



| The Path to Clean Transportation

Recommendations to Create Sustainable
Transportation Systems



U.S. PIRG | Education
Fund

The Path to Clean Transportation

Recommendations to Create Sustainable Transportation Systems



WRITTEN BY:

Ryan Giunta & Matt Casale
U.S. PIRG EDUCATION FUND

April 2022



U.S. PIRG | Education
Fund

ACKNOWLEDGMENTS

U.S. PIRG Education Fund thanks our individual contributors for their generous support of our work on public health and environmental issues. Additionally, thank you to Nicole Walters for her review of this report.

The authors bear responsibility for any factual errors. Policy recommendations are those of U.S. PIRG Education Fund. Thanks to Nicole Walter for her review and editorial support.

Copyright 2022 U.S. PIRG Education Fund. Some Rights Reserved. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-ncnd/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

With public debate around important issues often dominated by special interests pursuing their own narrow agendas, U.S. PIRG Education Fund offers an independent voice that works on behalf of the public interest. U.S. PIRG Education Fund, a 501(c)(3) organization, works to protect consumers and promote good government. We investigate problems, craft solutions, educate the public, and offer meaningful opportunities for civic participation. For more information about U.S. PIRG Education Fund or for additional copies of this report, please visit www.uspirgedfund.org.

Cover photo: <https://unsplash.com/photos/El5zuQAtfeo>

I CONTENTS

INTRODUCTION.....	5
DRIVING INTO DEBT.....	6
TRANSFORMING TRANSPORTATION.....	8
HOW DO WE GET THERE.....	9
ALTERNATIVES TO TCI	11
POLICY MENU	12
CONCLUSION.....	14
ENDNOTES	15

| Introduction

IN MUCH OF AMERICA, including many parts of the Northeast and Mid-Atlantic, access to a car is all but required to hold a job or lead a full and vibrant life. Generations of car-centric transportation policies – including lavish spending on roads, sprawl-inducing land use policies, and meager support for other modes of transportation – have left millions of Americans fully dependent on cars for daily living.

Owning a car is a costly endeavor. On average, accounting for car payments, gas, car insurance, and replacement parts, it costs roughly \$8,000 every year to own a car in the United States.¹ More Americans than ever before are going into debt to purchase cars, raising concerns about the financial future of millions.²

All this driving isn't just bad for our pocketbooks. Transportation is also the largest driver of climate change, releasing millions of tons of greenhouse gasses each year into the atmosphere. In 2019, 29% of all of the United States' carbon emissions came from the transportation sector, making it the largest source of emissions in the nation.³ The majority of these emissions come from everyday travel to and from work, essential services and recreation. More than half of our country's total transportation related emissions are from light duty vehicles, which are the most commonly owned vehicles used for individual transportation.⁴

Pollution from our cars, trucks and buses is also putting the health of Americans at risk. According to a study from researchers at the University of Chicago, the average person is exposed to more than three times the air pollution that is deemed acceptable by the World Health Organization.⁵ Exposure to this level of air pollution has also reduced the average life expectancy globally by about 2 years.⁶

Americans need a modern transportation network that is more affordable, works better and pollutes less. Making it easier for people to drive less will make lives better, communities safer and healthier and will help address climate change. Cities and states need to adopt policies and make investments designed to cut pollution and give people more options for getting where they need to go. In the Northeast and Mid-Atlantic, the Transportation and Climate Initiative (TCI), a cap-and-invest program on transportation fuels, was one of the most promising proposed policies.⁷ It would reduce climate emissions from the transportation sector and unlock hundreds of millions of dollars for investments in a better, more modern transportation network, getting us closer to an America where we can drive (and pollute) less and live more.

Although several states made significant progress toward adopting TCI, it now appears to be on pause.⁸ Still, the problems with the transportation system in the Northeast and Mid-Atlantic still exist and the states need to implement comprehensive plans to address those problems. This report examines the benefits residents in the region would reap if their states adopted TCI or a similar program to reduce emissions, and provides sample policy recommendations that look to help states prioritize where to make the most beneficial investments relating to their transportation systems.

| Driving Into Debt

OVER THE LAST CENTURY, America's suburbs, cities and towns have been built in ways that make it difficult or impossible to live without access to a vehicle. As a result, car ownership is nearly universal in the United States, with 91 percent of all U.S. households having access to at least one car.⁹ Ownership of a car is often a lifeline that gives Americans access to employment, shopping, education and recreational opportunities. Currently, about 86 percent of U.S. workers commute to work by automobile.¹⁰

Owning a car is expensive. Largely due to the expenses associated with driving, transportation is the second largest expense for American households, after housing.¹¹ In 2020, the average American household spends more than \$4,500 on vehicle purchases, around \$1,500 on fuel and motor oil, and more than \$2,000 each on vehicle insurance and repairs.¹² That means each car owned by a household could cost up to \$8,000 a year.

