



The Research Bureau

# ON TRACK FOR ZERO EMISSIONS?

Adoption of Electric Vehicles in  
Worcester County Since 2021

REPORT 26 - 12

September 2026





## EXECUTIVE SUMMARY

This report is a close analysis of electric vehicle (EV) adoption within Worcester County's sixty municipalities.

In 2025, according to the International Energy Agency, 25% of all vehicles sold worldwide were either battery electric or plug-in hybrids. In Worcester County, **the number of battery electric and plug-in hybrid registrations (together, "zero-emissions vehicles" as defined by the Massachusetts Vehicle Census, or MVC) grew from 0.44% of all vehicles in January 2021 to 2.21% of all vehicles in January 2026.** While the number of registered zero-emissions vehicles remains low in Worcester County, it is growing.

### A STATEWIDE ANALYSIS

The first part of this report, **pages 5-7**, puts Worcester County in context with the rest of the state. When adjusted for population, Worcester County ranked ninth of fourteen counties in terms of zero-emissions vehicle miles traveled in 2025.

Map 2, on **page 7**, shows where **internal combustion engine vehicles (ICEV), hybrid, and zero-emissions vehicles** are located across Worcester County.

### A MUNICIPAL ANALYSIS

**Pages 8-10** examine zero-emission vehicle adoption on a municipal basis. The analysis focuses on vehicle miles traveled (VMT). In 2025, more than 10% of the community of Harvard's vehicle miles traveled came from zero-emissions vehicles, the highest share among Worcester County's sixty municipalities. Indeed, this analysis shows that the share of VMT from zero-emission vehicles is much higher in the eastern third of the County. The western third of the County has much lower percentages.

The number of ICEV registered in Worcester County on January 1, 2021 and on January 1, 2026 decreased by 1,044, but hybrid and zero-emissions vehicles saw increases of 20,896 and 12,417, respectively. **While the number of overall vehicles registered in the County has increased, it has been driven by non-ICEV.** Shrewsbury saw a notable shift: hybrid and zero-emissions vehicles grew by 1,471 and 1,387, respectively, but ICEV decreased by 1,821!

Worcester County municipalities see zero-emissions vehicles being driven nearly 10 miles more a day than ICEV.

### UNDERSTANDING OWNERSHIP

Starting on **page 11**, The Research Bureau looked at zero-emissions VMT at the census tract level, finding, again, that census tracts from Harvard to Grafton, and east from there, tend to have higher share of VMT from zero-emissions vehicles. Using Census Bureau demographic data (**pages**

**12-15**), **The Research Bureau found that tracts with a higher percentage of Bachelor's Degrees, residents working from home, and higher median household incomes tend to have higher percentages of zero-emissions VMT.**

This finding is confirmed in the academic literature, which generally finds that consumers with higher incomes have easier access to EVs. While the factors in this analysis cannot be examined in a vacuum, as they are all related, they do provide a start for understanding barriers to adoption.

Acquiring an EV can be expensive, as data on **page 15** shows. According to Kelley Blue Book, in December 2025 the average new car was \$50,326 but the average EV was more, at \$58,034. There have been some attempts to mitigate that cost, such as the financial incentive provided by the "Massachusetts Offers Rebates on Electric Vehicles" program (MOR-EV), described on **pages 15 and 16**. Since 2023, Harvard residents have received more than \$571,000 in rebates, or \$81 per person.

Charging is another barrier to EV adoption (**pages 17 to 19**). Unlike ICEV, EVs can be charged at home. However, this leaves many renters, including affluent ones, relying on public chargers. Although there are more than 1,000 charging ports in Worcester County, 78% of them are Level 2, which can take 4-10 hours to charge to 80% depending on battery size; and many are available only to employees, students, or visitors to the institutions where they are located. Gas stations, on the other hand, can move dozens if not hundreds of vehicles through an hour. As charging infrastructure becomes more ubiquitous this will become less of a barrier, but it will remain a serious consideration even among the most interested buyers until then.

### RECOMMENDATIONS

Although cheaper EVs will help encourage purchases, at a state and municipal level we need a concerted effort to supercharge infrastructure to increase adoption.

- The Commonwealth **must commit to spending on EV charging stations** across the state's highways, including money that has already been granted.
- The **density of fully public charging stations locally must increase**, including more DC fast chargers.
- Getting **municipal feedback on where to put chargers, especially curb-side, is crucial**, and we must encourage all municipalities to do so.
- Municipalities should **offer zoning incentives** to encourage EV charging infrastructure construction.



## INTRODUCTION

Every day, many of our personal vehicles burn fossil fuels, emitting *greenhouse gases (GHG)* everywhere we go. In 2024, nearly 39% of carbon dioxide emissions in the United States came from the transportation sector; fifty-six percent of it due directly to motor gasoline. Massachusetts is not far behind – almost 38% of its gross GHG emissions in 2022 came from transportation sources.

