



**Bloomberg
Philanthropies**

**American Cities
Climate Challenge**

CLIMATE ACTION PLAYBOOK BRIEF

A STRATEGIC BRIEF TO ACCELERATE AND DEEPEN CLIMATE ACTION IN CITIES

OCTOBER 2019

FOREWORD

The threat of climate change is growing, but our momentum to tackle it is growing, too – and cities are leading the way. At Bloomberg Philanthropies, we’re working hard to support their efforts and help them do even more.

In 2018, we launched the American Cities Climate Challenge, a competition that invited mayors to propose ways to significantly deepen and accelerate their efforts to tackle climate change and improve their residents’ lives. We selected 25 winners and are providing them with powerful new resources and support to help them meet their goals.

One year into the program, the cities in the Climate Challenge are pursuing more than 170 proven policies and programs to reduce emissions, including those highlighted in this Climate Action Playbook. Their efforts – from building new renewable energy projects, to retrofitting old and inefficient buildings, to purchasing electric buses and other city vehicles – are projected to reduce their collective carbon emissions by over 40 million metric tons by 2025. That’s the equivalent of taking 8.5 million cars off the road.

Those efforts are vital to bringing the U.S. closer to our commitment under the Paris Climate Agreement, but we still have much more to do. We hope this handbook will help spread the good work cities are doing – and inspire more communities to act boldly.

Sincerely,



Michael R. Bloomberg
UN Special Envoy for Climate Action

INTRODUCTION

The **American Cities Climate Challenge** is an unprecedented opportunity for 25 ambitious cities to deepen and accelerate efforts to tackle climate change and promote a sustainable future for their residents.

Since June 2017 when Washington turned its back on the Paris Agreement, mayors from more than 230 cities representing more than 70 million Americans have said **We Are Still In** and will continue to push America forward.

These city leaders did so because:

- Our cities are already experiencing the deleterious effects of climate change;
- Our residents want more resilient, sustainable neighborhoods and local economies; and
- Our mayors recognize that better health, jobs, and opportunities tomorrow depend on bold actions today.

For America's cities to lead the way in reducing carbon pollution requires a different kind of commitment. Delivering on it will require local innovation, broad-based efforts to grow and deepen public support for a sustainable future, community engagement, and a relentless focus from mayors and their partners to achieve results.

To support this vital work, Bloomberg Philanthropies and partners have committed to a \$70 million investment in the American Cities Climate Challenge. Twenty-five "Leadership Cities" have been accepted into a two-year acceleration program, with powerful new resources and unprecedented access to world-leading support to help them meet—or beat—their near-term carbon reduction goals.

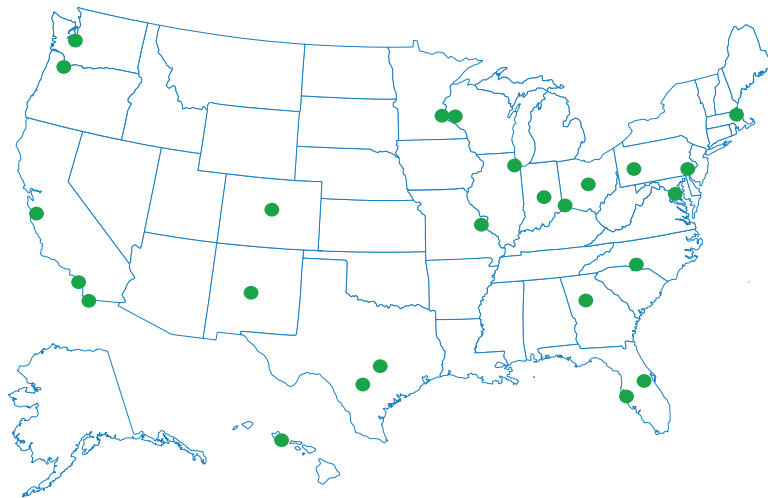
The Climate Challenge was open to the 100 most populous cities in America, and applications were reviewed for city commitment, ambition, opportunity for impact and collaboration. The 25 winning cities spans a broad demographic spectrum spanning geography, political affiliation, and state legislative political party.

Our 25 Leadership Cities will showcase a variety of different pathways to reaching the Paris Agreement climate goals and represent cities at different points in the climate action journey ranging from cities with early support for emissions reductions to cities with strong track records of innovative emissions reduction programs.

ALBUQUERQUE, NM
ATLANTA, GA
AUSTIN, TX
BOSTON, MA
CHARLOTTE, NC
CHICAGO, IL
CINCINNATI, OH
COLUMBUS, OH
DENVER, CO

HONOLULU, HI
INDIANAPOLIS, IN
LOS ANGELES, CA
MINNEAPOLIS, MN
ORLANDO, FL
PHILADELPHIA, PA
PITTSBURGH, PA
PORTLAND, OR
SAINT PAUL, MN

SAN ANTONIO, TX
SAN DIEGO, CA
SAN JOSE, CA
SEATTLE, WA
ST. LOUIS, MO
ST. PETERSBURG, FL
WASHINGTON, D.C.



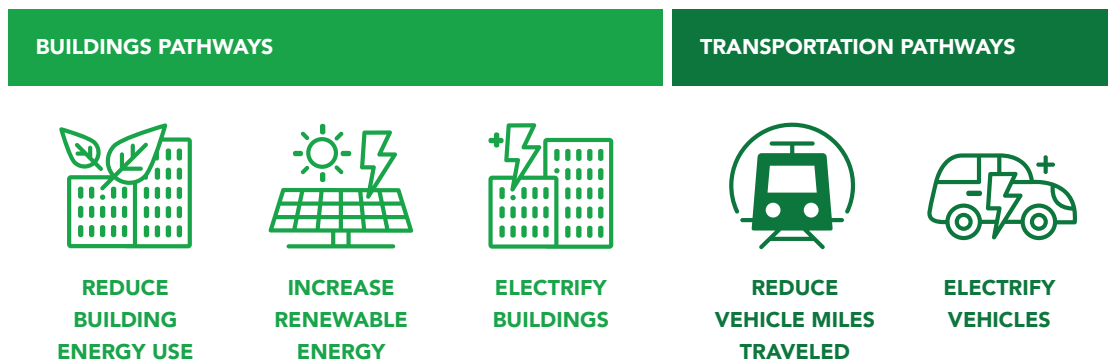
CITIES ARE THE NEW FACE OF CLIMATE LEADERSHIP

Participating cities will:

- **Make the Paris Agreement goals real.** Mayors and their partners will scale and implement proven climate solutions and innovations that will help grow the economy, protect public health, and improve the quality of life for citizens.
- **Focus on high impact.** Leadership Cities will focus their efforts on the two sectors that contribute most to emissions in American cities: buildings and transportation. In nearly every major American city, buildings and transportation consume more energy and are responsible for more carbon pollution than any other sector, totaling 80% of citywide emissions.
- **Create community.** Leadership Cities will have access to leading experts who will help mobilize support for accelerated climate action, bringing together residents, businesses, and community organizations.
- **Lead a movement.** The network of 25 Leadership Cities will leverage the unique power of collective learning and accountability and will provide insight and momentum for others. They will serve as role models for the rest of America.
- **Deliver results.** Mayors and their teams will work with dedicated delivery experts to put their plans into practice, engage city departments, review evidence of progress regularly, and innovate and improve until the goals are met.



To meet ambitious climate commitments, Climate Challenge cities are pursuing customized packages of actions in the buildings and transportation sectors across a few pathways for reducing GHG emissions. These pathways and related actions focus on reducing resource consumption, shifting to cleaner sources of energy, and transforming our communities for deep long-lasting climate action.



Within each of these pathways, the Climate Challenge is focusing on a combination of near-term **foundational** actions with higher impact, **ambitious** and **moonshot** actions that can help cities meet or beat their Paris climate ambitions.

FOUNDATIONAL ACTIONS	AMBITIOUS ACTIONS	MOONSHOT ACTIONS
<p><i>Experts believe should be standard practice in cities seriously committed to reducing carbon pollution.</i></p> <ul style="list-style-type: none"> • All cities have completed or will work through these actions under the Climate Challenge • Opportunities for early wins • Within existing city purview • Heavy emphasis on municipal operations 	<p><i>More challenging, yet critical for Leadership Cities to undertake to deliver significant carbon reductions.</i></p> <ul style="list-style-type: none"> • Cities selected at least two ambitious actions to pursue under the Climate Challenge • Heavy emphasis on community-wide policies and programs 	<p><i>Longer-term policies that must be implemented now to achieve deep emissions reductions.</i></p> <ul style="list-style-type: none"> • For leading cities on climate action, these are new opportunities for transformative change

The 25 Leadership Cities in the Climate Challenge are focusing on a set of priority actions developed in consultation with national partners and informed by city applications. These policy and programmatic actions represent specific high impact opportunities and best practices for city leadership.

The actions were selected based on the following criteria:

- **Interest from cities:** Where winning cities want to focus their efforts over the course of the Climate Challenge.
- **Proven:** Actions that have been demonstrated by cities to reduce GHG emissions.
- **Potential for near-term action:** Given the duration of the Climate Challenge, actions where substantial progress is possible within the two-year timeframe.
- **Scalable:** Climate solutions that may be implemented by cities in the United States across diverse local and state regulatory environments.

This briefing provides an overview of each priority action, summarizes key benefits to cities, and recommendations for action.

Developed in close collaboration with Climate Challenge national partners, this briefing directly leverages partner resources, toolkits and expertise.

IMPORTANCE OF EQUITABLE CLIMATE ACTION

Mayors and city officials are responding to the needs of their most vulnerable constituents and are stepping up commitments to racial and social equity. This means looking for ways to integrate equity considerations into a broad range of policies and activities. Climate action plans will reshape local job prospects, housing costs, transportation systems, environmental health conditions, and more.

As local governments plan and implement bold strategies for reducing GHG emissions, an opportunity exists to address existing disparities and to create stronger, more equitable communities for everyone. Making climate action plans more responsive to priority equity concerns will also help galvanize broader constituencies of support for bold climate solutions.

Throughout the implementation of the Climate Challenge, we will support cities to foster climate solutions that address the disproportionate burdens faced by vulnerable community members.

OVERVIEWS OF CLIMATE CHALLENGE PRIORITY ACTIONS

Through the American Cities Climate Challenge, Bloomberg Philanthropies has convened a deep bench of national partners to provide robust technical assistance and a support package to winning cities across priority actions.

COORDINATING PARTNERS



BUILDINGS & ENERGY



TRANSPORTATION



DATA



CROSS-CUTTING



PRIORITY ACTIONS: BUILDINGS

IMPLEMENT ENERGY EFFICIENCY RETROFITS AND RE-TUNING OF MUNICIPAL FACILITIES

PATHWAYS



PARTNERS



¹ City of Orlando, GreenWorks 2012: *Municipal Operations Sustainability Plan*. http://www.the100bestfleets.com/images/sustainabilitybook_web.pdf.

Buildings typically represent a large portion of greenhouse gas emissions at the local level. Implementing energy efficiency projects in municipal facilities is a great way to lead by example, engage the private sector, and demonstrate that reducing emissions can also save money.

There is no one-size-fits-all approach to energy efficiency, though well established strategies are utilized across the nation including hiring an energy manager, performing cyclical energy audits, upgrading equipment, retrocommissioning, workforce training and establishing equipment standards. Many electric and natural gas utilities offer incentives that help offset costs, ranging from cash rebates to free energy audits to a variety of financing and funding mechanisms. Cities may even consider municipal buildings policies that standardize and institutionalize sound energy management, ensuring savings are realized even with changing administrations.