Due to the high cost of owners, Americans are increasingly going into debt to purchase cars. More Americans have outstanding car loans than ever before and the amount owed by the average American is at an all time high -- increasing from \$2,960 in 2003 to \$4,520 in 2017.¹³

This is a problem familiar to many in the Northeast and Mid-Atlantic.

Figure 1: Auto Debt in the Northeast and Mid-Atlantic

State	Auto Debt per capita in 2017	Percent increase per capita from 2010-2017	% of 2017 total debt from autoloans
Connecticut	\$3,600	45%	6%
D.C	\$3,010	45%	4%
Delaware	\$4,750	49%	9%
Maine	\$4,330	52%	10%
Maryland	\$5,110	52%	7%
Massachusetts	\$3,810	56%	6%
New Hampshire	\$5,220	54%	10%
New Jersey	\$3,910	32%	7%
New York	\$3,560	36%	7%
North Carolina	\$4,910	54%	11%
Pennsylvania	\$4,000	47%	10%
Rhode Island	\$3,610	53%	7%
Vermont	\$4,860	50%	11%
Virginia	\$4,650	46%	7%
West Virginia	\$4,500	43%	16%
Sample Average	\$4,255	48%	9%
U.S Average	\$4,520	53%	9%

Figure 1: Auto debt in states throughout the Northeast and Mid Atlantic regions (Includes data from U.S PIRG Driving Into Debt Report published in 2019).¹⁴

This is not an accident. It is the result of a century of policy decisions that made us over-reliant on cars to get where we need to go.

Single occupancy vehicles dominate many suburban, rural and urban communities alike. A 2019 survey that found that 86% of commuters used their own vehicles daily. The next most common mode was public transit at about 10%.¹⁵ A survey conducted in 2021 confirmed the rarity of electric vehicles by reporting that only 7% of U.S adults say they own an electric vehicle or hybrid.¹⁶ The transportation system in America is still dominated by fossil fuel powered single occupancy vehicles.

Transit plays a critical role in our transportation network, but remains limited, often by a lack of adequate funding. Historically, federal and state transportation funding has been focused on road infrastructure.¹⁷

We started building highways in the 20th century to connect the country, but now, with so many cars on our roads, highway expansion is designed as a way to reduce congestion. But this has not been successful. Expanding a highway sets off a chain reaction of societal decisions that ultimately lead to the highway becoming congested again.¹⁸ Along with the lack of results from highway expansion, creating new highway projects has had a history of negatively affecting local communities.¹⁹ Suburban communities can become disrupted by highway projects which can cause a number of impacts including lower property values and increased levels of pollution.²⁰

As highway projects go on, many other transportation projects such as walking and biking infrastructure remain underfunded. In many areas there are limited safety precautions that help to support people who want to walk or bike on short commutes. Despite that, there has been some progress. According to a study conducted by People for Bikes, the number of protected bike lanes (bike lanes shielded by physical barriers to protect riders) in the United States has doubled every year since 2009.²¹ In addition, electric bikes that assist riders have become more popular and allow for riders to commute significantly longer distances with their bikes.²²

To limit negative public health and environmental effects as well as reduce the financial burden our transportation system has on residents, we need to rethink the way that we organize our transportation system. Investing in electric vehicle infrastructure is one way to transition away from fossil fuels, however we can also look to create a system that is less car centric which would help to tackle America's auto debt problem in addition to emissions related concerns.

| Transforming Transportation

A **CLEANER TRANSPORTATION SYSTEM** will require us to swap out fossil-fuel powered vehicles of all kinds with electric models. Building out charging infrastructure is critical to accelerating the adoption of electric vehicles because this will allow individuals to use these vehicles to travel longer distances without worrying about getting home before the battery dies. As of the beginning of 2022, electric vehicles can travel between 250 and 350 miles before needing to be recharged.²³ As that number increases and charging stations become more popular the transitioning to electric vehicles will become progressively easier.