Not every vehicle emits GHG directly. *Battery electric vehicles (BEVs)*, operating on stored electricity, emit none. Globally, electric vehicles have substantially increased their market share. According to the International Energy Agency, in 2025, **25% of all vehicles sold worldwide were either battery electric or plug-in hybrids** (International Energy Agency, 2026, p. 16). In the United States, between 2020 and 2025, the share of these *electric vehicles (EVs)* grew from 2% of sales to 10% (2026, 18).

There has been growth in the registration of new electric vehicles in Massachusetts. According to the *Massachusetts Vehicle Census (MVC)*, **average registrations for new electric vehicles statewide grew from 2.3% in 2020 to 8.8% in 2025. Brand new vehicles with only internal combustion engines averaged 93.8% of registrations in 2020, but only 69.3% in 2025.**<sup>1</sup> The 2020s have seen significant strides in the adoption of electric over internal combustion engine vehicles.

This report focuses on zero-emission vehicle adoption in Worcester County since 2022, which is defined by the Massachusetts Vehicle Census as battery electric vehicles, plug-in hybrids, and fuel cell electric vehicles. This includes registrations, miles traveled, and more across the county's sixty municipalities. It asks where those vehicles are most likely to be located – which was ultimately affluent communities in the eastern part of the county – and whether appropriate charging infrastructure exists to support them.

The widespread adoption of electric vehicles is crucial for Massachusetts' climate goals as set out in the 2021 law, An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy. To promote adoption, Massachusetts offers a substantial financial incentive, the "Massachusetts Offers Rebates for Electric Vehicles" program (MOR-EV). This report also examines the distribution of those rebates across the County.

The switch from internal combustion engines to electric-powered vehicles is necessary for reducing existing greenhouse gas emissions, but it should not be forgotten that electric vehicles are still just that – **vehicles, prone to user error**. While this report is focused on their essential adoption, **it is imperative that readers do not lose sight**

**of the importance of alternative modes of transportation:** micromobility options like walking or biking and public transportation such as the Worcester and Montachusett Regional Transit Authorities and the Massachusetts Bay Transportation Authority. **Nor should we abandon street safety, Vision Zero, or efforts at reducing minimum parking requirements as we make this transition.** The Research Bureau has written extensively on all of these issues, including on [public transit](#), [parking](#), and [pedestrian safety](#).

While EVs have been widely available since the mid-2000s, consumer adoption remains low, despite the fact that Massachusetts was among the top 10 states for EV adoption in 2024 (U.S. Energy Information Administration, 2026). In the following pages, this report will show readers just how far Worcester County is from a complete switch over to electric vehicles. Speed bumps, such as an anemic charging infrastructure outside of its large population centers and the high cost of electric vehicles in general, remain in front of that transition. Ultimately, however, the right investments, incentives, and education should aid in spreading adoption outside of the most affluent communities.

### **Commonly Used Terms and Acronyms in this Report**

**ICEV:** Internal Combustion Engine Vehicle

**EV:** Electric Vehicle (a catch all term for battery electric vehicles and plug-in hybrids)

**BEV:** Battery-Electric Vehicle

**PHEV:** Plug-in Hybrid Vehicle (these are internal combustion engine vehicles that can also be charged to travel short distances on battery power)

**VMT:** Vehicle Miles Traveled (a measure of total miles traveled by vehicles in a community)

**MVC:** Massachusetts Vehicle Census (a statewide dashboard of registered vehicles)

**NHTS:** National Household Travel Survey (data from the Federal Highway Administration, billed as the authoritative source on the travel behavior of Americans)

**Zero-Emissions:** This is the catch-all term used in the Massachusetts Vehicle Census to refer to BEV, PHEV, and hydrogen fuel cell vehicles (there are very few in that last category).



In 2021, the Massachusetts General Court passed An Act Creating a Next-Generation Roadmap For Massachusetts Climate Policy (Chapter 8 of the Acts of 2021). The Act instructs the Secretary of the Executive Office of Energy and Environmental Affairs to adopt new **greenhouse gas (GHG)** emissions limits every five years, leading to a “2050 statewide emissions limit that achieves at least net zero statewide greenhouse gas emissions; provided, however, that in no event shall the level of emissions in 2050 be higher than a level 85 percent below the 1990 level” (Mass. Gen. Laws Ch. 21N, § 3b). In other words: the Commonwealth required itself to reach net zero while reducing remaining emissions to 85% below what they were in 1990. “Net zero” refers to sequestering or recapturing the same amount of released GHG emissions. This ultimately led to the creation of the Clean Energy and Climate Plan for 2050 (hereafter referred to as the 2050 Climate Plan) (2022).

Transportation is one of the largest sources of GHG. According to the U.S. Energy Information Administration, the transportation sector accounts for one-third of Massachusetts’ total energy use (U.S. Energy Information Administration, 2026). In 2022, transportation accounted for 38% of statewide gross GHG, with buildings (residential and commercial) emitting the second highest at 36% (Executive Office of Energy and Environmental Affairs, 2025).

Carbon dioxide (CO<sub>2</sub>) is not the only greenhouse gas, but in the United States, transportation accounted for nearly 39% of its emissions in 2024; its largest source was motor gasoline (56%), followed distantly by diesel (23.7%) (U.S. Energy Information Administration, 2025). Notably, over the last 20 years motor gasoline-related emissions have declined slightly despite more vehicle miles traveled nationally, thanks to “higher vehicle fuel economy standards and, to a lesser extent, increased deployment of electric vehicles” (2025).