CASE STUDY

Municipal Operations Sustainability Plan (Orlando, FL): In 2012, Green Works Orlando created the Municipal Operations Sustainability Plan, which established interim and long-term goals for the substantial energy and carbon reductions necessary for the city to achieve its 2030 Climate Challenge commitment. The plan includes greenhouse gas neutrality for municipal operations and a 50 percent reduction in municipal electricity consumption, with 100 percent of the remaining consumption coming from renewable sources.¹

BENEFITS

- **Showcase city leadership and lead-by-example:** In the short term, it showcases city leadership and a city's buy-in to the actions that are or will be requested of the private sector. Over the longer term, actions taken by the city in its own buildings will lay the groundwork for moving the entire community towards a more energy efficient future.
- **Taxpayer savings:** Reductions in energy consumed by municipal buildings benefits both a city government and the city's residents and businesses, as it is their tax dollars paying the local government's energy bills. By investing in energy efficiency within the municipal building stock and other operations, cities can achieve significant reductions in operating costs, thereby reducing long-term taxpayer burdens.

RECOMMENDATIONS FOR ACTION

- Municipal efforts should begin with benchmarking as many city buildings as is practical. If a benchmarking policy is being considered, the municipal building threshold should be lower than the private-sector threshold, to lead by example.
- An energy committee should be formed if departments do not have individual full-time energy managers. This committee shares data and collaborates on citywide energy efficiency projects while establishing a culture of prioritizing energy in decision-making.
- Benchmarking data should be analyzed to prioritize highest impact efficiency projects and used to inform budget allocations and future funding.

MEET MUNICIPAL ELECTRICITY DEMAND WITH RENEWABLE ENERGY SOURCES

PATHWAYS



PARTNERS



WORLD
RESOURCES
INSTITUTE

² www.cityrenewables.org

³ Julia Pyper, "Washington State Spearheads a Novel Clean Energy Solution for Starbucks, REI and Target," Greentech Media, April 19, 2017, <https://www.greentechmedia.com/articles/read/Washington-State-Spearheads-a-Novel-Clean-Energy-Solution-for-Starbucks-REI>.

⁴ EPA. "Guidance for Setting a Renewable Electricity Goal: A framework to help municipalities achieve their objectives." August 2018. <https://www.epa.gov/sites/production/files/2018-08/documents/gpp-goal-setting-guidance.pdf>

Cities that are looking to meet municipal electricity demand with renewables will need to first assess current and future electricity usage and needs, and then determine which renewable energy procurement strategies are available to them, based upon the city's electricity provider and the state's regulatory environment. Other factors that should be considered may include local electricity prices, current and projected "grid mix" (i.e. - percentage of clean electricity received from utility provider), and alignment with other community priorities such as workforce development and local job opportunities.

Based on these unique factors, a city may have access to some of the following options for purchasing renewable energy to meet municipal electricity demand. These options include: onsite solar projects at municipal facilities, utility programs, physical power purchase agreements (PPAs), virtual power purchase agreements (VPPAs), community solar programs, and renewable energy certificates². Each of these options has pros and cons and should be carefully weighed to assess their suitability to meet local needs and desired co-benefits such as cost savings, environmental benefits, and social equity benefits.

CASE STUDY

Utility Programs (Seattle, WA): In response to requests from corporate entities and city and county governments, Puget Sound Energy in Washington State created the [Green Direct](#) program. This new tariff allows existing customers, including city government accounts, to purchase 100% of their electricity from dedicated local renewable energy resources.³

BENEFITS

- **Economic savings on energy costs and long-term stability of energy expenditures:** Renewable energy projects with long-term contracts, such as PPAs or vPPAs, can provide both a reliable source of low-cost electricity and protection against potential rate increases.
- **Visible demonstration of city sustainability commitments:** Installing on-site solar on municipal facilities provides cities with the opportunity to lead by example and provide a tangible demonstration of renewable energy project opportunities for the community.

RECOMMENDATIONS FOR ACTION

- Understand and clearly define why your city is purchasing renewable electricity. Cities choose to purchase renewable energy for a variety of reasons. Different methods of procuring renewable energy will have different benefits, so city staff and decision makers should take time at the start of the process to understand these issues before developing a strategy or pursuing an individual project.
- Establish a renewable electricity goal. Although not essential, city staff should ideally set a renewable electricity goal in collaboration with key decision makers early in the process. Setting a concrete public goal can increase a city's chances of successfully transitioning to renewable electricity.⁴

INSTALL ELECTRIC VEHICLE CHARGING IN MUNICIPALLY OWNED PARKING LOTS

PATHWAYS



PARTNERS



⁵ McKinsey&Company, *Electrifying insights: How automakers can drive electrified vehicle sales and profitability*. January 2017. <https://www.mckinsey.com/>

⁶ Energize Connecticut, *Guidelines for the Installation of Electric Vehicle Charging Stations at State-Owned Facilities*. September 2014. <http://www.ct.gov/>

⁷ https://www.wxystudio.com/uploads/2400024/1550074865953/Final_Curb_Report_Nov2018_web.pdf

⁸ <https://www.cityofsacramento.org/Public-Works/Electric-Vehicle-Initiatives/EV-Charging-Locations>

⁹ https://www.rmi.org/insight/from_gas_to_grid/

A robust and well-planned public EV charging infrastructure network is necessary to support a growing adoption of EVs. In fact, a recent analysis of public charging infrastructure by McKinsey finds that EV adoption is outpacing EV infrastructure investment.⁵ By installing chargers in municipal parking lots, local governments can bolster local EV charging infrastructure and provide visible assurance to visitors, customers, and employees that electric vehicle charging infrastructure is available if needed.⁶

Most cities have numerous municipal parking lots and should focus on sites that community members regularly visit, which can showcase readily available EV charging infrastructure. This includes leveraging local, state and utility grants for EV charger installations. However, other projects related to solar PV, lighting upgrades, seismic or other energy retrofits could provide additional opportunities for lowering the cost of EV charger installation. In neighborhoods with limited off-street parking or garages, cities can also enable the targeted deployment of curb-side EV chargers.⁷

CASE STUDY

Charging station map (Sacramento, CA):⁸ At city parking facilities, charging is offered at no additional cost to patrons, except for the one pay-to-charge DC fast charger at the Sacramento Valley Amtrak Station. The city provides a clear map of charging stations on its website that differentiates city chargers from non-city public chargers. The map allows users to cross-reference charging stations with parking space quantity and type, parking garages, and residential permit zones.

BENEFITS

- **Increased availability of charging:** Installation of EV charging infrastructure in municipal parking lots makes charging more accessible to visitors, residents, and employees.
- **Local government support for EVs:** Installation of EVSE in frequently accessed public spaces demonstrates city support for and interest in expanding EV use.
- **Familiarize private businesses with EV technology:** Municipal chargers can serve as demonstration projects, demystifying the process of installing EV chargers for privately-owned parking lots and structures.

RECOMMENDATIONS FOR ACTION

- Public charging stations should be sited for high utilization. Level 2 chargers should be sited where drivers have a preference to charge over a longer interval, such as workplaces.⁹ Level 3 (DCFC) chargers should be sited where drivers are more likely to charge over a shorter interval, such as downtown areas, particularly near high-traffic corridors and in high-visibility locations that are accessible and have sufficient signage.
- Consider subsidizing the cost of charging in the short term to incentivize use of EV vehicles.

ENFORCE BUILDING ENERGY CODE COMPLIANCE

PATHWAYS



PARTNERS



¹⁰ The City of Austin defines Zero Energy Capable as being able to achieve net-zero energy consumption on an annual basis with the addition of on-site renewable energy generation. In Austin, homes would have to be 65 percent more efficient than a typical home built to the Austin Energy Code in 2006.

¹¹ Institute for Market Transformation and Global Buildings Performance Network, Third-Party Performance Testing: A case study of residential energy code enforcement in Austin, Texas, Fall 2011. <http://www.imt.org/uploads/resources/files/CaseStudy1.pdf>

¹² Institute for Market Transformation, *Policy Maker Fact Sheet: Building Energy Code Compliance*, October 2010. <http://www.imt.org/uploads/resources/files/3FactSheet-EnergyCodeComplianceFunding.pdf>

A strong building energy code is one of the most affordable and effective mechanisms for advancing energy efficiency in buildings. The national model building energy codes have increased energy-saving potential by around 30 percent from 2006 to 2018. However, energy savings are only realized when the code is enforced. Although there has been a push to adopt the latest model energy codes in many states and cities in recent years, resources for training and enforcement have been lacking, and code compliance rates in many municipalities remain low. City building departments have many priorities related to life-safety and are often resource constrained, making it challenging for them to maintain a staff of building plan reviewers and inspectors who are fully educated on and actively enforcing complex and evolving energy code requirements

Anecdotal evidence suggests that code compliance is particularly low in building renovations, including measure-specific retrofits (e.g. window replacements or equipment upgrades). In order to capture the benefits of more stringent codes during the natural cycle of building upgrades, local jurisdictions should issue clear direction on how and when renovation and retrofit projects trigger the need to bring specific building systems up to code. Most compliance assessments and studies to date have focused solely on new construction, and data on compliance rates for renovations is largely absent.

CASE STUDY

Zero energy capable building code (Austin, TX): In 2007, the City of Austin committed to ensuring that all new and renovated single-family and multifamily homes are zero energy capable by 2015.¹⁰ To achieve this goal, in 2010 the city began requiring builders to have homes performance-tested by third-party service providers before certificates of occupancy are issued. The program has successfully increased compliance with key components of the energy code while keeping additional administrative costs to a minimum.¹¹

BENEFITS

- **Cost-Effective Energy Savings:** An Institute for Market Transformation task force determined that every dollar spent on enforcing the energy code yields \$6 in energy savings, even when you include all the public-sector (enforcement, compliance) and private-sector (incremental design and construction) costs associated with energy code compliance¹².

RECOMMENDATIONS FOR ACTION

- Work closely with the building department and related codes staff, engage a third party to perform an energy code compliance assessment to identify common code compliance issues, and recommend best practice solutions that will ultimately increase compliance rates.
- Develop a detailed energy code compliance plan that includes targets and metrics to evaluate progress.

FACILITATE PRIVATE SECTOR CHALLENGE PROGRAMS FOR ENERGY EFFICIENCY IN BUILDINGS

PATHWAYS



PARTNERS



¹³ <https://www.chicago.gov/city/en/sites/retrofitchicago/home/about.html>

An energy efficiency challenge program is designed to garner voluntary commitment from real estate stakeholders to increase the energy efficiency of their buildings by a targeted amount, through friendly competition. Energy efficiency challenge programs should be initiated and managed by the city or in partnership with local organizations. Challenge programs can complement and bolster support for other efficiency policies and programs. Often sector-specific, such challenges for universities or commercial tenants target high-energy-use neighborhoods or geographic areas including central business districts. More than 20 high-profile challenge programs exist today at the local, state, and federal levels; several major cities are facilitating successful challenge programs that have yielded significant energy and cost savings for participants.

Energy efficiency challenges have two primary purposes:

1. Challenge programs build communities of early adopters and advocates, raise awareness of the benefits of energy efficiency, mobilize a workforce focused on improving the efficiency of buildings, and send market signals that the local government and real estate community are investing in energy-efficient products and services.
2. Challenge programs serve as a powerful platform to recognize energy efficiency leaders.

CASE STUDY

Retrofit Chicago Energy Challenge (Chicago, IL):¹³ Retrofit Chicago Energy Challenge encourages, promotes, and celebrates voluntary energy efficiency leadership. Participants commit to reducing energy use by at least 20 percent within five years of joining the program, tracking and sharing energy efficiency progress through ENERGY STAR Portfolio Manager and serving as an ambassador to other buildings. Through these efforts, Chicago's leading buildings are reducing operating costs, increasing asset value, creating good local jobs, and reducing greenhouse gas emissions. Currently, Retrofit Chicago Energy Challenge includes more than 90 building participants.