But the cleanest car is the car not driven. So in addition to electrifying vehicles, we also need to make targeted investments that will give people more options, like public transportation, to avoid driving altogether. Doing so would significantly reduce the amount of fossil fuels consumed by our transportation system.²⁴ Increasing public transportation options would also give consumers the ability to save significant amounts of money. Buying, owning and maintaining a car is a significant expense for American households. We need to improve the range and frequency of public transportation, not only in urban areas, but also in suburban and rural ones where funding is limited.²⁵

We also need to ensure that people have the ability to safely walk and bike to local destinations. We need to invest in sidewalks, protected bike lanes and walking and biking trails. Creating infrastructure to support walkers and bikers allows for a transportation alternative that is cheap for pedestrians and produces significantly less pollution than other transportation methods.²⁶ Similarly to the case for public transportation, it is important to make investments in supportive infrastructure in all different geographic regions.



Drive Less, Live More

| Communities should invest in multi-use paths to encourage residents to get out of their cars and choose more sustainable and affordable forms of transportation.

Photo link:<https://unsplash.com/photos/WeXlsI0-cjU>

| How Do We Get There

BY REBUILDING OUR TRANSPORTATION SYSTEM to give more people the option to spend less time in a car, by expanding access to active means of travel such as walking and biking, and by adopting zero-emission electric cars and buses, we can make our transportation safer, healthier, cleaner and more efficient. Such a system would also financially benefit American consumers by making it easier to get around without having to drive. As noted above, if we make it easier to own one fewer car, each American household could save around \$8,000 a year.

But to do that, states in the U.S. need to have a plan that is designed to reduce transportation emissions and invest in healthier, more affordable options. While many states in the Northeast and Mid-Atlantic are pursuing paths toward vehicle electrification, most do not have an overarching plan that will make it easier for people to drive less.²⁷

The Transportation and Climate Initiative (TCI) could be an important part of that plan for the Northeast and Mid-Atlantic. A proposed regional “cap and invest” program on transportation fuels, TCI would work to reduce transportation-related emissions by 26% by 2032 and raise billions of dollars that could be spent building a system that makes it easier to spend less time in the car.²⁸

In addition to the climate benefits, according to a recent study by the T.H. Chan school of public health at Harvard University, under TCI, up to 1,360 American lives would be saved per year across the District of Columbia and the 12 Atlantic states participating in the program representing up to a \$13.5 billion health benefit annually.²⁹ The Harvard study considered the health impacts from three different implementation scenarios (Figure 2).

In addition to reducing traffic fatalities and air pollution, TCI is also expected to reduce the Northeast’s impact on climate change, leading to improved public health for the region. Implementing TCI could decrease the extreme temperatures, limit the damage sustained during extreme weather events (such as hurricanes, wildfires, floods etc.) and decrease rates of pollen in the air which have been projected to increase as we experience the effects of climate change.³⁰ In 2019, CO2 emissions accounted for 80% of U.S anthropogenic GHG emissions which cause the effects of global warming.³¹

As of 2019, the leading cause of greenhouse gas emissions in the United States was the transportation system, making up nearly one-third of the country’s total emissions.³²

It's clear that potential investments from TCI could lead to major advancements on the way to creating a cleaner, healthier and more efficient transportation system. Although implementing TCI would not immediately solve the problems plaguing our transportation system, it could be a crucial step in the right direction.

Recently, TCI has encountered a setback due to Governor Lamont from Connecticut, Governor Baker from Massachusetts and Governor Mckee from Rhode Island all announcing that they will no longer be pushing for the program to be implemented in their states in the immediate future.³³ Advocates for the program are hopeful that TCI will remain in the mind of legislators and will one day be implemented.³⁴ In the meantime many advocates are continuing to spread information about the Transportation and Climate Initiative, while also prompting their legislators to take immediate action to reduce carbon emissions and create a cleaner and healthier transportation system.³⁵ In the following sections, this report will give alternative policy options for states to consider that share similar overarching climate and public health goals as the Transportation and Climate Initiative.