The 2050 Climate Plan sets sector limits for each major source of GHG emissions, ensuring that reductions do not fall entirely in one sector. Reductions in the transportation sector would materially alter the Commonwealth’s overall emissions profile. Because **battery electric vehicles (BEVs)** do not produce any GHG emissions of their own, the plan anticipates them playing a key role in reducing overall transportation emissions.<sup>2</sup> **Table 1** shows the strategies to achieve a reduction of 86% of 1990 baseline emissions from this sector.

The plan requires making public transit, biking, and walking more viable forms of transit throughout the state, of course, but one of its central strategies is accelerated EV adoption. In the 2050 Climate Plan “the primary strategy to achieve deep decarbonization of the transportation sector is to make sure that the vehicles that are driving those miles are being powered by clean energy” (Clean Energy and Climate Plan for 2050, 2022, p. 50).

Thanks to the **Massachusetts Vehicle Census (MVC)**, we can measure the number and **vehicle miles traveled (VMT)** of zero-emission vehicles in municipalities across the Commonwealth. The Vehicle Census, the main data source for this report, uses annual inspection data to track type, use, fuel class, age, and mileage data of every vehicle registered in the Commonwealth. In 2025, vehicles registered in Massachusetts traveled **more than 57 billion miles, or nearly 8,000 miles per person**, and undoubtedly visitors to the state added many more. Of that 57 billion, about **1.8 billion was driven by zero-emission passenger vehicles** (which the MVC defines as **battery electric vehicles (BEV)**, **plug-in hybrid vehicles (PHEV)**, and fuel cell electric vehicles)<sup>3</sup> with an additional **41.6 million by zero-emission commercial vehicles**; in total, zero-emission vehicles accounted for **slightly more than 3% of all miles traveled** by vehicles registered in Massachusetts.

**Table 1: Transportation Sector Sublimits**

| Residual Emissions Subcategory     | Residual Emissions in 2050 (MMTCO <sub>2</sub> e) | Benchmarks to Enable Emissions Reductions |                                                                              |
|------------------------------------|---------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------|
| Light-Duty Vehicle Fuel Use        | <0.1                                              | # EVs                                     | ~5 million light-duty EVs                                                    |
|                                    |                                                   | % EVs                                     | 97% of all light-duty vehicles                                               |
|                                    |                                                   | VMT                                       | Reduce VMT per household to ~19,400 miles/year                               |
| Medium/Heavy Duty Vehicle Fuel Use | <0.1                                              | # EVs                                     | ~353,000 medium and heavy-duty EVs (battery electric and hydrogen fuel cell) |
|                                    |                                                   | %EVs                                      | 93% of all medium- and heavy-duty vehicles                                   |
|                                    |                                                   | Alternative Fuel Use                      | Diesel emission intensity down to 1 kg/mmBtu from 74 kg/mmBtu                |
| Marine and Aviation Fuel Use       | 4.1                                               | Alternative Fuel Use                      | Emission intensity down to 60 kg/mmBtu from 70 kg/mmBtu                      |

Source: *Clean Energy and Climate Plan for 2050*, p. 22 (2022). The 1990 baseline in transportation was 29.6 million metric tons of CO<sub>2</sub> equivalent (MMTCO<sub>2</sub>e); it was 23.7 in 2020. The 2050 plan calls for a reduction to 4.1—the majority of which would be from marine and aviation fuels.



## THE STATE OF WORCESTER COUNTY'S ZERO-EMISSIONS ADOPTION

In this report, data about vehicle miles traveled comes from the MVC's "annual" datasets. These datasets do not include vehicle counts. Those come from quarterly "snapshot" datasets, which provide point-in-time counts of vehicles registered on January 1, April 1, July 1, and October 1, due to seasonality differences in the number of registrations. Unless otherwise stated, VMT and vehicle counts from all sources includes all types (passenger, bus, etc.) and weights (light, medium, and heavy duty) of vehicles.

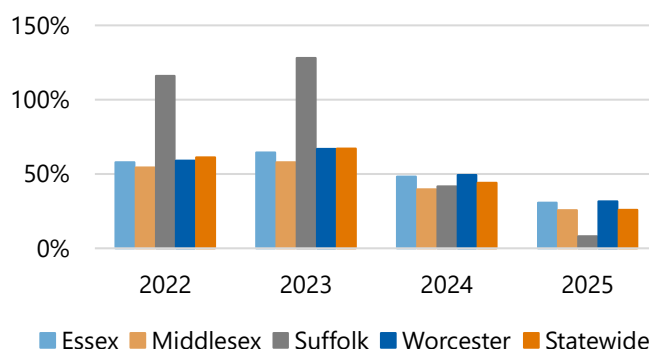
Worcester County is the second most populous county in Massachusetts. In terms of overall vehicle miles traveled, Worcester County ranked **second** in 2025, and **third** in terms of zero-emissions VMT among all fourteen of Massachusetts' counties. However, when accounting for population, Worcester County ranks **sixth** in total VMT per person, and **ninth** in terms of total zero-emissions VMT per person (Dukes County, which is largely Martha's Vineyard, ranked first in both categories). About 2.4% of all of Worcester County's 2025 VMT was due to zero-emissions VMT; in 2022, that number was 0.8% (statewide, it was 1.14%). **It is preferable for higher VMT to consist of a larger percentage of zero-emission miles.** The following map shows the breakdown by county in terms of zero-emissions VMT per person in 2025.