BENEFITS

- **Accelerate market demand for energy efficiency:** Challenge programs build demand for energy-efficient products and services, as building owners and operators begin searching for and investing in equipment to improve buildings' performance. This signals to the providers of such products and services that the region is a strong market for energy efficiency, leading to an increase in the availability and accessibility of energy retrofit opportunities for building owners.
- **Establish relationships with the real estate community:** A well-designed challenge program provides a direct communications link to many of the largest and most important real estate owners in the community. Cities can use this connection to inform the development of comprehensive, industry-supported approaches to improving building energy efficiency.

RECOMMENDATIONS FOR ACTION

- Set an energy or carbon reduction goal for each sector.
- Tailor the metrics to fit the sector. For example, energy per employee rather than energy per square foot might be a better metric for commercial tenants since it rewards best practices such as space consolidation.

SUPPORT WORKFORCE DEVELOPMENT PROGRAMS

PATHWAYS



PARTNERS



¹⁴ *Clean Jobs America 2019 - Nearly 3.3 Million Clean Energy Jobs*. E2, Clean Jobs Count, 13 Mar. 2019, www.e2.org/wp-content/uploads/2019/04/E2-2019-Clean-Jobs-America.pdf

¹⁵ *U.S. Energy and Employment Report. U.S. Department of Energy, 2017, U.S. Energy and Employment Report*, https://www.energy.gov/sites/prod/files/2017/01/f34/2017_US_Energy_and_Jobs_Report_0.pdf

The energy efficiency sector is one of the fastest growing job markets in the country. Energy efficiency companies added 76,000 new jobs in 2018, accounting for over half of all new clean energy jobs.¹⁴ However, 73 percent of employers across the energy efficiency sector reported difficulty hiring qualified workers over the last 12 months.¹⁵ The leading issues for hiring were insufficient education, certifications, and hands-on training for technical skills.

This gap in the supply-and-demand of qualified workers provides opportunity for cities to link their climate goals with economic and equity goals by creating or supporting pre-existing energy efficiency workforce development training programs and connecting them to available energy efficiency jobs. Workforce development training programs can help people receive the technical training, industry-recognized certification, work experience, and career readiness skills they need to succeed in the energy efficiency workforce, while also providing the energy efficiency industry with skilled workers.

Depending on the existing workforce development programs, cities can act as the creator, convener, funder, or promoter of programs. To ensure the workforce development program will meet the needs of the energy efficiency industry and provide workers (especially from underserved communities) with support services and career pathways, cities must engage and partner with utilities, labor unions, community-based organizations, and other local stakeholders in the design and implementation process.

CASE STUDY

United Pre-Craft Trainee Program (Los Angeles, CA): The United Pre-Craft Trainee Program (UPCT), developed by the International Brotherhood of Electrical Workers (IBEW) Local 18 in partnership with the Los Angeles Department of Water and Power (LADWP) is an earn-and-learn, pre-apprenticeship training program in which entry-level trainees work full-time weatherizing buildings while learning skills and preparing for civil service exams and career opportunities in the utility. Trainees receive \$16 per hour, plus health and retirement benefits, and become union members represented by IBEW Local 18. While in the program, trainees can take the city's civil service exam and, if they pass it, have the opportunity to stay working within the LADWP. The vast majority (88 percent) of hires are still working, either in the UPCT program (54 percent) or as full-time permanent employees of LADWP or the City of Los Angeles (34 percent).

BENEFITS

- **Energy savings:** A skilled local workforce means better implementation of energy efficiency upgrades, leading to energy savings and improved comfort for residents and business owners.
- **Social equity:** If designed correctly, workforce development programs have the potential to provide high road jobs to underserved community members.

RECOMMENDATIONS FOR ACTION

- Engage key stakeholders in the design and implementation process to ensure city efforts are focused on filling gaps in trainings and existing job opportunities to create viable pathways to high road jobs.
- Administer industry recognized certifications.
- Provide wrap around support services to participants (case management, training wage, child care, transportation stipend) to ensure that they are able to successfully complete the program.

IMPLEMENT NEW FINANCING PROGRAMS FOR ENERGY EFFICIENCY, RENEWABLES, AND INFRASTRUCTURE

PATHWAYS



PARTNERS



¹⁶ An overview of Boston's multi-sector program (municipal, institutional, commercial, residential) can be viewed online at <https://vimeo.com/100718630>

In recent years, cities, states, and utilities have implemented a variety of financing programs designed to enable building owners to undertake efficiency projects and attract private capital to the market. In addition, several federal agencies are moving to include energy efficiency in their underwriting standards.

There are several options that cities can make accessible for developers, owners, and managers of private sector buildings. The financing mechanism that best fits for a particular city will depend on many factors, including state-level regulatory environments. These include whether the local utilities are municipally or investor owned, if they have any existing financing or incentive programs, whether any existing city (and/or state) programs could be adapted to support efficiency, and potential sources of funding.

Program structures to consider: credit enhancements, revolving loan funds, energy efficiency finance corporations, property assessed clean energy (PACE) programs, on-bill repayment, or mortgage finance and energy savvy appraisal.

CASE STUDY

Renew Boston Trust (Boston, MA): Boston is taking an innovative approach to attract more risk capital (high-risk/high-reward investment funds) and expand the demand for energy efficiency returns by private investors. Boston's multi-sector program includes new models of municipal procurement, budgeting, and public finance; a new kind of tax-exempt leasing conduit for nonprofits; a financing hub organized as a public-private partnership for commercial owners; and an unsecured, non-recourse loan fund for multifamily housing and any other owners with particularly constrained reserves and equity¹⁶.

BENEFITS

- **Tapping into private capital:** Well-designed programs can leverage available funds to induce greater participation of third-party and private capital providers.
- **Opportunities to scale clean energy solutions:** Broad-based programs allow for better integration of efforts across multiple sectors (residential, institutional/non-profit, commercial) to allow for increased scale with minimal city resources.

RECOMMENDATIONS FOR ACTION

- A financing program should be designed to encourage private lenders to participate in the market by supporting projects that can demonstrate typical returns and make the results of loan performance publicly available.
- Assess existing financing structures already in place in the city – such as economic development corporations, tax increment financing, or community development funds – and whether it is possible to expand an existing structure to cover efficiency projects or to require efficiency improvements as a precondition for such financing.

ADOPT AND IMPLEMENT ENERGY BENCHMARKING AND TRANSPARENCY POLICIES IN EXISTING BUILDINGS

PATHWAYS



PARTNERS



¹⁷ U.S. Environmental Protection Agency, ENERGY STAR Portfolio Manager Benchmarking and Energy Savings DataTrends, October 2012.

A benchmarking and transparency policy requires building owners to annually measure and report the energy and water use in properties above a certain square footage using the U.S. Environmental Protection Agency's free online tool, ENERGY STAR Portfolio Manager, and to make select energy performance data public.

Portfolio Manager generates metrics that enable the comparison of building energy performance, allowing building owners, managers, and facilities staff to understand the scale of energy use in a property, track performance over time and compare it against peer buildings, and to guide and verify energy efficiency investments. The public availability of benchmarking data empowers tenants, investors, real estate lenders, and other parties to identify and compare the efficiency of buildings, increasing accountability for building energy and water performance and unlocking market demand and competition for energy-efficient space.

While similar transparency rules are standard practice in other sectors, such as fuel economy labels on vehicles and nutritional labels on food, information about the energy use of buildings is not similarly transparent. Benchmarking and transparency ordinances fill this information gap by making building performance data available to the public. You can't manage what you don't measure, which is why annual benchmarking of large building energy and water use along with public availability of the results is the foundation of an effective energy efficiency policy framework.

CASE STUDY

Nationwide movement of cities: As of June 2019, 30 U.S. cities have enacted building energy benchmarking and transparency ordinances for large buildings. The specifics of these ordinances vary, but all of them require annual benchmarking and transparency of building energy-performance data. Information on these city ordinances can be found at www.buildingrating.org.

BENEFITS

- **Motivates energy efficiency improvements:** Benchmarking leads to reduced energy use and associated costs for building owners and businesses. An Environmental Protection Agency study of 35,000 voluntarily benchmarked buildings found an average annual savings of 2.4 percent over three years, for a total savings of more than 7 percent.¹⁷
- **Lays the groundwork for energy efficiency:** The information on energy efficiency in existing buildings is slim, creating a barrier for improvement by building owners, operators, investors, lenders, occupants, service providers, and local government or utility programs. A benchmarking and transparency policy creates foundational information on which additional incentives, program targeting and design, as well as new requirements can be built.

RECOMMENDATIONS FOR ACTION

- Analyze citywide building stock to understand the number and types of buildings in the city and where energy is being consumed, by building type.
- Convene a stakeholder process or task force to introduce the idea of a benchmarking and transparency policy, explain the value and need for this information to achieve the city's energy and carbon commitments, and solicit feedback on how best to structure the policy for that market.
- Lead by example and benchmark municipally owned buildings and make the data publicly available.

ADOPT BEYOND-BENCHMARKING POLICIES FOR EXISTING BUILDINGS

PATHWAYS



PARTNERS



Although benchmarking and transparency will raise awareness of the benefits of energy efficiency in buildings, additional policies are helpful in transforming this interest into action. The following items are all examples of beyond-benchmarking requirements that have been adopted by U.S. cities. Each of the requirements below can be adopted as a singular requirement or in conjunction with others.

- **Energy audit policies** require that building owners complete periodic whole-building energy assessments.
- **Retuning (retrocommissioning) requirements** ensure that the existing equipment in covered buildings has been maintained, repaired, and calibrated to operate at a prescribed level of efficiency.
- **Building Energy Performance Standards** require buildings to achieve a certain benchmarking score or performance threshold by a specific date.

CASE STUDY

Building Energy Performance Standard (Washington, D.C.): In December 2018, Washington DC adopted the Clean Energy DC Omnibus Act which requires a broad swath of existing buildings to improve their whole-building energy performance. The policy sets a minimum energy efficiency standard of no lower than the median performance level for each building type. Under the Building Energy Performance Standard (BEPS), all existing buildings over 50,000 square feet will be required to reach minimum levels of energy efficiency or deliver savings by 2026, with progressively smaller buildings phasing into compliance over the following years.

BENEFITS

- **High-impact energy consumption and cost savings:** Building energy audits can uncover potential energy savings in the range of 10 percent to 40 percent. Requiring building owners to make cost-effective improvements identified through energy audits can capture a significant portion of these savings.
- **Improved building asset:** High performance buildings typically have improved indoor air quality, comfort, and reliability to improve tenant and occupant satisfaction.

RECOMMENDATIONS FOR ACTION

- Convene stakeholders to determine the appropriate policy approach for the local building stock.
- Consult with local utilities early on to ensure the city's energy efficiency requirements will work in tandem with utility incentive programs and are structured to avoid conflicts that could jeopardize utility funding.
- Work with local partners to ensure that training is available for the relevant specialties within the workforce.