Figure 2: Health Impacts of TCI Scenerios

	Scenario A	Scenario B	Scenario C	Scenario B	Scenario B
	25% CO₂ Reduction Cap	25% CO₂ Reduction Cap	25% CO₂ Reduction Cap	22% CO₂ Reduction Cap	20% CO₂ Reduction Cap
Total deaths avoided (biking, walking, and air quality)	1360	1160	840	640	320
Estimated monetized benefits of 8 health outcomes	\$13.5	\$11.6	\$8.3	\$6.3	\$3.3

Figure 2: Estimated health benefits for 5 different TCI investment scenarios in 2032 (Billions of USD 2016).³⁶

| Alternatives to TCI

AS PREVIOUSLY MENTIONED, the Transportation and Climate Initiative has experienced setbacks in a number of Northeastern states, leaving a sense of uncertainty around the program's future. Regardless of the program's fate, it is imperative that the Northeast finds ways to achieve the main goals of TCI which include reducing vehicular emissions to limit air pollution and slow the rate of climate change, find a sustainable source of funding for transportation related projects and increase access to affordable transportation options for all residents.³⁷

With the incoming federal funding from the Infrastructure Investment and Jobs Act it is incredibly important that legislators understand what policies can most effectively help create a safer, more equitable and more sustainable transportation system.³⁸

While an influx of funding can present an opportunity, if used incorrectly it can also become a detriment to creating a sustainable transportation system. As previously mentioned, one of the most common misconceptions around our transportation system is that the solution to traffic congestion problems is to expand or create new roads. This has been the primary way of thinking for decades and yet traffic congestion has only increased. Between 1980 and 2021 the nation has created more than 870,000 lane miles of highway and yet pre-COVID congestion was worse than it was in the early eighties.³⁹

Not only are these highway expansion projects ineffective at reducing congestion, they also lead to increased amounts of greenhouse gas emissions from our transportation sector by fueling an increase in the number of drivers on the road.⁴⁰ As a result, to avoid wasteful spending on harmful roadway expansion projects, it is imperative that legislators understand the types of investments that will best reduce greenhouse gas emissions, relieve congestion and support a safe and equitable transportation system for all Americans.

The following recommendations are meant to help states prioritize different investments and policy options that they can support in order to increase access to public transportation, increase rates of active mobility, promote vehicle electrification and repair roads and bridges all in an effort to transform our transportation system.



Policy Menu: Priority investments for sustainable transportation systems

We desperately need to transform our transportation system. Regardless of where we live, all Americans deserve healthier, cleaner and more affordable transportation options. To deliver these options, we need to make serious investments in public transportation, as well as walking and biking infrastructure. This document will provide suggestions of potential places to spend incoming funding to get the most benefit possible from our transportation system.



E-bikes are a great way to extend the range of bicycles to increase their capability as a form of transportation.

Public transportation Investments

1. Expanding service frequency on established routes: According to a report from the Congressional Research Service, increasing frequency of service is the best way to increase ridership.⁴¹
2. Expanding service locations: Thinking holistically about how to connect different areas and communities ensures that a transit system is regionally equitable and is accessible to a variety of locations.
3. Updating trains, buses and subways for safety and convenience purposes: Currently one in every ten American buses is considered to be in poor condition, making riders less comfortable and putting them at higher risk while riding public transit.⁴² Updating older train cars, buses and subway cars can reduce the likelihood of mechanical failures and make passengers safer.

4. Updating stations for safety and convenience: As is the case with public transportation vehicles, updating and beautifying stations can make these areas more accessible and attractive locations to board transportation systems.⁴³

Walking and Biking Infrastructure

5. Upkeeping/Upgrading sidewalks as well as multi-use paths: Creating new sidewalks and multi-use paths have been found to significantly increase the average time community members spend walking because of the added safety and convenience provided by additional infrastructure.⁴⁴
6. Upkeeping/ Upgrading bike lanes: According to a NACTO study, creating painted bike lanes or protected bike lanes increases bike ridership by 21% and 171%.⁴⁵ Of those consulted in the study, many people who do not currently bike said that they would be more inclined to do so if proper infrastructure was installed.