In ranking third in total zero-emissions VMT, Worcester County contributes about 10.8% of all vehicle miles traveled for zero-emissions vehicles in Massachusetts. Norfolk County contributes slightly more at 13.61% of the state

total, while Middlesex County contributes by far the most at 31.95%. Worcester County contributes 14.45% of the state's total VMT, while Norfolk and Middlesex contribute 10.1% and 21.05% respectively.

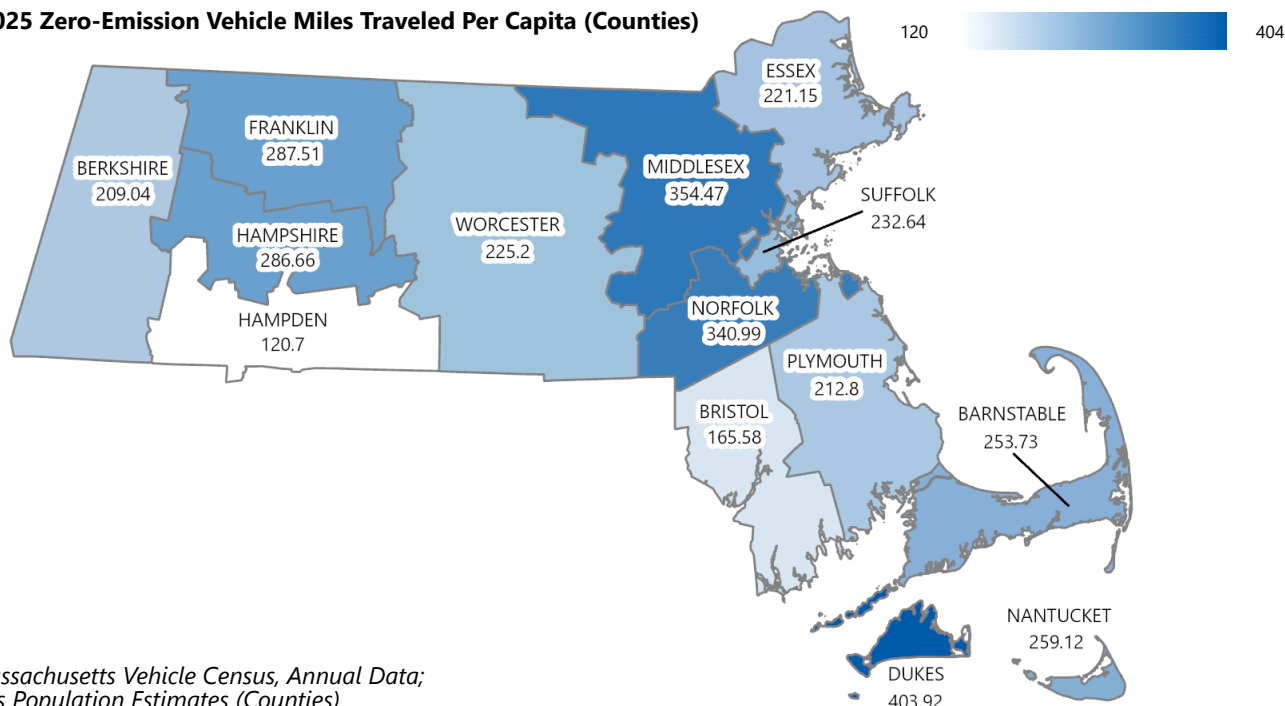
Between 2022 and 2025, zero-emissions VMT in Worcester County grew by 228.6%. **Figure 1** shows the percent change (from the year before) in zero-emissions VMT of the top four most populous counties in Massachusetts, as well as the statewide total.

**Figure 1: Percent Change from the Year Before in Total Zero-Emissions VMT, Top Four Most Populous Counties**



Source: Massachusetts Vehicle Census, Annual Data

**Map 1: 2025 Zero-Emission Vehicle Miles Traveled Per Capita (Counties)**



Source: Massachusetts Vehicle Census, Annual Data;  
U.S. Census Population Estimates (Counties)

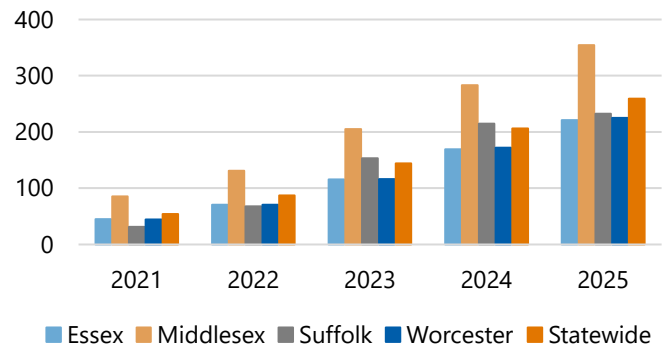


The amount of zero-emissions VMT per capita has also grown. Worcester County saw a 220.44% growth in zero-emissions VMT per capita between 2022 and 2025. Statewide, it was 198.12%. **Figure 2** shows the zero-emissions VMT per capita for the top four most populous counties in Massachusetts, as well as the statewide total.

