi-state regional offsetting program. Review existing governing bodies that could help with this enforcement and/or consider new governing bodies. Develop an accountability framework to make decisions such as what happens when an offset project is found to be faulty.</p>

**FIGURE 4 CONT.:** A Better City’s Initial Best Practice Recommendations for Offsetting

<p><b>REAL</b></p>	<p>Represents actual emissions reductions that are not remnants of incomplete or flawed accounting elsewhere. As stated earlier, double counting, in which more than one entity claims carbon offset benefits from the same project, must be avoided. The PAVER definition of ‘Real’ could also be expanded upon here so that ‘Real’ also ensures no leakage beyond the offset project generating a true reduction of carbon emissions on the ground. Retirement of associated carbon credits is encouraged but not required.</p> <p><i>For further discussion:</i> Develop criteria to ensure, especially in the context of a multi-state or regional offsetting program, that leakage does not occur across state or other jurisdictional boundaries.</p>
<p><b>EQUITABLE</b></p>	<p>Prioritizes and incentivizes offsetting projects that encourage local benefits and climate justice outcomes.</p> <p><i>For further discussion, as an example:</i></p> <ul style="list-style-type: none"> <li>• [x]% of carbon offsetting proceeds from a potential Massachusetts carbon market that should be dedicated to the Clean Energy Equity and Innovation Fund*</li> <li>• [x]% of carbon offsetting proceeds from a potential Massachusetts carbon market that should be dedicated to workforce development programs like Roxbury Community College’s Smart Buildings Technology Program</li> <li>• What could equitable, robust stakeholder engagement and offset governance look like in Massachusetts?</li> </ul>
<p><b>CONTEMPORARY RELEVANCE</b></p>	<p>Ensures that the carbon removals or avoidance associated with the offset carbon credits are delivered at the time of offset sale, rather than be dependent on an offset project maturing over time (this is one of the reasons why tree-planting offset projects are often discouraged).</p>
<p><b>LOCAL BENEFIT(S)</b></p>	<ol style="list-style-type: none"> <li>1. Ensures that a percentage of carbon offsetting proceeds be dedicated to the establishment and ongoing funding of a Green Bank or similar mechanism, providing incentive programs for local deep energy retrofits, clean and affordable housing, and urban green infrastructure projects.</li> <li>2. Offsetting projects from outside New England may be discounted in value by a determined percentage with the leftover proceeds feeding back into the Green Bank. Alternatively, offsetting projects from within New England could be incentivized by including a local benefit ‘adder’ to local offset projects used for emissions reduction compliance.</li> </ol> <p><i>For further discussion:</i> Design a local offsetting program to empower local communities to both participate in and benefit from offset projects that include robust stakeholder engagement.</p>

\* Recent legislation Bill S.9 An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, signed into law by Governor Charlie Baker in March 2021, established the Clean Energy Equitable Workforce and Market Development Program within the Massachusetts Clean Energy Center (MassCEC). If a Clean Energy Equity and Innovation Fund were to be developed as a component of a regional offsetting program, then there is potential for offsetting proceeds to contribute to the work of this new office, and to potentially provide a funding match to projects that align with the MassCEC Clean Energy Equitable Workforce and Market Development Program and help to scale up equitable decarbonization efforts.

**2. Consider Establishing a Customized Carbon Offsetting Verification Scheme:** The Commonwealth should engage with relevant stakeholders to assess the feasibility of establishing a customized, state-wide carbon offsetting verification scheme, by partnering with local conservation organizations, utilities, consulting firms, and/or environmental nonprofits for independent third-party verification. Such partnership would place offset project verification and long-term stewardship into the hands of local natural resource experts who are the most familiar with the landscape and understand our Commonwealth’s broader emissions reduction and greenhouse gas inventory context. Rather than outsourcing offsetting project verification to international carbon registries, the Commonwealth could incorporate best practices from trusted carbon registries into a customized and contextualized system. Additionally, although Massachusetts does have considerable natural and working lands to help support a potential regional offsetting program, the Commonwealth could benefit from working with surrounding states in New England and the Northeast to unlock additional regional carbon removal opportunities and to establish a regional offsetting program that is transparent and effective and does not promote “leakage” of carbon offsetting projects across state lines. This would also provide potential new funding. Further considerations for governance and enforcement of a Commonwealth Carbon Offsetting Verification Scheme are included in the mid- to long-term recommendations section, below.

**3. Establish Sector-Specific Offsets Guidelines That Encourage Cross-Sector Collaboration and the Transfers of Carbon Credits:** The Commonwealth has indicated that up to 15 percent of state-wide emissions may be compensated for through offsets, and the City has indicated that up to 10 percent of city-wide emissions may be compensated for by offsets—but it remains unclear how these percentages may apply to specific sectors over time. Since some sectors like buildings and transportation will be harder to decarbonize than others, offsetting allowances—and how they may or may not be transferred or traded across sectors—must be considered carefully and strategically.