ADOPT EV READINESS OR INSTALLATION REQUIREMENTS IN NEW BUILDINGS

PATHWAYS



PARTNERS



¹⁸ <https://sfdbi.org/sites/default/files/EV%20Ready%20Brief%20Oct%2018%202016.pdf>

¹⁹ <https://www.atlantaga.gov/Home/Components/News/News/10258/1338?backlist=/>

In the same way that cities can adopt solar requirement provisions in their building codes to accelerate the deployment of rooftop solar, cities can also adopt electric vehicle (EV) charging infrastructure requirement provisions to accelerate the deployment of electric vehicles. Planning for EV charging infrastructure during time of construction or major remodel of buildings is the least-cost approach to supporting new EV charging infrastructure. By either directly installing infrastructure for EV charging at time-of-construction or making the space EV-ready, cities can reduce net costs by \$1,000 to \$1,600 per EV parking space in parking structures, and up to \$5,000 per space in EV parking lots.¹⁸

An EV requirement would make it mandatory for certain types of new and major renovations of buildings and parking structures to install EV chargers at time of construction. Alternatively, an EV-ready requirement would make it mandatory for certain types of new buildings and parking structures to be equipped with the electrical capacity infrastructure (e.g., electrical raceway, wiring, and electrical circuit) to accommodate future installation of EV chargers.

CASE STUDY

EV-ready requirement for new homes and parking (Atlanta, GA)¹⁹: In November 2017, Atlanta passed an ordinance requiring new residential homes and public parking facilities to accommodate electric vehicle supply equipment (EVSE). Residential homes must be equipped with infrastructure to accommodate future installation of EV charging infrastructure. Public parking facilities must provide 20 percent of parking spaces with the capacity for future installation of EVSE.

BENEFITS

- **Minimize cost:** Both EV requirements and EV-ready provisions minimize the cost of EV charging infrastructure by eliminating the need for or simplifying a future retrofit. EV-ready provisions ensure buildings have the flexibility to support the growth of clean transportation.
- **Reduce emissions:** The amount of GHG emissions generated from the production, transport, and use of gasoline can be significantly higher than the average emissions generated per kWh delivered on an electric grid, especially on relatively “clean” electric grids.

RECOMMENDATIONS FOR ACTION

- It is important to factor local conditions into the decision to use codes to regulate for EV charging infrastructure. States may encourage local EV readiness by offering a menu of options that are standardized at the state level but adopted on a voluntary basis at the local level.
- Be sure to explore expedited permitting and inspection processes. Codes can encourage EV adoption by removing barriers to residential EV charger installation. States such as Oregon have used codes to establish a flat, consistent fee for residential EV charging infrastructure installation.

ADOPT SOLAR READINESS OR INSTALLATION REQUIREMENTS IN NEW BUILDINGS

PATHWAYS



PARTNERS



²⁰ <https://www.cesa.org/assets/2017-Files/Standards-and-Requirements-for-Solar.pdf>

²¹ <https://sfbos.org/sites/default/files/o0221-16.pdf>

²² <http://e-docs.southmiamifl.gov/webink/DocView.aspx?id=166539&dbid=0&cr=1>

²³ Seattle Permits, Renewable Energy and Solar-Ready Roofs for Commercial Buildings, Seattle Department of Construction and Inspections, May 2017. <http://www.seattle.gov/DPD/Publications/CAM/Tip422.pdf>

²⁴ Barry Friedman et al., Benchmarking Non-Hardware Balance-of-System (Soft) Costs for U.S. Photovoltaic Systems, Using a Bottom-Up Approach and Installer Survey – Second Edition, NREL, U.S. DOE, Oct 2013. <https://www.nrel.gov/docs/fy14osti/60412.pdf>

Building codes put forth a set of rules that specify minimum requirements for the design and construction of structures and buildings to protect public health, safety, and welfare. For solar PV projects, building codes can help ensure the safe installation and operation of the systems²⁰, but many jurisdictions have not explicitly addressed solar PV in building codes. Cities can make building codes and development processes more solar friendly, as follows:

- **Streamline solar permitting and update building codes.** Streamlining the permitting and inspection process to reduce the time and cost of solar installations can reduce barriers for solar adoption in existing buildings.
- **Adopt solar readiness provision.** Cities can require new buildings to be designed to accommodate solar installation in the future, or provide development incentives for solar installations to be included.
- **Adopt solar mandates.** Installing solar at time-of-construction is more cost-effective than retrofitting even a solar ready building because workers are already on-site, permitting and administrative costs are integrated into the initial design and construction process²¹ and systems can be financed at a lower rate if included in the initial home financing²².

CASE STUDY

Solar ready requirement for multifamily and commercial buildings (Seattle, WA): Seattle additionally requires some multifamily and commercial buildings to be solar ready and/or incorporate renewable energy. Multifamily buildings 4 stories or taller with more than 5,000 square feet of floor area are required to install renewable energy at time of construction. Non-residential buildings 1-20 stories tall with more than 5,000 square feet of floor area must incorporate solar ready construction and renewable energy. The same buildings with less than 5,000 square feet of floor area are only required to incorporate solar ready construction. Finally, non-residential buildings 21 stories or taller with more than 5,000 square feet of floor area must include renewable energy at time of construction.²³

BENEFITS

- **Reduce confusion and inconsistency:** By streamlining the solar permitting process and explicitly addressing solar in building codes, everyone involved in the solar development process – homeowners, builders, installers, and city staff – will benefit from clarity and consistency.
- **Reduce costs:** The non-hardware costs of solar make up to 64 percent of the cost of rooftop solar PV systems²⁴. By streamlining solar permitting processes, explicitly addressing building codes, and/or requiring solar-ready construction, cities can reduce the costs of developing solar.

RECOMMENDATIONS FOR ACTION

- Engage with local stakeholders including architects, project developers, solar PV contractors, and local homeowners on preliminary policy objectives, and gather input on concerns and opportunities.
- Adopt development incentives for new construction and retrofits that incorporate solar-ready design features.

IMPLEMENT COMMUNITY SOLAR PROJECTS AT SCALE

PATHWAYS



PARTNERS



WORLD
RESOURCES
INSTITUTE

²⁵ David Feldman et al., Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation, NREL, U.S. Department of Energy, April 2015. <https://www.nrel.gov/docs/fy15osti/63892.pdf>.

²⁶ Community Renewable Energy Act of 2013, Leg. # B20-0057, Law # L20-0047, Washington, DC. <http://dcclims1.dccouncil.us/images/00001/20130801110725.pdf>.

Most solar installation business models rely on home or building owners with solar-feasible rooftops to invest in PV solar systems. However, about 50 percent of households and businesses are unable to host a PV system²⁵. Therefore, community solar programs expand renewable energy access to residents and businesses who cannot or prefer not to install solar directly. States with the most projects tend to have state-level policy on community solar, although projects are also being developed in states without such policies.

Community solar programs enable multiple customers to share the economic benefits of a solar energy system. Residents or businesses voluntarily subscribe to a single solar system and receive credits on their utility bills for the share of solar their subscription produces. Although projects can be developed under several different models, all community solar projects expand access to solar energy. Community solar programs can also address physical and financial barriers to installing solar panels, and thus can help to make renewable energy more attainable for low-income customers and those who do not own their home.

CASE STUDY

Community Renewable Energy Amendment Act of 2013 (Washington, DC²⁶): Washington, DC established rules for its community renewable energy program that specify how many megawatts of energy each renewable energy facility may produce, how many subscribers they must have, how much of their electricity consumption subscribers may offset, consumer disclosure requirements, and more. Several community solar projects are now completed or underway in the District.

BENEFITS

- **Reduce costs and complexity through economies of scale:** Because community solar allows for significantly larger systems than individual rooftop systems, costs associated with permitting, interconnection, and customer acquisition are spread over larger project sizes. Additionally, siting flexibility enables projects to be placed in locations with lower-cost and higher-value grid integration.
- **Opportunities for collaboration and innovation:** Community solar can be achieved through a wide range of possible business models; provides opportunities for residential, commercial, and municipal collaboration; and expands opportunities for community engagement around renewable energy.

RECOMMENDATIONS FOR ACTION

- A community solar project must allow multiple entities to own a portion of or subscribe to the energy output of a single solar system. A community solar project should expand access to renewable energy beyond traditional rooftop solar, and subscribers should receive tangible economic benefits that are equitable based on the value generated by that subscriber's share of clean renewable energy.

CREATE ENERGY RESOURCE CENTERS

PATHWAYS



PARTNERS



²⁷ https://www.researchgate.net/publication/329362745_One-stop-shops_for_energy_renovations_of_buildings_Case_studies

The one-stop shop energy resource center model addresses a known problem in the market: building owners often express confusion about program offerings and how to make use of them, and as a result, many available programs are under-subscribed. Moreover, simply making use of programs can impose high costs on owners in the form of time spent navigating the process. Experience shows that providing assistance can increase the conversion rate of and improve the quality of energy efficiency projects.

The purpose of an energy resource center is to simplify the process of identifying, applying for, and leveraging existing energy efficiency programs, incentives, and financing opportunities for owners, tenants, and developers so they can use them with the least administrative burden - and to increase uptake of and make connections between available programs. To do this, a one-stop shop requires personnel positioned to help owners navigate the eligibility process, identify available resources in support of comprehensive projects, and provide trusted technical assistance, including initial assessments, onsite audits, and project support; they should also include an online resource center.

CASE STUDY

Energy efficiency program administrator (Chicago, IL): The one-stop shop model has been used successfully in Chicago by Elevate Energy, a nonprofit that works with homeowners, renters, and building owners, and others to improve energy efficiency in its multifamily building program. Elevate offers building owners a free, utility-funded building energy audit and helps the owner understand the results. More than 40 percent of the energy audits provided by the program have resulted in installed projects—an exemplary conversion rate. Elevate also provides owners with information on available funding for energy efficiency projects through a partnership with the Community Investment Corporation, a local community development financial institution (CDFI). Administrative staff and energy analysts at Elevate serve to integrate services across project life cycles, helping drive participation and project completion.

BENEFITS

- **Increase uptake of energy efficiency programs and leverage existing funds:** Energy efficiency programs and incentives are only effective if used by the community. By assisting homeowners and other eligible parties to identify and apply for available programs, energy resource centers can help ensure that programs reach their intended targets and achieve their energy savings goals.
- **Navigate various financing options:** Local energy resource centers can help eligible parties take advantage of financing programs for energy efficiency, renewables, and infrastructure projects.
- **Support compliance with local ordinances:** These centers can help existing buildings comply with benchmarking ordinances and meet performance standards.

RECOMMENDATIONS FOR ACTION

- Create a digital resource tailored to initiatives related to energy efficiency, building decarbonization, solar, and/or EVs, including incentive and financing programs.
- Accompany digital resources with a physical space that serves as a one-stop shop with access to educational materials and expert assistance.²⁷

PROMOTE BUILDING DECARBONIZATION THROUGH INCENTIVES AND DEMONSTRATION PROJECTS

PATHWAYS



PARTNERS

The Building Electrification Initiative

²⁸ Tatum, Jenna et al. (2018). Building Electrification in Cities: A Market Transformation Initiative led by Cities to Decarbonize Heating and Cooling Systems in Buildings. ACEEE Summer Study.

²⁹ http://eta-publications.lbl.gov/sites/default/files/electrification_of_buildings_and_industry_final_0.pdf

³⁰ <https://www.energy.gov/energysaver/heat-pump-systems/air-source-heat-pumps>

³¹ <http://www.sanjoseca.gov/index.aspx?NID=5475>

³² <http://www.sanjoseca.gov/index.aspx?NID=1509>

In cities, emissions from burning fossil fuels onsite for space and water heating can range from 15 percent to 40 percent of a city's total emissions²⁸. In colder climate cities, this can account for the single greatest source of GHG emissions. Building decarbonization involves shifting to lower carbon intensity fuel sources, such as improving energy efficiency and substituting efficient electric technologies for end uses that are currently powered by fossil energy sources, such as natural gas- or oil-fired boilers and furnaces. In buildings, electric alternatives exist for all major energy end uses²⁹ including space heaters, water heaters, cook stoves and dryers. Electric heat pumps can also provide cooling³⁰, which can provide benefits where climate change is resulting in hotter summers. Heat pump technology can also be grid interactive to help balance the electric grid, particularly relative to higher penetrations of renewable energy.