7. Installing traffic calming measures: Adding roadside trees, bollards and buffer strips has been identified as effective safety measures which give individuals confidence in walking and biking as forms of transportation.⁴⁶
8. Creating a bikeshare program: Creating bikeshare programs has been successful in increasing ridership in many cities.⁴⁷ These programs' ability to increase ridership has also been linked to the amount of biking infrastructure already in place.⁴⁸

Vehicle Electrification

9. Creating new charging stations in strategic locations: According to a survey conducted in 2020, 45% of Boston residents would consider purchasing an electric vehicle if they knew that they would have sufficient access to charging infrastructure.⁴⁹
10. EV incentives: States like California have begun to provide incentives beyond the federal tax credit like rebates, and assistance programs to help individuals afford electric vehicles.⁵⁰
11. Working with points of interest to install priority parking with charging stations: The US Department of Energy has acknowledged that creating charging stations at points of interest may significantly increase consumers' willingness to buy electric vehicles.⁵¹

12. Working to electrify municipal vehicle fleets: In many areas of the country, the majority of municipal vehicles are still powered by fossil fuels. A study conducted in Massachusetts has found that in rural areas municipal vehicles from the department of public works and the police department make up 85% of their municipalities fuel consumption, thus converting these vehicles to run on electricity would make a major impact on these area's total emissions outputs.⁵²
13. Adopting a mandate to transition to electric buses: Showing a commitment to electrification is one way communities can potentially increase their chances of winning competitive grant funding for transportation projects.⁵³

Repairing and Upgrading Existing Roads

14. Repairing Existing roads and bridges: 173,000 miles of roads and more than 45,000 bridges in the U.S are classified as being in "poor" condition.⁵⁴ As of 2017, 11 states had at least 30% of their roads in poor condition.⁵⁵
15. Creating requirements for states to use a certain percentage of highway funding for repairing roads: Setting measurable goals for repairing roads will increase the state's accountability and limit the creation of new highway boondoggles.⁵⁶

| Conclusion

TRANSPORTATION IN THE UNITED STATES IS BROKEN. In the Northeast and Mid-Atlantic, the Transportation and Climate Initiative paired with other complementary policies could help reduce the amount of greenhouse gas that our transportation system produces and take us one step closer to creating a more sustainable and efficient system. For the rest of the country, it could serve as a promising model.

TCI could save nearly \$10 billion in public health costs each year as a result of 1,000 fewer premature deaths from air pollution and transportation related injuries, along with preventing over 1,300 asthma attacks per year and 1,700 fewer traffic related injuries.⁵⁷ The program would also create a net savings of \$4.85 billion for consumers resulting from a healthier, cleaner, more efficient transportation system.⁵⁸

States who choose to implement the TCI program would be taking a leadership role on climate issues. Not only would states be reducing dangerous air pollution, but they would also reap the environmental benefits that come from lowering climate-harming emissions. Global climate change is the greatest challenge of our generation. Decision makers must take bold action and reduce the country's negative impact on the climate now.

The United States must transition away from single occupancy fossil-fuel powered vehicles as a primary form of transportation. TCI is a well designed program that would provide the public with a variety of environmental, economic and health benefits.

While implementing the TCI program remains a pivotal step in achieving significant emissions reductions and generating consistent revenue for transportation projects, there are a variety of short term actions such as those outlined in this report, that states can take to immediately start reducing emissions.

All states should find ways to take immediate action on climate issues while also considering the Transportation and Climate Initiative as well as other programs that can provide significant long term impacts on their transportation systems. While TCI remains paused, states should take the chance to use the once in a lifetime opportunity presented to them by using the federal funding coming from the Infrastructure Investments and Jobs Act to invest in public transportation, vehicle electrification, active mobility infrastructure and the repair of roads and bridges. The previously stated recommendations are meant to serve as a starting point for legislators to begin thinking about how to prioritize investments that will create a more sustainable, equitable and affordable transportation system in the near future.