For example, will these allowances for offsets as they pertain to emissions reduction compliance be evenly distributed across sectors, or will some sectors have a higher opportunity for offsets? Will there be some provisions for hardship exemptions for exceptionally hard-to-decarbonize buildings? Similar to questions arising within the UNFCCC around cross-jurisdictional transfers of carbon credits, will offset allowances in Massachusetts be transferable or tradeable across sectors and/or jurisdictions for emissions reduction compliance? The Commonwealth and City of Boston should publish more detailed sector-specific guidance and timelines regarding the use of offsets to achieve emissions reduction targets. Guidance should specify how the percentage of emissions compliance compensated for by offsets applies to all relevant sectors and determine if and how the percentage of the emissions mix to be compensated for by offsets will decrease over time. Additionally, guidance should establish exceptions and discrepancies in offset allowances by sector, as some sectors will have more difficulty achieving 90 percent direct emissions reduction than others.

**4. Expand the Carbon Sequestration Task Force:** The Carbon Sequestration Task Force, which is currently slated to be comprised of state agencies only, will help to advise the Baker Administration on the design framework for a regional carbon market and will also lead stakeholder engagement around regional carbon sequestration market design. The Commonwealth should consider expanding the Task Force membership to include practitioners in carbon sequestration and nature-based climate solutions within local conservation organizations, community-based organizations, and the business community, especially large building owners like healthcare institutions and commercial real estate.

**5. Prioritize Equitable Clean Energy Workforce Development:** As required by Bill S.9 *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*, the Commonwealth will establish the Clean Energy Equity Workforce and Market Development Program within the Massachusetts Clean Energy Center, which could help to

connect regional offsetting projects to local, equitable clean energy workforce development opportunities.<sup>67</sup> In addition, the Commonwealth should consider establishing an associated Clean Energy Equity and Innovation Fund to help fund technological innovation and to address offsetting equity concerns, local co-benefits, and workforce development opportunities.

## MID- TO LONG-TERM RECOMMENDATIONS

A Better City recommends that the Commonwealth, in consultation and coordination with the City of Boston, consider the following mid- to long-term recommendations to establish effective offset governance and enforcement for emissions reduction compliance, to ensure equitable and transparent disbursement of proceeds associated with a regional offsetting program, and to scale up carbon offsetting best practices through the exploration of linking carbon offsetting to mitigation banking.

### I. Establish an Offsetting Governance and Enforcement Framework That Incentivizes Decarbonization:

If carbon offsets are to be used for compliance with the Commonwealth's emissions limits and sublimits in the future, then further offsetting oversight will be needed to ensure consistent governance and implementation, to clarify how offset proceeds might be used to incentivize decarbonization (to promote energy efficiency and renewable energy deployment whenever possible), and to guide transparent and equitable enforcement of offsetting best practices over time. Additional roles for a potential Offset Governing Board could include ensuring public access to offset accounting and data tracking, managing offset allowance distribution and allowance auctions, structuring incentives to promote decarbonization and prevent overreliance on offsets, hosting public hearings, and providing effective and consistent enforcement of offset best practices in perpetuity. This proposed Offset Governing Board may also want to consider guidelines around when offset buyers should pull out of offset projects that do not deliver and/or establish a reporting mechanism for faulty offset projects. Offsetting governance would also benefit from the input of legal perspectives to proactively address litigation risk and concerns with offset projects that may

not deliver on the carbon credits that they claim. Finally, the Offset Governing Board could also assist the Commonwealth in establishing potential multi-state and even international linkages to the Massachusetts offset market in the longer-term. Once an offsetting governance and enforcement framework is established for Massachusetts, the Offset Governing Board could also consider longer-term recommendations to eventually diminish the use of offsets over time as technological advances and grid modernization efforts scale up, such as the possibility of retiring carbon credits from the market and/or phasing out the use of offsets in emissions reduction compliance.

### 2. Establish a Financial Disbursement Mechanism for Anticipated Offset Allowance Auction Proceeds:

In the example of the California Air Resources Board (CARB), the allocation of offset allowances as they relate to emission reduction compliance is also linked to the auction of offset allowances, which then generates considerable auction proceeds to the state of California for use in their California Greenhouse Gas Reduction Fund (GGRF).<sup>68</sup> If a parallel process were to be explored in Massachusetts with offset allowances and an associated auction of offset allowances, then the proceeds generated would require a financial disbursement mechanism and governing body (ideally the same governing body as referenced in the first mid- to long-term recommendation above). A rough example of financial disbursement of auction proceeds from offsets in Massachusetts could be explored as follows:

- Establish a financial disbursement structure for offset revenue to support the following:\*
- Deep energy retrofit incentives
- Direct payments to conservation organizations to support verification/permanence/enforcement efforts
- Subsidies to help promote district energy solutions and clean energy technological deployment via a new Clean Energy Equity and Innovation Fund
- Equitable clean energy workforce development programs.