These gains in zero-emissions VMT were not matched by losses elsewhere. Statewide, VMT of all vehicle fuel classes increased between 2022 and 2025. In Hampshire, Middlesex, and Norfolk Counties, the number of *internal combustion engine (ICEV)* miles traveled decreased between 2022 and 2025, while everywhere else it increased. Per person, however, ICEV miles traveled decreased in Middlesex, Norfolk, and Suffolk Counties – and even statewide. So, although the total number of miles by all ICEV increased, **per person the number of miles traveled by ICEV statewide actually decreased.** **Table 2** shows the percent change in VMT across different fuel classes for all of Massachusetts' counties, as well as the percent change in per person VMT (to better compare counties of different population sizes).

Worcester County and the state are a long way from the 2050 goal of 97% of registered light-duty vehicles being zero-emission. **While zero-emissions vehicles contributed 2.4% of total VMT in Worcester County in 2025 and hybrid vehicles contributed 5.4%, conventional ICEV contributed 92.2% of the total** – a decrease from the 96.4% of 2022, to be sure, but still by far the most significant part of the transportation sector.

**Figure 2: Zero-Emissions VMT Per Capita, Top Four Most Populous Counties**



Source: Massachusetts Vehicle Census

Thanks to the Massachusetts Vehicle Census quarterly snapshot data, we can visualize where hybrid, ICEV, and zero-emission vehicles are located throughout Worcester County. **Map 2** on the following page uses dots to represent vehicle registrations on April 1, 2026 – each dot represents ten vehicles. We can see on the map where vehicles are located generally, as well as the heaviest concentrations of hybrid and zero-emission vehicles.

Of course, Worcester County consists of 60 municipalities, and not every municipality has the same rate of adoption. Indeed, the heaviest adoption of zero-emission vehicles has been in the eastern part of the County. The next section will examine this adoption more closely.

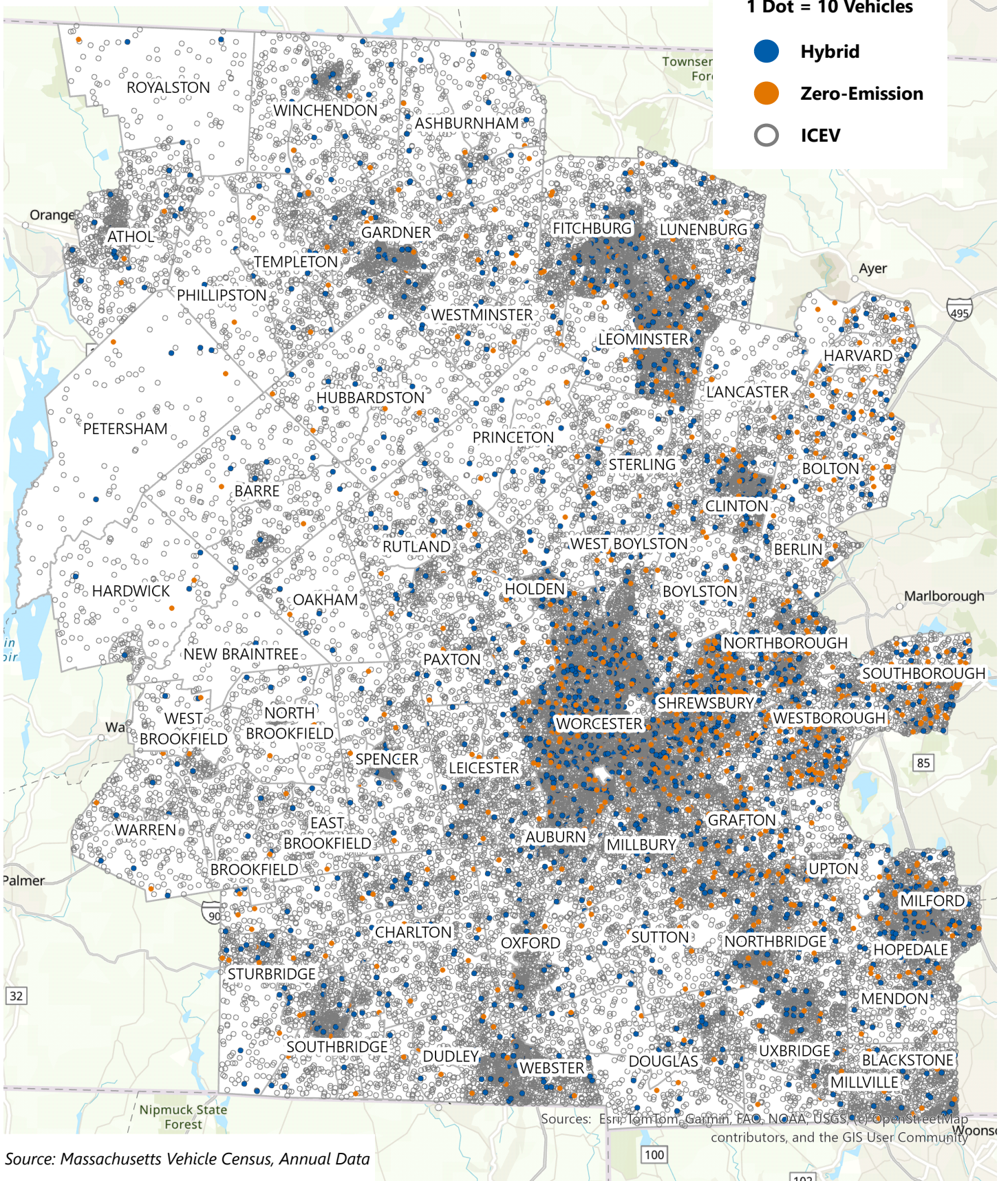
**Table 2: Percent Change, 2022 to 2025, Massachusetts Counties**