CASE STUDY

Workshop and showcase on heat pump water heaters (San Jose, CA): San Jose is developing resources to increase uptake of zero net energy buildings,³¹ which often include incorporation of efficient electric technologies. In April 2018, the city offered a workshop and showcase on heat pump water heaters³² in partnership with Passive House California and Silicon Valley Energy Watch. The workshop was tailored to architects, designers, developers, contractors, engineers, and homeowners.

BENEFITS

- **Greater comfort:** High-efficiency space heating provides virtually silent, constant, and uniform heating and cooling. It is already the solution of choice for high-end homes. These technologies may be particularly beneficial to cities whose building stock lacks central cooling, but that expect to experience increasingly warmer summers.
- **Improved air quality and human health:** Electrically-powered end uses avoid the combustion of fuels on site, mitigating emissions at the point of customer use and improving both indoor air quality and outdoor air pollution. This also reduces the fire hazards caused by gas combustion and leaks in buildings, as well as the risk of carbon monoxide poisoning.
- **Increase awareness:** By piloting decarbonization projects, cities and their partners can increase understanding of electrification technologies and test their cost-effectiveness, benefits, and viability.

RECOMMENDATIONS FOR ACTION

- Work with your utility to provide a rebate for heat pump technologies.
- Implement demonstration projects in city or partner buildings.
- Launch outreach and education programs to increase customer awareness of heat pump technologies and their benefits.

PLAN FOR BUILDING DECARBONIZATION THROUGH LOCAL CODES

PATHWAYS



PARTNERS



³³ <http://carbonneutralcities.org/wp-content/uploads/2018/09/CNCA-Game-Changers-Report-2018.pdf>

Adopting updated local building codes and zoning ordinances for new construction and existing buildings to reduce overall energy use are among the most impactful steps cities can take to transition towards efficient all-electric buildings.

Building codes don't necessarily need to mandate all-electric buildings; they can incentivize them through alternate compliance pathways, zoning density bonuses, etc. For existing buildings, cities may consider setting mandatory energy efficiency standards for buildings or units at time-of-lease or sale and allowing all-electric as an option for compliance with this standard. Market acceptance of electric versions of appliances, such as induction cook stoves, is a critical component of passing these policies. Therefore, cities should seek to integrate public education and outreach as part of these policies and also build a strong voluntary and market-driven approach through incentives, pilots, demonstration projects and workforce development to pave the way for future mandates.

CASE STUDY

All-Electric Building Requirement for New Construction (Berkeley, CA): In July 2019, City of Berkeley passed a new law banning natural gas infrastructure in new houses, apartments, and commercial buildings. The ordinance has a few temporary exemptions for building systems that cannot currently be modeled in the California building code compliance software, like central hot water systems in large apartment buildings and hotels. The new ordinance requires that any exempted buildings be "electric-ready", helping reduce the cost of a later conversion to electricity for remaining gas end uses.

BENEFITS

- **Reduce long-term costs:** Achieving zero emission and zero carbon buildings is most cost-effective when incorporated into the planning and design of new buildings and major renovations, thus avoiding costly retrofits down the line.
- **Improved air quality and human health:** Indoor combustion of fossil fuels is a leading cause of poor indoor air quality which also leads to public health disparities. Furthermore, this reduces the fire hazards caused by gas combustion and leaks in buildings, as well as the risk of carbon monoxide poisoning.
- **Support building the market:** Codes that incentivize building decarbonization through alternate compliance pathways, zoning density bonuses and other voluntary pathways are an important way to build long-term market acceptance.

RECOMMENDATIONS FOR ACTION³³

- Engage with the development and building sectors, including affordable housing developers, and collaborate with potential early adopters in the industry.
- Focus code innovation on the primary building types expected to be built in the next few decades.
- Select a zero-emission standard to guide building decarbonization efforts.
- Identify sources of incentive funding and technical assistance through other utility, city, or state programs.

PRIORITY ACTIONS: TRANSPORTATION

IMPROVE PUBLIC TRANSIT SPEED, RELIABILITY, AND USER EXPERIENCE

PATHWAYS



PARTNERS



³⁴ <http://transitcenter.org/wp-content/uploads/2018/05/Collaboration.pdf>

³⁵ <https://www.nctr.usf.edu/pdf/77607.pdf>

Although transit services are often run by independent transit agencies rather than city governments, cities play the essential role of managing the street networks, sidewalks, traffic signals, and bus stops that allow transit vehicles to move through cities and transit riders to access them. Regardless of how authority is divided among agencies, coordination is essential. On streets and corridors that cities control, it is important to coordinate with transit agencies to make sure that city investments match transit agency goals and resources.

Cities should engage with transit agencies for data on bus speeds, ridership, and other operating characteristics to inform decisions on where to install bus-only lanes and bus shelters with real-time information, and to make sure that the transit agencies have the ability to take advantage of the city's investments³⁴. Cities should remember that even without full coordination between city and transit authority, they can typically make changes to street design and operations (e.g. bus-only lanes, turn restrictions, etc.) that can increase transit speed and reliability with only limited changes from the transit authority itself.

CASE STUDY

Select Bus Service prioritization program (New York, NY): The New York City Department of Transportation and the Metropolitan Transit Authority partnered to launch the city's Select Bus Service (SBS) program in 2008. The program has since expanded to include 18 routes. Utilizing strategies such as off-board fare collection and transit-signal priority, the SBS program increased bus speeds up to 20% in its first year.

BENEFITS

- **Reduced trip times:** At the end of the day, people choose to use transit if it gets them to their destination in a reasonable time. Projects like transit signal prioritization and all-door boarding can significantly reduce trip times, making transit more competitive with driving.
- **Increased rider satisfaction:** While speed seems like the most important part of transit service, evidence suggests that riders are actually more concerned with reliability³⁵. By increasing reliability and providing accurate arrival information, cities can make large gains in rider satisfaction.

RECOMMENDATIONS FOR ACTION

- Formalize agency roles. In cities that do not manage transit, making improvements requires coordination with transit agencies. Creating formal project agreements can ensure that each agency does their part.
- Develop spot improvement programs. Spot improvement programs allow cities and transit agencies to create a pipeline of small projects to improve transit service.
- Find early wins. Identifying a small number of projects that can be implemented quickly and show clear results is a great way to build public support for future transit improvements.

IMPLEMENT HIGH PRIORITY SEGMENTS IN THE WALKING AND BIKING NETWORK TO BE SAFE AND INVITING TO ALL, INCLUDING FOR THOSE USING TRANSIT

PATHWAYS



PARTNERS



³⁶ <https://www.aarp.org/content/dam/aarp/livable-communities/livable-documents/documents-2016/2016-WalkingBicyclingBenchmarkingReport.pdf>

³⁷ Start cheap. Cities should begin building bicycle infrastructure quickly with low-cost, easy-to-implement tools such as paint and bollards. These projects can provide the initial wins necessary to justify more capital-intensive projects.

³⁸ <https://www.aarp.org/content/dam/aarp/livable-communities/documents-2016/2016-WalkingBicyclingBenchmarkingReport.pdf>

³⁹ <https://grist.org/cities/four-reasons-why-portland-became-a-bikers-utopia/>

⁴⁰ <https://www.portlandoregon.gov/transportation/72504>

Reducing greenhouse gas emissions from car travel requires not just cleaner cars but shifting to trips that don't use a car at all. Doing so requires that we make biking and walking priorities in our finite municipal budgets and city street space. Recognizing the many health, environmental and economic benefits of expanding walking and bicycling networks, many leading cities have a published goal to increase walking and bicycling, with adopted bicycle and/or pedestrian master plans.³⁶

Connected bicycle and pedestrian routes should cover a city to maximize the number of places that can be safely reached. The most important strategies for protecting pedestrians involve minimizing crossing distances and reducing automobile speeds. Both can be done by extending curbs farther into the street, either at intersections or mid-block. This can be done with quick-build materials like planters or bollards if a city does not have the budget for concrete.³⁷ Cities should also consider automobile speed when planning bicycle infrastructure. Painted bike lanes are only appropriate on streets with automobile speeds up to 25 mph. Cities should strive to build protected bike lanes on streets faster than 25 mph. Off-street bike paths are ideal for high-speed corridors with limited access.

CASE STUDY

Prioritizing bikeway, sidewalk and crossing improvements (Portland, OR): Portland leads large US cities in the percentage of commuters who bike to work and ranked tenth in 2016 for the percentage of commuters who walk to work.³⁸ The city has 350 miles of bikeways, with more than 50 miles funded to be installed in the next few years. Portland has developed this infrastructure not just by creating bike plans, but by backing these plans up with funding.³⁹ Portland is currently updating its pedestrian plan⁴⁰ to prioritize sidewalk and crossing improvements and other investments to make walking safer and more comfortable across the city. It will identify gaps and needs in Portland's pedestrian network, prioritize funding to locations with the greatest need first, and identify performance measures to track progress.

BENEFITS

- **Increased transportation efficiency:** Half of all trips are less than three miles in length, yet people use cars to complete 72 percent of these trips. Improving walkability and bikeability may make commutes more efficient and is an integral part of supporting transit infrastructure. People walking and biking can bypass congestion, and shifting more commuters away from cars may also improve the efficiency of those who continue to commute by car.
- **Improved health outcomes:** Physical inactivity is a major contributor to the rise in rates of obesity, diabetes, heart disease, stroke, and other chronic health conditions in the United States. Even small increases in light-to-moderate activity, such as daily bike rides or 30-minute walks, can produce measurable benefits.

RECOMMENDATIONS FOR ACTION

- Consider connectivity. A single bicycle lane in a sea of high-stress streets is unlikely to convince many people to start riding. As a city plans its bicycle network it should identify connected corridors that provide continuous routes between destinations.

PROMOTE ELECTRIC VEHICLE EDUCATION AND INCENTIVES

PATHWAYS



PARTNERS



⁴¹ <https://insideevs.com/news/338839/2018-july-us-plug-in-electric-car-sales-charted-market-share-exceeds-2/>

⁴² <https://www.ct.gov/deep/cwp/view.asp?A=2684&Q=539780>

⁴³ https://www.electrificationcoalition.org/wp-content/uploads/2018/06/SAF_1213_EC-Roadmap_v12_Online.pdf

Electric vehicle adoption currently faces market barriers such as higher upfront costs (compared to gasoline and diesel-powered vehicles), despite having in some cases a lower lifecycle cost of ownership due to lower maintenance costs and fuel costs. There is also a lack of consumer awareness about the availability and viability of EV technology. Cities can play a leading role in increasing the use of EVs by implementing incentives and education policies.

Most major automakers have announced plans to increase electric vehicle product offerings, so we should in theory see a rapid increase in EV availability in the coming years.⁴¹ However, in many cities throughout the U.S., there are only a limited number of EV models actually available at auto dealerships and in many cases none at all. For now people are still relatively unfamiliar with EV technologies, and cities can support the market uptake of EVs with incentives, consumer education, and partnering with local dealerships.⁴²

CASE STUDY

Plug-In Electric Vehicle Readiness Plan (Charlotte, NC): Charlotte's Plug-In Electric Vehicle Readiness Plan identifies a suite of existing and proposed education and outreach programs. Existing programs include a partnership with Charlotte-area Chevrolet and Nissan dealerships to help educate EV owners and the public about EVs and charging stations. Proposed communication efforts include media communication through email newsletters, print advertising, radio, social media, transit advertising, and more.