\*Depending on the offset best practices required, the amount and types of revenue, stakeholders involved, and oversight required may vary substantially. Ideally, an offsetting structure could be set up that would allow for proceeds to be split and shared in ways that can catalyze further equitable decarbonization in Massachusetts.

**3. Explore the Role of Mitigation Banking in Scaling up Offsetting:** Mitigation banking is a system where the liability of ecological damage is transferred from the permittee or developer to the mitigation banker through a system of credits and debits under regulatory guidelines. A mitigation banker develops, restores, preserves, and manages a conservation site and earns mitigation credits, which are then sold to the permittee or developer for a fee.<sup>69</sup> Mitigation banking could provide an opportunity for large-scale investment into our natural climate solutions and natural heritage, with a more centralized and pre-vetted offset project that multiple buyers can choose from, as opposed to one-to-one offset buyer-to-seller transactions. This could be pursued either by the City or State and could help achieve carbon sequestration targets as discussed in the Clean Energy and Climate Plan for 2030, while also providing a large pool of possible carbon credits to allocate for emissions reduction compliance in Massachusetts. Once relevant offsetting infrastructure in Massachusetts is established in a way that delivers effective, verified, equitable, and transparent carbon removals through offsets, then mitigation banking may be a powerful tool in scaling up our offsetting efforts beyond New England, while also promoting large landscape conservation projects that would not happen otherwise.

## CONCLUSION

The complexities highlighted in this report illustrate the types of challenges that will need to be addressed in the development of a carbon offsetting program for emissions reduction compliance in Massachusetts. While many technical and logistical challenges remain, it is clear that there is considerable interest in beginning a robust stakeholder engagement process with both the City and State on offsetting best practices and program design. This work will need to be done with intentionality and transparency, guided by extensive stakeholder engagement across sectors and community organizations. Despite these challenges, carbon offsetting has the potential to serve as a transitional tool to enable decarbonization in Massachusetts and promote near-term carbon

removals, as energy efficiency initiatives and clean energy technologies continue to advance. Additionally, carbon offsetting holds considerable promise in generating new revenue for climate solutions in Massachusetts, as the global carbon market has grown to about \$272 billion in 2020, and is expected to continue to grow.<sup>70</sup>

As the City of Boston and Commonwealth of Massachusetts consider the role of carbon offsetting in our City and State's decarbonization pathways to 2050, there is significant opportunity for public-private partnership in offset design and implementation, as well as on-the-ground engagement with key community-based organizations. Engagement with large building owners and tenants will be vital as best practices are developed to ensure effective offsetting implementation within the business community and buildings sector. Additionally, it will be essential to center local communities and equity considerations in offsetting conversations, offset program design, and decision-making whenever possible.

Finally, regardless of where stakeholders fall in their support of, or opposition to, carbon offsetting, it is only a matter of time before offsets come to Massachusetts and Boston as a tool in emissions reduction compliance. If we can begin robust best practices dialogues now, by engaging the business community, community-based organizations, environmental justice communities, and other stakeholders, then we will be in a much better position to deliver on our environmental, economic, and equity goals once offsets are permitted for emissions reduction compliance.

Given the significant economic shortfalls across sectors from the coronavirus pandemic, the City and State have an opportunity to pursue offsetting as a tool in climate funding and financing, while also designing projects that are transparent, effective, and permanent in their emissions reductions. A Better City looks forward to continuing the conversation around offsetting best practices in the Commonwealth and hopes that this initial report may help to spur further discussion and intentional, transparent action around carbon offsetting in Massachusetts.

# APPENDIX A: SWOT ANALYSIS

## STRENGTHS

- **ACCELERATING A PRAGMATIC DECARBONIZATION TRANSITION:** Offsets internalize the cost of carbon, while providing flexibility for businesses and other stakeholders looking to decarbonize their portfolios, institutions, sectors, and communities.
- **OPPORTUNITIES FOR HARD-TO-DECARBONIZE BUILDINGS:** Offsets provide flexibility for businesses pursuing decarbonization.
- **ACHIEVING PERMANENCE:** Despite their challenges, components of offsetting programs in Australia and California are worth exploring, including 100-year permanence requirements and penalties for defaulting.
- **GEOGRAPHIC SCOPE:** A regional offsetting program might work best across New England plus New York. New England and New York already have a lot of shared greenhouse gas accounting and similar methodologies for calculating carbon stocks and sequestration across these states. Consistency in accounting methodology is key.
- **PROMOTING MULTIPLE NON-CARBON BENEFITS:** Offsets can be designed so that multiple goals and benefits are required beyond carbon removals; stacking and bundling of these benefits are key to a successful program.
- **OFFSET INVESTMENTS:** These could be prioritized in areas that have been hardest hit by air pollution, point source pollution, and decades of siting of industrial facilities near low-income communities and communities of color.
- **ALIGNING WITH ANTICIPATED CLIMATE POLICY:** Offsets could be designed to align with existing climate policy initiatives like the City of Boston's 20-year Urban Tree Forest Plan and possible alignment to and/or leverage from the net zero goal of the Metro Mayors Coalition.<sup>71,72</sup>