| County     | Hybrid VMT | Not Advanced (ICEV) VMT | Zero-Emissions VMT |
|------------|------------|-------------------------|--------------------|
| Barnstable | 95.34%     | 2.88%                   | 199.11%            |
| Berkshire  | 104.66%    | 2.13%                   | 170.68%            |
| Bristol    | 108.38%    | 4.32%                   | 264.71%            |
| Dukes      | 102.65%    | 7.37%                   | 170.40%            |
| Essex      | 131.95%    | 2.95%                   | 219.04%            |
| Franklin   | 53.22%     | 0.50%                   | 112.56%            |
| Hampden    | 122.44%    | 2.48%                   | 211.27%            |
| Hampshire  | 65.18%     | -0.09%                  | 136.57%            |
| Middlesex  | 101.32%    | -0.85%                  | 177.35%            |
| Nantucket  | 118.07%    | 5.39%                   | 288.77%            |
| Norfolk    | 122.40%    | -1.64%                  | 219.66%            |
| Plymouth   | 128.69%    | 3.66%                   | 249.03%            |
| Suffolk    | 107.96%    | 0.73%                   | 249.83%            |
| Worcester  | 114.22%    | 5.02%                   | 228.60%            |
| Statewide  | 108.14%    | 1.43%                   | 203.57%            |

Source: Massachusetts Vehicle Census, Annual Data



**Map 2: Registered Vehicles by Fuel Class, Per Block Group (4/1/2026)**



## ZERO-EMISSION VEHICLES - WORCESTER COUNTY MUNICIPALITIES

Adoption of zero-emission vehicles varies widely across the county. However, one pattern is clear: communities in the eastern half of the county tend to have more miles attributed to zero-emission vehicles than those in the western half.

Because VMT counts miles traveled by all registered vehicles, communities with more residents and registered vehicles generally record higher total VMT. Vehicles registered in Worcester, for example, drove 1.415 billion miles in 2025; New Braintree, the smallest community, had 12.4 million miles. Comparing these values requires adjusting them on a per capita (or per-person) basis. In that case, Worcester had 6,620.5 VMT per person but New Braintree had 12,238.31. **Map 3** visualizes this adjustment.

The county-wide median VMT per person for all vehicle fuel classes was 10,983 and an average of 10,686. In general, VMT per person decreases in communities where there is access to nearby employment, public transportation, and density that shortens distances. Between 2022 and 2025, VMT per person increased in Worcester County's 60 municipalities by 834 miles, with the largest increase in Phillipston (2,312) and the smallest in New Braintree (149).

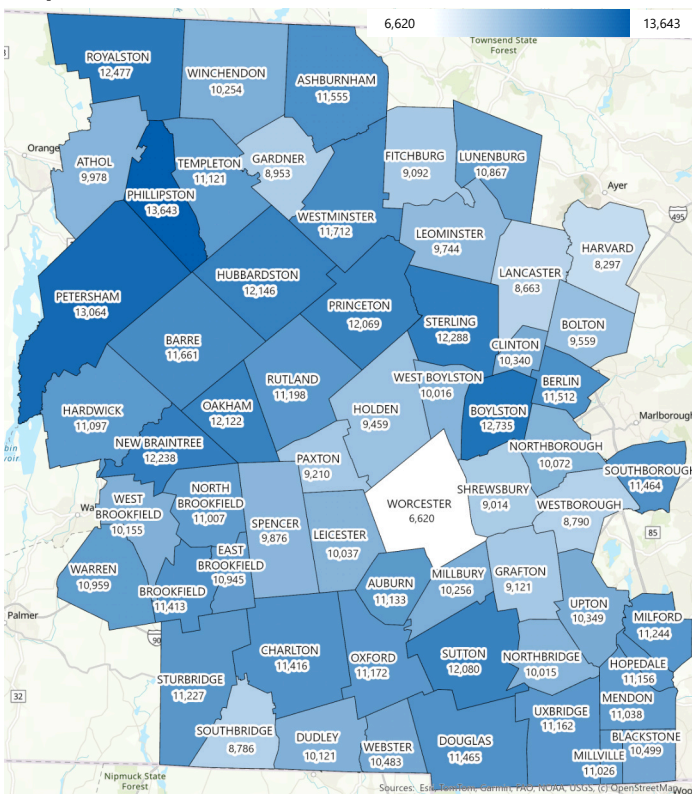
Zero-emission vehicles made up a small percentage of total VMT, no matter the community. **Map 4** shows the zero-emission vehicle percentage share of VMT in 2025. In general, **communities on the central-eastern third of Worcester County tended to have a greater share of VMT from zero-emissions vehicles than communities in the other two-thirds of the county. Harvard had the most, with 10.2% of its VMT from zero-emissions vehicles, while Athol, on the opposite side of the county, saw 0.76% of its VMT created in the same way.**