BENEFITS

- **Improved local air quality:** Aside from greenhouse gas emissions, gasoline-powered cars also create harmful localized pollution. Battery-electric vehicles have no tailpipe emissions, and plug-in hybrid vehicles pollute less than traditional cars even when operating on gasoline⁴³.
- **Reduced costs of operations:** The upfront costs of EVs are offset by savings over the life of the vehicle. Cost savings come both from increased efficiency and reduced maintenance needs. Using national average prices, it costs about half as much to fuel an EV as a conventional internal combustion vehicle.

RECOMMENDATIONS FOR ACTION

- Cities should take stock of existing local, state, and federal EV incentives and make this information easily available online and at community facilities, such as libraries, City Hall, and the Planning Department (e.g., plan check desk).
- Tailor incentives and education programs towards low-income communities. The relatively high upfront cost of EVs often makes them inaccessible to low-income communities. Targeting grant programs, tiered incentives based on income, electric shuttles, and car-share and low-rate loans can help expand EV access to underserved communities.
- Create interchangeable incentives. Cities may enhance the attractiveness of their incentive programs without increasing program cost if they allow consumers to choose benefits that best meet their needs. For instance, through their municipal utility, the City of Sacramento offers either a free Level 2 charger or a \$599 cash incentive to new EV drivers.

ENCOURAGE NEW MOBILITY OPTIONS SUCH AS BIKESHARE, SCOOTER SHARE, AND OTHERS

PATHWAYS



PARTNERS



⁴⁴ <https://mobilitylab.org/2018/07/18/bikeshare-has-an-equity-problem-and-philadelphia-is-tackling-it/>

⁴⁵ https://www.bikesharing.ch/fileadmin/redaktion/bikesharing/Dokumente/Documents_et_autres/Bikesharing_in_the_United_States.pdf

Shared bicycles and scooters have emerged as a new way for people to travel across their cities. Aimed at short point-to-point trips, these vehicles give commuters another option for first- and last-mile transit connections and substitute for more carbon-intensive forms of travel. Users of public bikeshare systems pick up bicycles at a self-service station and return them to other stations within the service area. Planning and operation of the system is led by the city, generally with one or more private partners. Bicycles and scooters are placed in the public right-of-way and can be rented using phone apps. Because these systems are privately operated, they can be deployed quickly and require no city funding.

As bikeshare (and scooters) have moved to dockless systems, there are concerns that these systems have not been implemented with the proper local regulatory oversight. To manage dockless providers, cities are beginning to explore permitting programs. These programs would regulate how and where vehicles are deployed and contain safeguards to prevent the vehicles from cluttering public rights-of-way. Cities can also use permit programs to regulate the speed of electric shared vehicles and extend access to users without smartphones.

CASE STUDY

Indego Bikeshare equity initiative (Philadelphia, PA): Philadelphia's Indego Bikeshare provides a model for equity-minded public bikeshare. Indego works with low-income and minority residents to provide bikeshare stations where communities want them. Indego prioritizes collaboration with local communities and provides monthly low-income plans, cash payment options, and lessons on bike safety. Because of these efforts, 45% of Indego passholders are from nonwhite groups and 35% have incomes less than \$25,000.⁴⁴

BENEFITS

- **Low costs:** Public bikeshare systems typically have relatively low implementation and operational costs. They can be installed and ready to use in months rather than years⁴⁵, as opposed to other transportation infrastructure. Sponsorships can help underwrite operations. Private bikeshare and scooter-share systems require no city funding at all, beyond resources necessary to create a permit program if desired.
- **Increased accessibility:** Bikeshare systems give people greater access to places that are beyond their reach on foot. Bikeshare also increases accessibility to public transit by facilitating first- and last-mile connections.

RECOMMENDATIONS FOR ACTION

- Design a dense network for optimal uptake and use. In station-based bikeshare systems, station density is highly correlated with bikeshare use. Ideally, stations should be no more than 0.5 miles apart.
- To ensure that new mobility options serve as many people as possible, cities should design their systems with robust community engagement. The cost of bikeshare can be a barrier to adoption in low-income communities; offering monthly passes and cash payments can help put bikeshare within reach of more people. Private dockless systems are typically only accessible with a smartphone, so cities should consider mandating that operators provide other means of renting the vehicles.

PROMOTE COMMUTER INCENTIVES TO REDUCE DRIVING

PATHWAYS



PARTNERS

⁴⁶ <https://www.portlandoregon.gov/transportation/article/695489>

⁴⁷ <https://www.vtapi.org/tdm/>

A large portion of vehicle travel is related to commuting, with most people driving alone to work every day. Commuter incentives are benefits that employers can use to encourage employees to use more sustainable methods of getting to and from work.

Cities can facilitate the development of commuter incentives by launching their own program for city employees or by requiring private employers to provide commuter benefits in the form of monetary and non-monetary incentives. Monetary incentives include parking cash-out, transit and rideshare passes, and pre-tax transit and rideshare benefits. Non-monetary incentives include shuttles to/from transit, flexible work schedules, ridesharing assistance, and bike lockers and showers. Cities can also create transportation management associations (TMAs) and require new office developments to provide commuter incentives.

CASE STUDY

Transportation Wallet incentive instead of residential parking permits (Portland, OR): Portland's Bureau of Transportation allows residents who hold parking permits in a specific zone to trade in their permit for a "Transportation Wallet." The wallet includes an annual Portland Streetcar pass, an annual bikeshare membership, and \$100 to use on local transit.⁴⁶

BENEFITS

- **Reduced congestion and demand for parking spaces:** Commuter incentive programs have been shown to reduce the percentage of commuters driving to work alone, which corresponds to less congestion on local roads and a lower demand for parking at offices.
- **Increased transit ridership and revenue:** Employer-sponsored transit passes can increase both ridership and revenue for transit agencies.

RECOMMENDATIONS FOR ACTION

- Before designing a municipal employee program, a city should assess existing barriers to using alternative commute modes, key opportunities for employees to switch to different modes of travel, and what level of incentive is needed to facilitate this switch.
- Beyond offering commuter incentives to their own employees, cities should require large employers to provide similar benefits. If necessary, cities can assist employers with designing or funding these programs, including facilitating the design of a transportation management association (TMA) for specific areas such as downtown, medical centers, or industrial parks.⁴⁷

ELECTRIFY CITY FLEETS AND BUSES

PATHWAYS



PARTNERS



⁴⁸ http://www.caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018.pdf

⁴⁹ http://www.caletc.com/wp-content/uploads/2019/01/Literature-Review_Final_December_2018.pdf

⁵⁰ <https://www.govtech.com/workforce/Electric-Buses-Are-Not-Only-Clean-but-Less-Costly-to-Run.html>

⁵¹ <https://www.nrdc.org/experts/max-baumhefner/program-electrify-san-diegos-trucks-and-buses-approved>

Cities can demonstrate leadership and commitment to fighting climate change and carbon reductions by converting their existing fleets from internal combustion engines to electric vehicles (EVs). Fleets are uniquely suited to electrification because they have predictable routes, centralized parking facilities, and high vehicle utilization rates. In addition, the lower operating and maintenance costs of electric vehicles make the economics of EVs especially compelling to certain fleet owners, to offset any initial higher up-front costs.

Along with light-duty fleet vehicles, cities should consider electrifying medium- and heavy-duty (MD/HD) fleet vehicles, such as municipal buses and work trucks, since they have a bigger potential to offset GHG emissions per vehicle and show more significant operational cost savings. Urban and suburban transit and school bus routes are also well-suited for electrification, as they run the same or similar routes daily, have a high stop frequency, operate at low speeds, cover short distances, and are capable of being centrally fueled⁴⁸. Bus and fleet electrification particularly benefits underserved communities who are often most adversely impacted by poor air quality related to proximity to transportation corridors.

CASE STUDY

Electric transit buses (Los Angeles, CA): The Los Angeles Department of Transportation introduced electric buses into its DASH fleet in 2017. The agency purchased four 35-foot buses with a \$2.8 million state grant. With 150 miles of range, the buses can easily complete a daily service before charging overnight. Over 150 electric buses have been successfully deployed in the State of California, with about 386,000 deployed worldwide. Under new state rules, all new transit buses in California will be zero-emission, electric buses by 2029⁴⁹.

BENEFITS

- **Improved local air quality and health benefits:** Since they produce no tailpipe emissions, EVs contribute less to local pollution than gasoline-powered vehicles. This improves air quality in the immediate region where the vehicles travel.
- **Economic savings:** Some transit agencies are already seeing savings from operating quieter, smoother electric buses that have much lower fuel and maintenance costs. The total costs of ownership will improve even more over time as battery costs continue to decline.⁵⁰
- **Improved utilization of renewable energy generation:** Electric vehicles can utilize renewable energy, particularly solar PV during peak generation periods, instead of fossil fuel energy. This can build a strong case for utility-scale and local renewable energy projects and enforces resiliency and energy independence in the region⁵¹.

RECOMMENDATIONS FOR ACTION

- Identify EV enthusiasts and champions across city government and sister agencies and match with grant funding opportunities from local and state sources.
- Focus on employee education. For pool vehicles that are checked in and out during the day, charging can be a challenge. Educating employees on how to properly use charging stations is vital for maintaining fleet reliability.
- Once a city has begun to deploy electric vehicles, it should monitor their use and make any necessary adjustments to maximize program efficiency.

PROVIDE INCENTIVES AND BEHAVIORAL NUDGING FOR USE OF LOW-CARBON MOBILITY MODES

PATHWAYS



PARTNERS

ideas

42

⁵² <http://theconversation.com/how-gamification-can-make-transport-systems-and-choices-work-better-for-us-57663>

⁵³ <https://www.citylab.com/transportation/2018/10/durhams-plan-to-nudge-drivers-out-of-cars/574264/>

⁵⁴ <https://medium.com/@salutjames/why-should-we-gamify-transit-3c3701c983ff>

Cities interested in sustainable transportation should look to the field of behavioral science for guidance. Providing nudges, or small pieces of reinforcement, can help shake drivers out of their habits and increase the adoption of low-carbon modes of travel. Nudges do not force people into certain modes; rather, they encourage people to choose the most environmentally friendly modes from a full range of options.

Gamification is a behavioral science concept in which principles of game design are used in everyday life. Gamification guides residents away from single-occupancy vehicles by making sustainable commuting fun⁵². Cities can use this concept by, for instance, creating leaderboards that allow commuters to compete over how often they carpool or awarding prizes in exchange for exploring a transit system. Several cities across the world use gamification to encourage transit riders to avoid periods of peak congestion, and the concept could be applied to driving as well.

CASE STUDY

Personalized commuting maps and bus lottery nudging (Durham, NC): In 2018, Durham, North Carolina piloted a program aimed at reducing single-occupancy vehicle trips into downtown by five percent. The city used two nudging strategies in the program. The first strategy involved sending participants personalized commuting maps highlighting the benefits of not driving to work alone. The second strategy involved a “bus lottery” in which city employees could win a cash prize for riding the bus. Solo driving dropped 12% for commuters who received the maps and 16% for commutes who received the maps and participated in the lottery⁵³.

BENEFITS

- **Mode shift at low cost:** Behavioral nudging is based on the use of small, low-cost incentives to change behavior. Piloting a nudging program is a way to encourage mode shift that does not require a large investment.
- **Preserved choice:** Forcing residents to use certain forms of transportation is bound to be extremely unpopular. By using small incentives (or disincentives), nudging encourages low-carbon transportation while still allowing people to make their own travel choices.