## WEAKNESSES

- **RISK:** Concern about reputational and litigation risks might delay needed offset development and implementation of best practices.
- **EXACERBATING DISPARITIES:** Many community-based organizations are concerned that carbon offsetting programs would only help to exacerbate existing disparities and environmental injustices that result in communities of color bearing the brunt of negative health and other environmental impacts associated with our emissions.
- **MARKET LIMITATIONS:** Since there is still a lack of universal price for carbon, carbon markets remain geographically fragmented and at risk of price volatility and fluctuation over time.
- **INCONSISTENCY & FRAGMENTATION:** Inconsistent standards and practices and fragmented carbon markets with varying prices per ton of carbon can lead to buyer hesitancy and general distrust in the stability of the carbon market.
- **LACK OF LOCAL BUY-IN:** There continues to be substantial opposition to any use of offsets for emissions reduction compliance in Massachusetts from community-based organizations, which has been especially apparent in the push against offsets being used for Boston's drafted Building Emissions Performance Standard.
- **CUMBERSOME ACCOUNTING:** Accounting for carbon removal data and offset tracking is both difficult to scale-up and cumbersome, so a structure needs to be developed that avoids having to count the sequestration potential of every individual tree, as an example.
- **ADMINISTRATION & GOVERNANCE:** It is not clear who would be responsible for governing a regional offset program and ensuring public access to tracking data. Significant administrative and governance capacity concerns must be addressed pre-implementation.
- **GREENWASHING:** Unless pursued in tandem with energy efficiency measures and renewable energy procurement, offsets may enable a "business as usual" scenario.



## OPPORTUNITIES

- **PROMOTING CARBON REMOVALS THAT PRIORITIZE LOCAL COMMUNITIES:** Offsets could lift up and expand existing programs like the Greening Gateway Cities Program that involves targeted tree planting in Environmental Justice communities with co-benefits for stormwater management, wildlife habitat, mitigating extreme heat, and/or the Family Forest Program — a potential model for engaging small forest and working landowners.<sup>73, 74</sup> Offsetting could also explore the potential for blue carbon projects in achieving carbon removals.
- **COMMUNITY BENEFIT:** If designed correctly, then offsets can emphasize non-carbon benefits to local communities (particularly health and healthcare cost-savings benefits), help to achieve established climate commitments, and/or aid to improve and protect our natural and working lands.
- **RENEWABLE ENERGY EXPANSION:** Offsets could be used to promote building renewable energy infrastructure, grid modernization, conserving open space, and wetlands habitat restoration. Additionally, offsets could be linked to the replacement of peaker plants with energy storage.<sup>75</sup>
- **ACCELERATING CLIMATE INVESTMENT:** Offsets could provide seed funding for climate investment revolving loan funds, at a time when funding is limited.
- **LOCAL CLIMATE SOLUTIONS:** A customized Massachusetts offsetting scheme could help us to achieve our emissions reduction targets and provide climate funding.
- **PROMOTING TRANSIT EQUITY & AIR QUALITY IMPROVEMENTS:** Offsets could enable free public transit by funding monthly fare cards for low-income riders; offsets could be paired with regulations that mandate air quality improvements around point sources of pollution.

## THREATS

- **ENCOURAGING NON-CARBON PRIORITIES:** Without the inclusion of non-carbon benefits, offsets can oversimplify the challenge of climate change solely to consider CO<sub>2</sub> emissions, thereby missing large additional contributors to climate change and social inequities.
- **POLICY UNCERTAINTY:** Policy drivers are subject to change and there is some transitional risk around what does or does not count in terms of offsetting uses for emissions reduction compliance, particularly in the context of upcoming COP26 discussions of Article 6.
- **LEAKAGE:** There are major challenges around guaranteeing that emissions sequestration or avoidance in one area does not leak into adjacent or other areas. If we are considering a regional offsetting program that would work across state lines, then leakage could pose a considerable problem.
- **DOUBLE COUNTING:** If we are paying for offset projects in Maine, we need to ensure that the carbon removal/emissions avoidance is not being counted for Maine's decarbonization goals as well as Massachusetts'.
- **COMPLIANCE:** Many emissions reduction policies are being developed at City and State levels, but what indirect emissions reduction efforts will "count" are not yet defined; it remains unclear what kinds of offset projects may be allowed, how they will interact with RECs, and/or which best practices to prioritize.
- **GEOGRAPHIC SCOPE:** Some organizations operate at different geographic scales: local, regional, national, and international. Keeping this spectrum of offsets operating across geographic scales in mind, best practices should be developed in a way that takes this range of scope into account.
- **MISMATCHED BURDENS & BENEFITS:** If businesses want the privilege of paying for offset projects in Maine to continue polluting in Massachusetts, then we need a parallel market for public health impacts in Massachusetts; remediation needs to stay within our State.