Still, between 2022 and 2025 the total number of zero-emissions miles did increase. While miles increased for every fuel class category, in nearly every community, zero-emissions VMT had a higher rate of growth than hybrid or ICEV. Six municipalities, or 10%, saw their ICEV miles traveled **decrease** between 2022 and 2025 – Bolton, Harvard, New Braintree, Shrewsbury, Southborough, and Westborough.

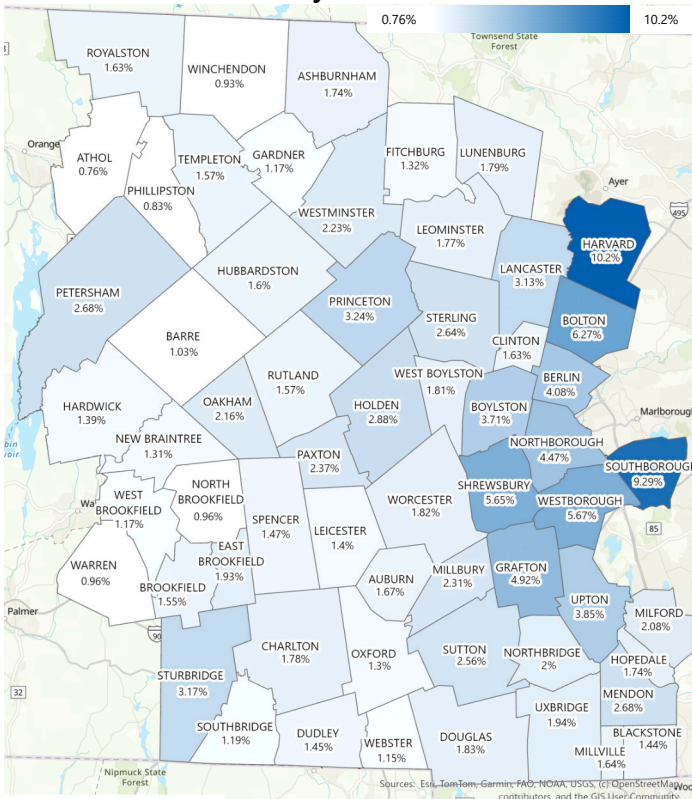
### WHO IS DRIVING MORE?

Residents are driving more in all of Worcester County's communities. The Massachusetts Vehicle Census also provides quarterly snapshots of the number of vehicles registered on a specific day, as well as an estimate of the number of miles driven that day by those vehicles. The quarterly snapshots account for seasonality among some types of vehicles (like motorcycles, which may see their registrations lapse in the wintertime).

**Map 3: 2025 Vehicle Miles Traveled Per Person, All Vehicles**



**Map 4: 2025 Percent of Total Vehicle Miles Traveled, Zero-Emission Vehicles Only**



Source: Massachusetts Vehicle Census, Annual Data; U.S. Census Population Estimates (Counties)



Countywide, overall growth in the total number of vehicles has been low. **Figure 3** shows the percent difference from January 1st to January 1st each year for each fuel class category in the total vehicle count. From 2021 to 2026, the number of ICEVs in Worcester County **decreased** by 0.16% or 1,044; while the number of hybrid and zero-emission vehicles **grew** by 176.52% (20,896) and 424.22% (12,417) respectively, contributing to an **overall increase of 4.87%**.

Adoption varied greatly across municipalities. Some communities, like Royalston, New Braintree, and Oakham saw large rates of growth as they increased from zero, one, and two vehicles to 12, 11, and 22 respectively. In Worcester, the number of the registered vehicles grew by 5,167 – driven by hybrid (3,846) and zero-emission (1,727) vehicles, not by ICEV, which decreased by 406. **Shrewsbury saw a notable shift: growth of 1,037 registered vehicles, again driven by hybrid (1,471) and zero-emission (1,387), not ICEV registrations, which decreased by 1,821**, by far the largest count decrease in that fuel class among any of Worcester County's municipalities.