| Endnotes

1. U.S Bureau of Labor Statistics, All Consumer Units: Annual Detailed Expenditure Means, Standard Errors, Coefficients of Variation, and Weekly or Quarterly Percents Reporting, Consumer Expenditure Surveys, 2020 (page 41) (Yearly costs of owning a car include gas, financing, maintenance, tires, parts, oil changes, repair, parking, insurance and other vehicular expenses).
2. Matt Casale, R.J Cross, Tony Duttzik and Ed Mierzwinski, U.S PIRG, *Driving Into Debt: The Hidden Costs of Risky Auto Loans to Consumers and Our Communities*, 2019.
3. EPA, *Sources of Greenhouse Gas Emissions*, accessed at <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions,2021>,<https://web.archive.org/web/20220401152930/https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.
4. EPA, *Fast Facts on Transportation Greenhouse Gas Emissions*, accessed at <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>, 2021, <https://web.archive.org/web/20220401153706/https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>.
5. Sharon Udasin, “Cutting Air Pollution Levels Could Raise Life Expectancy by 2 Years: Study,” The Hill, 1 September 2021.
6. Air Quality Life Index, *Pollution Facts*, accessed at <https://aqli.epic.uchicago.edu/pollution-facts/>, 2021, <https://web.archive.org/web/20220401160129/https://aqli.epic.uchicago.edu/pollution-facts/>.
7. Transportation and Climate Initiative , *TCI*, accessed at <https://www.transportationandclimate.org/>, 2022. <https://web.archive.org/web/20220404132259/https://www.transportationandclimate.org/>.
8. Amy Sokolow, “Charlie Baker drops out of TCI, admitting initiative ‘no longer best solution’ for state,” Boston Herald, 18 November 2021.
9. Bankrate, *Car Ownership Stats*, accessed at <https://www.bankrate.com/insurance/car/car-ownership-statistics/#:~:text=There%20are%20276%20million%20vehicles,secure%20experience%20than%20public%20transportation,2022>. <https://web.archive.org/web/20220404134743/https://www.bankrate.com/insurance/car/car-ownership-statistics/>.
10. Brian McKenzie, American Community Survey Reports, *Who Drives to Work? Commuting by Automobile in the United States:2013*, 2015.
11. See note 1.
12. See note 1.
13. See note 2.
14. See note 2.
15. Statista, *Cars Still Dominate the American Commute*, accessed at <https://www.statista.com/chart/18208/means-of-transportation-used-by-us-commuters/>, 2022. <https://web.archive.org/web/20220404141314/https://www.statista.com/chart/18208/means-of-transportation-used-by-us-commuters/>.
16. Drew Desilver, Pew Research Center, *Today’s Electric Vehicle Market: Slow Growth in U.S., Faster in China, Europe*, 2021.
17. Matthew Casale, Bryn Huxley-Reicher, John Stout and Gideon Weissman, U.S PIRG, *Highway Boondoggles 6: Big projects. Bigger price tags. Limited benefit*, 2020.
18. Ibid.
19. Suzanne Gamboa, Josh Lederman, Phil McCausland and Ben Popken, “Bulldozed and bisected: Highway construction built a legacy of inequality,” NBC News, 18 June 2021.
20. Shelley Little, “How Modern Transit and Highways Affect Property Values,” MyMove, 25 September 2020.