<ul style="list-style-type: none"> <li>• <b>GOVERNANCE &amp; ADMINISTRATION:</b> Higher education institutions in Massachusetts could play the role of independent third-party verifiers for offset projects (Duke University has begun to explore this). There needs to be an Offset Governing Board (not just Advisory in capacity) comprised of broad community representation, state and city agency representatives, and representatives of businesses operating in the large existing buildings space (among others) to manage how offsets are being distributed and enforced over time. The Metropolitan Area Planning Council, which convenes the Metro Mayors, could also be helpful in running offset procurements and administering programs and expanding on GHG inventory datasets. Finally, American Forests is an organization working on urban forestry that is based in DC, with presence in VT, and could potentially play a role of offset clearinghouse.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>TRANSPARENT ACCOUNTING:</b> Publicly posted, regularly updated tracking and inventory of offset projects are needed (i.e. an inventory that details associated GHG reductions, how offset proceeds are being spent, what the health outcomes are, etc.).</li> <li>• <b>OFFSETS STIGMA:</b> Although we know that offsets are going to play a role in both City- and State-level compliance for emissions reduction in the next 5-10 years, significant opposition to offsets may threaten to stall or prevent conversations around best practices, transparent accounting, multi-state collaboration on carbon sequestration accounting and market frameworks, and more. Despite, and perhaps, because of, this controversy, offsetting best practice conversations must be pursued immediately.</li> </ul>
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A Better City Member Organizations:

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- Conservation Law Foundation
- Green Ribbon Commission
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- Massachusetts' Implementation Advisory Committee for the Global Warming Solutions Act: Climate Justice Working Group
- Metropolitan Area Planning Council
- Metro Mayors Coalition
- Practice Green Health
- The Nature Conservancy
- Union of Concerned Scientists

# SOURCES

1. Greenhouse Gas Protocol (2021) <https://ghgprotocol.org/calculationg-tools-faq#:~:text=Direct%20GHG%20emissions%20are%20emissions,or%20controlled%20by%20another%20entity.>
2. City of Boston. (2019) Climate Action Plan (CAP) Update. [https://www.boston.gov/sites/default/files/embed/file/2019-10/city\\_of\\_boston\\_2019\\_climate\\_action\\_plan\\_update\\_4.pdf](https://www.boston.gov/sites/default/files/embed/file/2019-10/city_of_boston_2019_climate_action_plan_update_4.pdf)
3. Secretary Theoharides (2020) Net Zero By 2050 Letter of Determination, April 22, 2020.
4. World Resources Institute (2015) <https://resource-solutions.org/wp-content/uploads/2015/08/RECsOffsetsQA.pdf>
5. Goodward, J. and Kelly, A. (2010) Bottom Line on Offsets. World Resources Institute, [https://www.wri.org/publication/bottom-line-offsets#:~:text=A%20greenhouse%20gas%20\(GHG\)%20or,cap%2Dan-d%2Dtrade%20system](https://www.wri.org/publication/bottom-line-offsets#:~:text=A%20greenhouse%20gas%20(GHG)%20or,cap%2Dan-d%2Dtrade%20system)
6. Verra (2021) <https://verra.org/>
7. Gold Standard (2021) <https://www.goldstandard.org/>
8. American Carbon Registry (2021) <https://americancarbonregistry.org/>
9. Climate Action Reserve (2021) <https://www.climateactionreserve.org/>
10. In Search of Carbon Removal Offsets (2020) Carbon180, Medium. <https://carbon180.medium.com/in-search-of-carbon-removal-offsets-42abf71b3ccc>
11. Gillenwater, M. and Seres, S. (2011) The Clean Development Mechanism: A Review of the First International Offset Program. <https://www.c2es.org/site/assets/uploads/2011/03/clean-development-mechanism-review-of-first-international-offset-program.pdf>
12. United Nations Framework Convention on Climate Change (2021). The Clean Development Mechanism. <https://unfccc.int/process-and-meetings/the-kyoto-protocol/mechanisms-under-the-kyoto-protocol/the-clean-development-mechanism>
13. MIT Sloan (2018) A study of carbon offsets and RECs to meet Boston's mandate for carbon neutrality by 2050. <https://mitsloan.mit.edu/sites/default/files/2018-10/BU-Report-2018.pdf>
14. What Are Scope 3 Emissions? (2021) Carbon Trust. <https://www.carbontrust.com/resources/briefing-what-are-scope-3-emissions#:~:text=Scope%201%20covers%20direct%20emissions,in%20a%20company's%20value%20chain>
15. Energy Intelligence Centre (2021) 4 Types of Carbon Offset Projects. <https://www.eic.co.uk/4-types-of-carbon-offset-projects/>
16. Energy Intelligence Centre (2021) 4 Types of Carbon Offset Projects. <https://www.eic.co.uk/4-types-of-carbon-offset-projects/>
17. The Climate Trust (2021) <https://climatetrust.org/impact/>
18. Native Energy (2021) <https://native.eco/about-us/>
19. Family Forest Carbon Program (2021) <https://www.forestfoundation.org/family-forest-carbon-program>
20. Second Nature (2021) Purchasing Carbon Offsets FAQs. <https://secondnature.org/climate-action-guidance/purchasing-carbon-offsets-faqs/>
21. Sustainable Development Goals (2015) <https://sdgs.un.org/goals>
22. Potts, M. (2019) Carbon offsets are dominating headlines, here's what you need to know . Climate X-Change, August 22, 2019, <https://climate-xchange.org/2019/08/22/carbon-offsets-are-dominating-headlines-heres-what-you-need-to-know/>
23. Gold Standard. (2021) <https://www.goldstandard.org/>
24. Japan University English Model United Nations (2016) JUEMUN and SDGs <https://juemun.org/what-is-juemun/juemun-and-sdgs/>
25. Google's Carbon Offsets: Collaboration and Due Diligence (2011) <https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-carbon-offsets.pdf>