RECOMMENDATIONS FOR ACTION

- Set clear goals for behavioral nudging programs. Cities developing gamification programs should make the programs fun, but not lose sight of concrete mode shift goals. It is critical to tailor a program to city goals and to constantly monitor results⁵⁴.
- Maintain continuous engagement for results. Behavior change is not instantaneous. In one pilot, riders had to engage with the program for a month for meaningful change. Cities should not expect nudging programs to be successful without continuously reaching out to the target audience. In addition, cities should work with residents to figure out what strategies are most likely to keep their attention.
- Emphasize costs and benefits as part of the behavioral nudging program. One of the key aspects of behavioral nudging is to remind people of the costs and benefits of their choices. For instance, highlighting the costs of car ownership or the calories burned in an active commute can help encourage mode shift.

FULLY IMPLEMENT PLANNED BICYCLE AND PEDESTRIAN NETWORKS

PATHWAYS



PARTNERS



⁵⁵ <https://www.tucsonaz.gov/files/transportation/files/BBMP-2-22-17.pdf>

⁵⁶ <https://nacto.org/2016/07/20/high-quality-bike-facilities-increase-ridership-make-biking-safer/>

Just as cities have fully developed street networks for automobiles, walking and biking must be treated as serious modes of transportation. When filling in the bicycle and pedestrian networks, cities should consider infrastructure including:

- **Sidewalks:** At a bare minimum, cities should have sidewalks on all streets. Sidewalks should be kept in good repair to keep pedestrians safe and ensure access for people with disabilities.
- **On-street bike lanes:** On streets without space for protected cycle tracks, cities should try to paint on-street lanes dedicated to bicycles.
- **Bicycle boulevards:** Bicycle boulevards are streets with low motorized traffic volumes and speeds that have been designed as a through street for bicyclists. They often incorporate signs, pavement markings, and traffic calming measures to discourage through travel for motor vehicles and encourage safety and convenience for bicyclists.

CASE STUDY

Bicycle Boulevard Master Plan (Tucson, AZ): Tucson's Bicycle and Pedestrian Program is dedicated to creating a complete transportation network where walking and biking are safe, convenient, and comfortable ways of moving around the city for people of all ages and abilities. The city developed a Bicycle Boulevard Master Plan⁵⁵ in 2017 to enhance its over 1,000 miles of existing bikeways. The bicycle boulevard network – residential streets designed to prioritize bicycling and enhance conditions for walking – will serve as the backbone for active transportation throughout the city. The plan identifies a network of 193 miles of future bicycle boulevards along 64 residential corridors.

BENEFITS

- **Mode shift and improved safety:** Increasing rates of cycling and walking is difficult. Although building infrastructure is not necessarily enough, research indicates that high-quality infrastructure is a necessary precondition to mode shift. Clear evidence shows that when cities build protected bike lanes, more people ride on the improved streets⁵⁶.
- **Equity for underserved communities:** Pedestrian fatalities tend to be highest in low-income communities and communities of color. Investing in pedestrian infrastructure across an entire city has the potential to greatly benefit the least privileged road users. Black and Latino cyclists die at higher rates than white cyclists, further highlighting the equity impacts of safety investments.

RECOMMENDATIONS FOR ACTION

- Leverage published design standards. Federal standards on street design are outlined in the Manual on Uniform Traffic Control Devices (MUTCD). While innovation is important, all bicycle and pedestrian programs must conform to MUTCD regulations.
- Design for mid-block crossings. Most pedestrian fatalities occur when pedestrians are not crossing at intersections. On long blocks, cities cannot expect people to walk to intersections to cross the street, and cities should build safe mid-block crossings.

UTILIZE PARKING MANAGEMENT AND PRICING TO ENCOURAGE LOW-CARBON TRAVEL

PATHWAYS



PARTNERS

⁵⁷ <https://www.jtlu.org/index.php/jtlu/article/viewFile/730/835>

⁵⁸ <https://buffalonews.com/2016/12/27/city-code-21st-century/>

⁵⁹ <https://www.planning.org/planning/2018/oct/peopleoverparking/>

Parking policy is at the heart of so many transportation and land use issues. The majority of parking in America is free and it is impossible to seriously address sustainable transportation without acknowledging this fact. Minimum requirements for parking spaces in new developments continue to encourage people to own cars. One study found people living near transit were twice as likely to own a car if they lived in a home that included parking⁵⁷. Once people own cars, they drive them, increasing vehicle miles traveled and therefore emissions.

City streets are typically lined with parking, and this curb parking is often free. When an in-demand product is free you end up with shortages, and parking is no exception. Drivers, then, end up cruising to try to find an open spot. The simplest way to prevent parking shortages is to charge for parking. But setting fixed prices, as many cities do, is an imprecise way to control demand. Instead, cities should adjust prices regularly so that one or two spots are always available on each block. Loop sensors and smart parking meters can allow this to be done easily from a central location.

CASE STUDY

Buffalo, NY: In 2017 Buffalo, New York became the first major city in the U.S. to eliminate parking minimums city-wide. Parking requirements for buildings more than 5,000 square feet in size are now set on a case-by-case basis that incorporates non-car transportation options. The change was part of a larger zoning overhaul conducted after seven years and 230 public meetings⁵⁸.

BENEFITS

- **Reduced cruising and congestion:** Charging market rates for curb pricing will prevent parking shortages. Reducing the need to cruise for parking reduces vehicle miles traveled (particularly inefficient stop-and-go driving) and saves residents time.
- **More affordable housing:** Building parking is expensive; garages cost tens of thousands of dollars per space⁵⁹. One study in Seattle found that parking added \$246 per month to apartment costs - 15 percent of total rent.

RECOMMENDATIONS FOR ACTION

- Eliminate off-street parking requirements. By eliminating parking minimums, developers can build only as much parking as people demand.
- Unbundle parking. Forcing landlords to charge for parking separately from housing means that people do not have to pay for parking that they don't want. This lowers housing costs and prevents people from buying cars that they are not sure they want.
- Charge market rates for curb parking. With less off-street parking, demand for on-street parking will rise. Charging market rates for curb parking will prevent shortages.
- Reinvest parking revenues in local neighborhoods. The money raised from curb pricing can be returned to neighborhoods in the form of parking benefit districts, which creates a constituency of people with a vested interest in charging for parking.

IMPLEMENT CONGESTION PRICING AND/OR LOW EMISSIONS ZONES FOR PRIORITY AREAS

PATHWAYS



PARTNERS



⁶⁰ https://ops.fhwa.dot.gov/congestionpricing/resources/enviro_benefits.htm

⁶¹ https://ops.fhwa.dot.gov/publications/fhwahop08039/cp_prim1_08.htm#faq2

⁶² http://www.baltic-ecoregion.eu/index.php?node_id=110.152&lang_id=1

⁶³ https://archive.sfcta.org/sites/default/files/content/Planning/CongestionPricingFeasibilityStudy/PDFs/MAPS_case_studies_111310.pdf

⁶⁴ <https://www.theguardian.com/environment/2008/feb/04/travelandtransport.carbonemissions>

⁶⁵ <https://www.epa.gov/mobile-source-pollution/research-health-effects-exposure-risk-mobile-source-pollution>

Traffic congestion is a major contributor to carbon emissions because stop-and-go traffic burns more fuel than freeflow travel⁶⁰. Modern congestion pricing differs from conventional tolling in that prices are set dynamically depending on traffic conditions.⁶¹ Although there are multiple forms of congestion pricing, cordon pricing is the most effective strategy for reducing emissions. Cordon pricing involves charging drivers a fee to enter a specific area, generally a city's central business district.

Low emissions zone programs further address high-emission vehicles. The first low emissions zone was established in Gothenburg, Sweden in 1996⁶² and Europe now has more than 200 such zones. Cities can structure low emissions zone programs by levying a fee on vehicles that do not meet certain emissions standards. Both congestion pricing and low emissions zones can raise additional revenue to invest in sustainable transportation and non-vehicle-based travel options to also address equity concerns.

CASE STUDY

Downtown cordon pricing and low emissions zone program (London, England): In 2003, London implemented a charge to drive within the center of the city. The program reduced congestion by 30 percent and greenhouse gas emissions by 16 percent. In addition, bus ridership rose by 18 percent and rates of pollution-caused illnesses like asthma and bronchitis fell⁶³. In 2008, London then implemented a low emissions zone program, initially applying a \$130 per day fee for diesel trucks⁶⁴. The city expanded to include other vehicles, and a new "Ultra-Low Emissions Zone" program imposes a \$16 charge on higher-emissions vehicles on top of the existing congestion fee in the area.

BENEFITS

- **Improved public health:** By discouraging the use of polluting vehicles, low emissions zones reduce fine particulate pollution and air toxics, which have negative impacts on public health⁶⁵.
- **Reduced congestion:** Both congestion pricing and low emissions zones can keep cars off of crowded streets to reduce congestion and improve travel times in priority areas.
- **Revenue collection:** Fees from low emissions zones can be used for a variety of programs, including transit improvements and subsidies to drivers to retrofit their vehicles to meet stricter emissions standards.

RECOMMENDATIONS FOR ACTION

- Assess the political and legal landscape. Congestion pricing and low emissions zones are new concepts in America. Cities interested in pursuing this strategy should begin by mapping out key players to determine who will need to be engaged and how. In addition, cities must make sure that they have the authority to levy road fees or work closely with agencies who do.
- Start with an initial pilot. While it may be difficult to enact a permanent congestion pricing program, starting with a pilot is more realistic. The experience in Stockholm, where an initially unpopular cordon was ultimately approved by voters, shows how a successful congestion pricing pilot can become permanent.
- Consider equity impacts and identify mitigating strategies. Low emissions zones raise equity concerns because low-income drivers are least able to afford newer, lower-emission vehicles. To help address this problem, cities should pair low emissions zones with transit improvements (to give people alternatives to driving) or consider rebates for low-income drivers.

DEFINE AND EXPAND THE HIGH-FREQUENCY PUBLIC TRANSIT NETWORK

PATHWAYS



PARTNERS

NELSON
NYGAARD

⁶⁶ <http://www.govtech.com/fs/Bus-Network-Redesigns-are-the-Hottest-Trend-in-Transit.html>

⁶⁷ <https://www.citylab.com/transportation/2014/02/far-beyond-rush-hour-incredible-rise-peak-public-transportation/8311/>

Increasing service frequency is critical to getting more people to ride buses. Since the wait for a transit vehicle contributes to total trip time, frequency is arguably the most important consideration in planning effective bus service. Without high-frequency service, defined as routes having headways of 15 minutes or less, buses cannot compete with private automobiles.

Headways are only half of an effective high-frequency network; smart route design is also crucial. Many transit systems have meandering routes haphazardly developed over time. Transit systems should run on a grid for maximum efficiency. A gridded system may require that riders make a connection to get to their destination, but as long as service is frequent this is not a problem.

Increasing frequency requires significant resources, so cities must be prepared to increase transit funding or make difficult decisions about cutting certain routes in favor of improving others. In addition to frequency of service, cities must consider span of service. While it may be tempting to focus resources on rush hour, cities should expand frequent service throughout the day and on the weekends to best serve non-traditional commutes and non-commute trips.

CASE STUDY

Full redesign and commitment to robust bus network (Houston, TX): Houston launched a full redesign of its bus network in 2015. The new system focused on creating gridded service and was centered upon a high-frequency network running at least every 15 minutes, at least 15 hours a day, and seven days a week. Before the program Houston's transit ridership had been falling for decades; after implementation the city saw gains in bus ridership⁶⁶.

BENEFITS

- **Improved anytime reliability:** Private automobiles give people control over their schedules; drivers can leave for a trip whenever they want. Transit struggles to compete with this convenience, but all-day high-frequency service makes it as attractive as possible.
- **Easy connections:** When service is infrequent and/or unreliable, transferring from one vehicle to another can make a trip much longer. A high-frequency network facilitates connections and greatly expands the reach of a transit system.