21. Saris Infrastructure, Protected Bike Lanes Ride Wave of Popularity, accessed at <https://www.sarisinfrastructure.com/post/blog-protected-bike-lanes-ride-wave-of-popularity>, 2021. <https://web.archive.org/save/https://www.sarisinfrastructure.com/post/blog-protected-bike-lanes-ride-wave-of-popularity>.
22. Larry Olmsted, “E-bikes Are the Hottest Thing on 2-Wheels: Here’s Why You Might Want One,” *Forbes*, 9 July 2020.
23. UC Davis, *Plug-in Hybrid and Electric Vehicle Research Center*, accessed at <https://phev.ucdavis.edu/about/faq-phev/>, 2022. <https://web.archive.org/web/20220328045230/https://phev.ucdavis.edu/about/faq-phev/>.
24. American Public Transportation Association, “The Benefits of Public Transportation,” 2008.
25. “Building Better Public Transit in Rural America,” *Via Transportation*, 23 October 2020.
26. Nancy Dosdall and Heather Kienitz, “Why Your Community Should Invest in Bicycle and Pedestrian Infrastructure,” Short Elliott Hendrickson inc., 2022.
27. David Brooks, “New England Grid Expects 1 Million Electric Vehicles, 1 Million Electric Heat Pumps by 2030,” *Concord Monitor*, 11 May 2021.
28. Transportation and Climate Initiative, *TCI-P Modeling Summary*, March 2021.
29. Harvard Chan C-Change, *TRECH Project Research Update on Health Benefits of TCI Policy Scenarios*, 25 February 2021.
30. Center For Disease Control and Prevention, *Climate Effects on Health*, accessed at <https://www.cdc.gov/climateandhealth/effects/default.htm>, 2022. <https://web.archive.org/web/20220404154251/https://www.cdc.gov/climateandhealth/effects/default.htm>.
31. U.S. Energy Information Administration, *Energy and the Environment Explained*, accessed at <https://www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php>, 2021. <https://web.archive.org/web/20220404161049/https://www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php>.
32. See note 3.
33. Benjamin Storrow, “Northeast States Abandon Cap-and-Trade Plan for Cars,” *E&E News*, 22 November 2021,
34. TCI Coalition, “Advocates Call on Lamont, CT Lawmakers To Keep Their Commitments on TCI,” *Save the Sound*, 23 November 2021.
35. Joshua Ostroff, “Statement on Massachusetts Withdrawal From TCI,” *Transportation for Massachusetts*, 18 November 2021.
35. Joshua Ostroff, “Statement on Massachusetts Withdrawal From TCI,” *Transportation for Massachusetts*, 18 November 2021.
36. See note 29
37. Transportation and Climate Initiative, *Memorandum of Understanding*, accessed at <https://www.transportationandclimate.org/sites/default/files/TCI%20MOU%2012.2020.pdf>. 2020.
38. Congress.Gov, *H.R. 3684 Infrastructure Investment and Job Act*, accessed at <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>, 2021. <https://web.archive.org/web/20220404163516/https://www.congress.gov/bill/117th-congress/house-bill/3684/text>.
39. See note 17.
40. See note 17.
41. William Mallett, Congressional Research Service, *Trends In Public Transportation Ridership: Implications for Federal Policy*, 2018.
42. Paul Skoutelas, “Neglecting Aging Public Transportation Hurts Our Economy,” *American Public Transportation Association*.
43. “5 Creative Strategies to Increase Public Transportation Ridership,” *National Express Transit*, 26 March 2018.
44. L.D Gunn, Y. Lee, E. Geelhoed, A. Shiell and B.Giles-Corti, *The Cost-Effectiveness of Installing Sidewalks to Increase Levels of Transport-Walking and Health*, 2014.

45. Alexander Engel, “High-Quality Bike Facilities Increase Ridership and Make Biking Safer,” National Association of City Transportation Officials, 20 July 2016.
46. Byoung-Suk Kweon, Jody Rosenblatt-Naderi, Christopher Ellis, Woo-Hwa Shin and Blair Danies, *The Effects of Pedestrian Environments on Walking Behaviors and Perception of Pedestrian Society*, 2021.
47. Leon Kaye, “With a Track Record of Success, Bike Share Programs Should Bounce Back Soon,” Triple Pundit, 2 June 2020.
48. National Association of City Transportation Officials, *Equitable Bike Share Means Building Better Places for People to Ride*, accessed at <https://nacto.org/equitable-bike-share-means-building-better-places-for-people-to-ride/>, 2021.<https://web.archive.org/web/20220404180550/https://nacto.org/equitable-bike-share-means-building-better-places-for-people-to-ride/>
49. City of Boston, *How-To Guide: Electric Vehicle Charger Installation*, 2021.
50. California Clean Vehicle Rebate Project, Air District and Utility EV Rebates, accessed at <https://cleanvehiclerebate.org/en/additional-rebates>, 2021.
<https://web.archive.org/web/20220404181408/https://cleanvehiclerebate.org/en/additional-rebates>.
51. U.S Department of Energy, *Alternative Fuels Data Center*, accessed at https://afdc.energy.gov/fuels/electricity_infrastructure.html, 2022.https://web.archive.org/web/20220403003047/https://afdc.energy.gov/fuels/electricity_infrastructure.html.
52. UMass Amherst, *Fuel Efficient Municipal Vehicles: 2019 Buyers Guide*, 2019.
53. U.S Department of Transportation, The INFRA Grant Program, accessed at <https://www.transportation.gov/grants/infra-grants-program>, 2022.<https://web.archive.org/web/20220404185808/https://www.transportation.gov/grants/infra-grants-program>.
54. James Horrox and John Stout, Frontier Group, *Fix It First: Focus Transportation Infrastructure Spending Where it's Needed*, 12 April 2021.
55. Ibid
56. See note 17.
57. Transportation for Massachusetts, *The Transportation and Climate Initiative*, Explained, 17 December 2019, https://web.archive.org/save/https://www.t4ma.org/tci_explained.
58. Ibid