26. Paris Agreement (2015) United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement, November 2015, [https://unfccc.int/files/meetings/paris\\_nov\\_2015/application/pdf/paris\\_agreement\\_english\\_.pdf](https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf)
27. Carbon Brief (2019) In-depth Q&A: How ‘Article 6’ carbon markets could ‘make or break’ the Paris Agreement. <https://www.carbonbrief.org/in-depth-q-and-a-how-article-6-carbon-markets-could-make-or-break-the-paris-agreement>
28. Corporate Europe Observatory (2015) EU emissions trading: 5 reasons to scrap the ETS. <https://corporateeurope.org/en/environment/2015/10/eu-emissions-trading-5-reasons-scrap-ets#:~:text=The%20failure%20of%20the%20ETS,the%20system%20well%20past%202020>
29. Friends of the Earth Europe (2010) The EU Emissions Trading System: failing to deliver. [https://ec.europa.eu/clima/sites/clima/files/docs/0005/registered/9825553393-31\\_friends\\_of\\_the\\_earth\\_europe\\_en.pdf](https://ec.europa.eu/clima/sites/clima/files/docs/0005/registered/9825553393-31_friends_of_the_earth_europe_en.pdf)
30. Clean Energy Regulator (2019) Australian Carbon Credit Unit Market Updates, December 2019, <http://www.cleanenergyregulator.gov.au/Infohub/Markets/buying-accus/australian-carbon-credit-unit-market-updates>
31. Thomas, S. and Hartmann, S. (2019) Australia’s carbon market needs to be faster and smarter. Blockchain can help. <https://theconversation.com/australias-carbon-market-needs-to-be-faster-and-smarter-blockchain-can-help-123991>
32. Thomas, S. and Hartmann, S. (2019) Australia’s carbon market needs to be faster and smarter. Blockchain can help. <https://theconversation.com/australias-carbon-market-needs-to-be-faster-and-smarter-blockchain-can-help-123991>
33. Commonwealth of Massachusetts, December 21, 2020 Press Release. <https://www.mass.gov/news/massachusetts-new-england-states-and-dc-commit-to-groundbreaking-regional-program-to-reduce>
34. California Air Resources Board (2021a) Our Work: 2017 Scoping Plan Update, <https://ww2.arb.ca.gov/our-work/topics/climate-change>
35. California Air Resources Board (2021b) California’s 2017 Climate Change Scoping Plan; The Strategy for Achieving California’s 2030 Greenhouse Gas Target. [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping\\_plan\\_2017\\_es.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017_es.pdf)
36. California Air Resources Board (2020c) About the Compliance Offset Program. <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/about>
37. California Environmental Protection Agency (2015) Overview of the ARB Emissions Trading Program. [https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/guidance/cap\\_trade\\_overview.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/guidance/cap_trade_overview.pdf)
38. Song, L. (2019) Cap and Trade Is Supposed to Solve Climate Change, but Oil and Gas Company Emissions Are Up. ProPublica, November 15, 2019. <https://www.propublica.org/article/cap-and-trade-is-supposed-to-solve-climate-change-but-oil-and-gas-company-emissions-are-up>
39. Roberts, D. (2018) California Cap-and-Trade System may be too weak to do its job. Vox, December 13, 2018. <https://www.vox.com/energy-and-environment/2018/12/12/18090844/california-climate-cap-and-trade-jerry-brown>
40. California Air Resources Board (2020d) 2020 Auction Notice: California Cap-and-Trade Program and Québec Cap-and-Trade System Joint Auction of Greenhouse Gas Allowances on August 18, 2020 Issued on June 19, 2020. <https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auction/aug-2020/notice.pdf>
41. WCI Program Design and Implementation (2021) <https://wci-inc.org/our-work/program-design-and-implementation>
42. Regional Greenhouse Gas Initiative: Offsets (2020) <https://www.rggi.org/allowance-tracking/offsets#:~:text=Offset%20projects%20must%20be%20located,regulated%20power%20plant's%20compliance%20obligation.>