RECOMMENDATIONS FOR ACTION

- Seek to balance frequency and coverage. Given finite resources, there is a need to balance frequency with system coverage. Some parts of cities are just not dense enough to support transit. Cities should be willing to eliminate infrequent, low-ridership lines in order to increase frequency in areas where transit is most useful.
- Plan to the grid. It can be tempting to divert transit routes to hit specific destinations, but this increases system complexity and slows down service for riders not going to these stops. With a strong grid and frequent service, destinations can be reached by low-stress connections rather than circuitous routes.
- Provide all-day and all-week service. As much as resources allow, maintain high-frequency service beyond peak commute periods. Midday, night, and weekend service make transit useful to many more people. Off-peak service is especially important to low-income people, who are more likely who have non-standard work schedules⁶⁷.

DEVELOP MARKET TRANSFORMATION PROGRAMS TO SIGNIFICANTLY ACCELERATE COMMUNITY-SCALE TRANSITION TO ELECTRIC VEHICLES

PATHWAYS 

PARTNERS



⁶⁸ <https://static1.squarespace.com/>

⁶⁹ http://www3.weforum.org/docs/WEF_2018_%20Electric_For_Smarter_Cities.pdf

Market transformation is about intervening in the market to create lasting change that accelerates adoption of electric vehicles, as the preferred vehicle technology in the absence of targeted programs. While implementing education and incentive programs are a good step towards electric vehicle adoption, cities serious about transitioning to EVs should enact more ambitious policies.

- **Make EV charging infrastructure business-as-usual:** Cities can encourage private vehicle purchasers to buy EV's by focusing on expanding EV charging infrastructure, through requiring housing developers to equip a percentage of parking spaces with EV chargers.
- **Utilize Mobility as a Service (Maas):** Mobility as a Service (Maas) provides an ambitious transportation model that can (1) provide travelers with the services they need to get from point A to point B under a single payment account, (2) integrate disparate modes of mobility under one customer experience to better serve the travelers in a city or region, and (3) create an economic model that promotes journey choices that ease congestion, whether fulfilled by public or private service providers.
- **Offer bulk purchasing programs:** Cities should consider working together to facilitate bulk purchasing programs to negotiate lower prices for EVs for both commercial and personal buyers. On the commercial side, some fleet operators are interested in buying specialized EVs at a scale too small for manufacturers.
- **Car-sharing:** Electric car-sharing has some of the same benefits as other fleet electrification, but also provides a way to expose consumers to electric vehicles.

CASE STUDY

Bulk purchase program and city fleet purchases (Kansas City, MO): Kansas City Power & Light partnered with the nonprofit Metropolitan Energy Center and Nissan to provide a bulk purchase discount on Nissan Leaf EVs to buyers in Kansas City. By purchasing EVs for its city fleet, Kansas City was able to secure a \$10,000 discount for consumers. The program increased sales 87% in its first year⁶⁸.

BENEFITS

- **Expanded access to low-carbon mobility options:** Electric car sharing will give EV access to people who cannot afford the upfront costs of EV ownership. Bulk purchasing can similarly reduce upfront costs for both residents and local businesses.

RECOMMENDATIONS FOR ACTION⁶⁹

- Take a multi-stakeholder and market-specific approach. Energy, mobility, and infrastructure enterprises, along with policy-makers, regulators, and urban planners, should collectively define this action for the city.
- Prioritize high-use vehicles. The first focus in this action should be on electrifying commercial fleets. Although personal-use vehicles will likely remain a significant portion of the vehicle stock for many years, they are on the road less than 5 percent of the time, representing a low volume of overall miles driven.

BUILD MORE HOUSING NEAR TRANSIT THROUGH UPZONING NEAR TRANSIT STATIONS, AND ELIMINATING PARKING REQUIREMENTS

PATHWAYS



PARTNERS



⁷⁰<https://urbanize.la/post/transit-oriented-communities-year-review>

⁷¹https://www.roads.maryland.gov/OPR_Research/MD-13-SP209B4N-Development-of-a-Framework-for-Transit-Oriented-Development_Report.pdf

⁷²<http://www.transformca.org/transform-report/why-creating-and-preserving-affordable-homes-near-transit-highly-effective-climate>

⁷³<https://www.transformca.org/transform-report/why-creating-and-preserving-affordable-homes-near-transit-highly-effective-climate>

Cities cannot ignore the link between housing and transportation: transit investment won't lead to increased ridership if no one lives close enough to the stations to ride. By upzoning the areas around stations, cities can help ensure that their transit investments pay off. Cities can pass ordinances upzoning near all high-frequency transit stops or focus on stations specifically identified as being conducive to transit-oriented development.

There is more to transit-oriented development than just upzoning. To further increase ridership, cities should eliminate or greatly reduce parking requirements in these areas. Additional strategies include mandating pedestrian-oriented design and allowing for mixed-use development to bring amenities closer to housing. Cities should account for gentrification when planning transit-oriented development ordinances. Inclusionary zoning is one step to fight displacement, by mandating the provision of affordable housing in new development or preventing property owners from evicting tenants to construct new buildings.

CASE STUDY

Density bonus and other incentives for transit-oriented development (Los Angeles, CA): In 2017 Los Angeles launched its Transit Oriented Communities Affordable Housing Incentives Program. The program allowed projects within a certain distance of transit to qualify for density increases and parking reductions in exchange for affordable housing guarantees. Within the first year, 200 developments had begun to apply for permits under the program⁷⁰.

BENEFITS

- **Reduced driving:** By having more people live close to transit, strategic upzoning can reduce driving. One study of transit-oriented development in Washington, D.C. found it correlated with a 20 percent reduction in vehicle miles traveled⁷¹.
- **Improved affordability:** Cities across the country are facing housing shortages. Upzoning will allow for increased housing production and supply, and can reduce housing prices.

RECOMMENDATIONS FOR ACTION

- Avoid displacement by including low-income requirements. Low-income individuals living near transit are much less likely to drive than higher-income individuals living near transit⁷². Beyond addressing fairness, increasing affordable housing in transit-oriented development can increase transit ridership⁷³.
- Consider small steps associated with zoning. Creating overlays around a small number of transit stations can provide a proof-of-concept to support future city-wide rezoning efforts.

ACHIEVE UBIQUITOUS EV CHARGING INFRASTRUCTURE

PATHWAYS



PARTNERS



⁷⁴<https://www.atlantaga.gov/Home/Components/News/News/10258/1338?/blacklist=>

⁷⁵<https://www.forbes.com/sites/Evaluation%2BReport%2Bwith%2BApendix.pdf/static/57a0a284d2b-857f883096ab0/t/5c0fd-dccc2241bddccc2241b>

Building a public charging system can increase consumer confidence and reduce the strain on the electric grid caused by overnight charging. There is a clear correlation between charging infrastructure and electric vehicle adoption; for example, City of San Jose, California, has six times the national per capita average number of charging stations and a 13 percent electric vehicle share.

On the residential level, Level 1 charging is as simple as running an extension cord to a wall outlet. Level 2 charging— preferred by most customers because it is faster— requires 220 volt outlets. Installing a 220 volt outlet can be expensive for homeowners and out of reach for renters without coordination and agreement with building owners. Ubiquitous EV charging infrastructure means that options for charging electric vehicles are as convenient as regular gas stations, if not more. Strategies also include bulk purchase of charging infrastructure and partnerships with entities such as electric utilities and national programs like Electrify America.

CASE STUDY

EV ready ordinance for new construction (Atlanta, GA): Atlanta passed an EV Ready ordinance in 2017 to ensure public access to charging stations. The ordinance requires that 20 percent of spaces in all commercial and multi-family parking garages be EV-ready. In addition, all new residential developments are required to have the conduit, electrical capacity, and other infrastructure necessary to install charging stations⁷⁴.

BENEFITS

- **Increased consumer confidence:** While currently available electric cars have more than enough range for the average driver's daily needs, consumers still worry about how long batteries last⁷⁵. Proliferating high-speed charging stations will make people feel more confident that electric cars will not leave them stranded.

RECOMMENDATIONS FOR ACTION

- Start with EV charging infrastructure in new construction. Ensure that new construction is wired for electric vehicle supply equipment (EVSE) and can support a higher electric load on the utility grid and service panel, with the potential for adding future vehicle battery charging capacity and eventually energy storage devices.
- Identify priority policy, codes, and program administration. Align EV charger deployment with policy and environmental mandates to achieve emissions reductions, air quality improvements, transportation technology advances and energy independence. Codes can be used to provide consistent and flexible options to regulate for EV charging equipment. This can include setting development standards, such as requirements for a certain number or percentage of EVSE designated parking stalls and clear administrative pathways for residential service upgrades and EVSE retrofit.
- Bulk purchase of Level 2 and Level 3 (DC) fast chargers. Both Level 2 and Level 3 DC fast chargers are necessary for a robust EV charging network. Level 3 chargers are quite expensive (at least \$50,000 each), so they should be prioritized for areas like retail centers where many people park for short periods. Level 2 chargers are more appropriate for all-day or overnight parking.

MAKE PUBLIC TRANSIT INVESTMENTS THAT SIGNIFICANTLY ENHANCE COVERAGE, SERVICE, QUALITY, FREQUENCY, AND/OR SPEED

PATHWAYS



PARTNERS



⁷⁶ <http://designlightrail.com/lightrailcompare/>

⁷⁷ <https://usa.streetsblog.org/2018/11/05/checking-in-on-america-pioneering-bus-rapid-transit-systems/>

⁷⁸ <http://libraryarchives.metro.net/DPGTL/MeasureM/20180524-how-pass-mega-transportation-measure-lacounty-measure-m-lessons-learned.pdf>

Cities looking to make large-scale transit investments have three main options: bus rapid transit, light rail, and heavy rail. Bus rapid transit is bus service that adopts many of the characteristics of rail transit, including dedicated lanes, high-quality stations, and off-board fare collection. Bus rapid transit is easier to deploy and adjust than rail and can be built and operated much more cheaply. Heavy rail, more commonly referred to as subways, is the highest speed, highest capacity form of transit, but is very expensive. Light rail uses smaller vehicles and simpler infrastructure than heavy rail but has more capacity than buses⁷⁶. Transit agencies often have to turn to bonds and/or voter-approved tax increases to fund these projects. Therefore, city leadership is critical to ensuring that transit agencies secure the necessary funding.

CASE STUDY

Voter authorized income tax for transit improvements (Indianapolis, IN): In 2016, voters in Marion County, Indiana voted to authorize a quarter-cent income tax. Indianapolis City-County Council approved the tax in early 2017. The Indianapolis Public Transportation Corporation used this tax to secure \$26 million dollars in bonds. These bonds will help fund the creation of three bus rapid transit lines, among other transit improvements.

BENEFITS

- **Faster service:** Bus rapid transit, light rail, and heavy rail all offer the potential for significant speed increases over standard bus service. For instance, when Cleveland, OH, built its Healthline bus rapid transit system, bus speeds along the corridor increased by more than a third⁷⁷.
- **Increased capacity:** Investing in rapid transit can greatly improve capacity. While an articulated bus can hold about 60 people, a subway can hold 1,500. Additionally, running vehicles on dedicated rights-of-way allows for more service and therefore more capacity.

RECOMMENDATIONS FOR ACTION

- Customize your messaging for your local context. Different people support large-scale transportation projects and the funding measures behind them for different reasons. To gain support, tailor messaging to focus on specific benefits such as increased transit service, improved traffic, or greenhouse gas reductions⁷⁸.
- Consider complementary policies that disincentivize driving. Transit improvements have a limited effect on ridership when driving remains cheap and convenient. Major transit projects should be paired with policies that discourage driving - such as congestion pricing and parking reform - to achieve the best results.