43. Regional Greenhouse Gas Initiative: Offsets (2020) <https://www.rggi.org/allowance-tracking/offsets#:~:text=Offset%20projects%20must%20be%20located,regulated%20power%20plant's%20compliance%20obligation>
44. Regional Greenhouse Gas Initiative: Offsets (2020) <https://www.rggi.org/allowance-tracking/offsets#:~:text=Offset%20projects%20must%20be%20located,regulated%20power%20plant's%20compliance%20obligation>
45. Ho, B. (2018) The Regional Greenhouse Gas Initiative Is a Model for the Nation. Natural Resources Defense Council, June 12, 2018. <https://www.nrdc.org/resources/regional-greenhouse-gas-initiative-model-nation>
46. Transportation and Climate Initiative (2021) <https://www.transportationandclimate.org/content/about-us>
47. Commonwealth of Massachusetts, December 21, 2020 Press Release. <https://www.mass.gov/news/massachusetts-new-england-states-and-dc-commit-to-groundbreaking-regional-program-to-reduce>
48. Commonwealth of Massachusetts, December 21, 2020 Press Release. <https://www.mass.gov/news/massachusetts-new-england-states-and-dc-commit-to-groundbreaking-regional-program-to-reduce>
49. WBUR, June 7, 2021 Transportation Emissions Plan Down To 3 Members After Conn. Walks Away From Pact, [https://www.wbur.org/news/2021/06/07/tci-transportation-climate-initiative-massachusetts-connecticut?utm\\_source=WBUR+Editorial+Newsletters&utm\\_campaign=00d027f74d-WBURTO-DAY\\_2021\\_06\\_08&utm\\_medium=email&utm\\_term=0\\_d0781a0a0c-00d027f74d-135418997](https://www.wbur.org/news/2021/06/07/tci-transportation-climate-initiative-massachusetts-connecticut?utm_source=WBUR+Editorial+Newsletters&utm_campaign=00d027f74d-WBURTO-DAY_2021_06_08&utm_medium=email&utm_term=0_d0781a0a0c-00d027f74d-135418997)
50. Chicago Climate Exchange Inc. (2009) Chicago Climate Exchange® Renewable Energy Systems Offset Project Protocol. [https://www.theice.com/publicdocs/ccx/protocols/CCX\\_Protocol\\_Renewable\\_Energy.pdf](https://www.theice.com/publicdocs/ccx/protocols/CCX_Protocol_Renewable_Energy.pdf)
51. Secretary Theoharides (2020) Net Zero By 2050 Letter of Determination, April 22, 2020.
52. MA CECP for 2030 (2020) Massachusetts Clean Energy and Climate Plan for 2030. <https://www.mass.gov/doc/interim-clean-energy-and-climate-plan-for-2030-december-30-2020/download>
53. City of Boston. (2019) Climate Action Plan (CAP) Update. [https://www.boston.gov/sites/default/files/embed/file/2019-10/city\\_of\\_boston\\_2019\\_climate\\_action\\_plan\\_update\\_4.pdf](https://www.boston.gov/sites/default/files/embed/file/2019-10/city_of_boston_2019_climate_action_plan_update_4.pdf)
54. City of Boston. (2019) Climate Action Plan (CAP) Update. [https://www.boston.gov/sites/default/files/embed/file/2019-10/city\\_of\\_boston\\_2019\\_climate\\_action\\_plan\\_update\\_4.pdf](https://www.boston.gov/sites/default/files/embed/file/2019-10/city_of_boston_2019_climate_action_plan_update_4.pdf)
55. Carbon Free Boston Social Equity Report (2019) <https://www.greenribboncommission.org/document/carbon-free-boston-social-equity-report/>
56. Carbon Free Boston Social Equity Report (2019) <https://www.greenribboncommission.org/document/carbon-free-boston-social-equity-report/>
57. Carbon Free Boston Social Equity Report (2019) <https://www.greenribboncommission.org/document/carbon-free-boston-social-equity-report/>
58. Relevant to equity issues: Carbon Free Boston Social Equity Report (2019) <https://www.greenribboncommission.org/document/carbon-free-boston-social-equity-report/>
59. Relevant to eucalyptus trees growing faster than other species: Calviño-Cancela, M. and Rubido-Bará, M. (2013) Invasive potential of Eucalyptus globulus: Seed dispersal, seedling recruitment and survival in habitats surrounding plantations. *Forest Ecology and Management*, 305: 129-137.
60. Jones, Nicola (2017) How the World Passed a Carbon Threshold. Yale Environment 360. <https://e360.yale.edu/features/how-the-world-passed-a-carbon-threshold-400ppm-and-why-it-matters>
61. NOAA (2021) Climate Change: Atmospheric Carbon Dioxide. <https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide#:~:text=The%20global%20average%20atmospheric%20carbon,least%20the%20past%20800%2C000%20years>
62. Carbon Free Boston Report (2019) Green Ribbon Commission. <https://www.greenribboncommission.org/wp-content/uploads/2019/01/Carbon-Free-Boston-Report-web.pdf>

63. Carbon Free Boston Report (2019) Green Ribbon Commission. <https://www.greenribboncommission.org/wp-content/uploads/2019/01/Carbon-Free-Boston-Report-web.pdf>
64. City of Boston. (2019) Climate Action Plan (CAP) Update. [https://www.boston.gov/sites/default/files/embed/file/2019-10/city\\_of\\_boston\\_2019\\_climate\\_action\\_plan\\_update\\_4.pdf](https://www.boston.gov/sites/default/files/embed/file/2019-10/city_of_boston_2019_climate_action_plan_update_4.pdf)
65. Carbon Free Boston Buildings Technical Report (2019) Boston University Institute for Sustainable Energy. [http://sites.bu.edu/cfb/files/2019/06/CFB\\_Buildings\\_Technical\\_Report\\_061719.pdf](http://sites.bu.edu/cfb/files/2019/06/CFB_Buildings_Technical_Report_061719.pdf)
66. Carbon Free Boston Buildings Technical Report (2019) Boston University Institute for Sustainable Energy. [http://sites.bu.edu/cfb/files/2019/06/CFB\\_Buildings\\_Technical\\_Report\\_061719.pdf](http://sites.bu.edu/cfb/files/2019/06/CFB_Buildings_Technical_Report_061719.pdf)
67. Bill S.9, An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy (2021) <https://malegislature.gov/bills/192/S9>
68. California Air Resources Board (2021c) California Cap-and-Trade Program: Summary of Proceeds to California and Consigning Entities. [https://ww2.arb.ca.gov/sites/default/files/2020-09/proceeds\\_summary.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-09/proceeds_summary.pdf)
69. Investopedia, Understanding the Basics of Mitigation Banking, <https://www.investopedia.com/articles/dictionary/031615/understanding-basics-mitigation-banking.asp>
70. S&P Global (2021) Global carbon market grows 20% to \$272 billion in 2020, <https://www.spglobal.com/platts/en/market-insights/latest-news/coal/012721-global-carbon-market-grows-20-to-272-billion-in-2020-refinitiv#:~:text=Global%20carbon%20market%20grows%2020%25%20to%20%24272%20billion%20in%202020%3A%20Refinitiv,-Author%20Frank%20Watson&text=London%20%E2%80%94%20The%20value%20of%20the,said%20in%20a%20report%20Jan>
71. City of Boston Urban Forest Plan Announcement (2020) <https://www.boston.gov/news/city-boston-seeks-partner-design-first-urban-forest-plan>
72. Metropolitan Mayors Coalition, Metropolitan Area Planning Council (MAPC), <https://www.mapc.org/get-involved/coalitions/mmc/>
73. Greening the Gateway Cities Program. Commonwealth of Massachusetts, <https://www.mass.gov/service-details/greening-the-gateway-cities-program>
74. Corporate Partnerships in the Family Forest Carbon Program. American Forest Foundation, <https://www.forestfoundation.org/family-forest-carbon-program>
75. Opportunities for Replacing Peaker Plants with Energy Storage in Massachusetts (2021) <https://www.psehealthyenergy.org/our-work/energy-storage-peaker-plant-replacement-project/massachusetts/>

## IMAGES

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