### Average Daily Mileage

On average, zero-emission and hybrid vehicles log more miles each day than ICEVs (one caveat, however, is that the sheer number of ICEV may affect what that average might look like). **Figure 4** and **Table 3** show the average daily mileage for each fuel class across the county, as well as

quarter-to-quarter percent change for each of the snapshots. Data was calculated using the estimated daily VMT per fuel class for each snapshot divided by the total number of vehicles in that class.

Hybrid vehicles generally have higher average daily mileage. However, hybrid and zero emission vehicles have never had fewer average daily miles than the ICEV in this set.

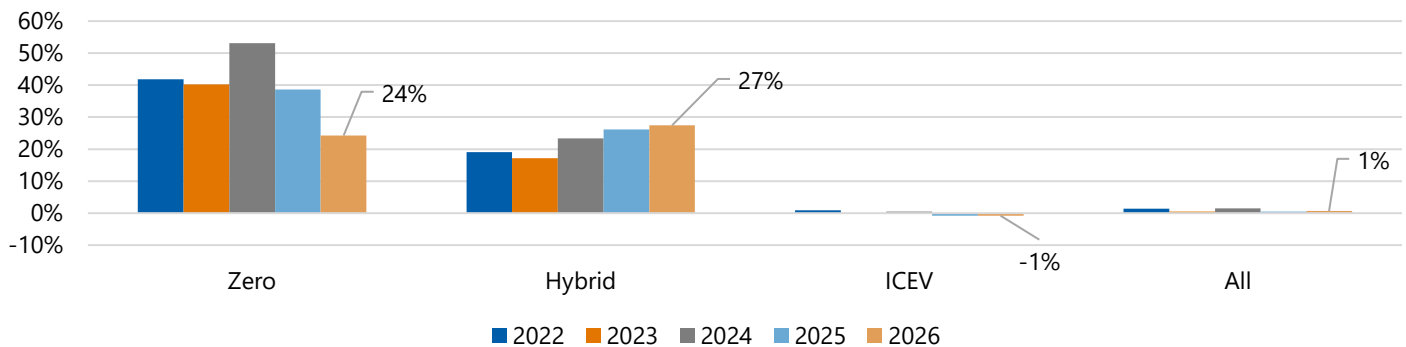
Quarter-to-quarter percent change sees a little more variability, but the trend remains largely the same: big gains in average daily mileage in 2021 and 2022 as the pandemic subsided, and smaller gains since. ICEVs tend to see declines in average daily mileage from quarter to quarter more often than the other modes, but negative swings are often countered by positive swings the next quarter. Variability in average daily mileage from quarter to quarter could simply be due to seasonality.

**Table 3: Average Daily Mileage by Fuel Class, Median Values of Worcester County Municipalities**

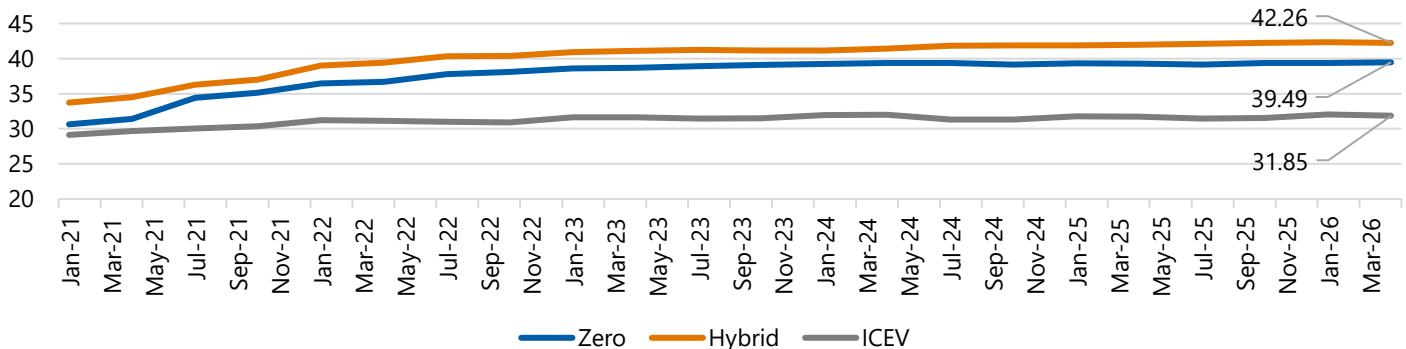
| Fuel   | Jan-26 | Apr-26 |
|--------|--------|--------|
| Zero   | 39.98  | 40.03  |
| Hybrid | 41.75  | 41.63  |
| ICEV   | 31.76  | 31.58  |
| All    | 32.33  | 32.32  |

Source: Massachusetts Vehicle Census, Snapshot Data

**Figure 3: Vehicle Count Percent Difference from Year Before (Jan. 1st Snapshot) in Worcester County**



**Figure 4: Average Daily Mileage in Worcester County (ending in April 2026)**



Source: Massachusetts Vehicle Census, Snapshot Data



Between Worcester County's 60 municipalities, **the estimated average daily mileage on January 1, 2026 for zero-emission vehicles ranges from 34.83 in West Brookfield to 59.01 in Oakham**. April values are comparable. The maps on this page show community to community differences.

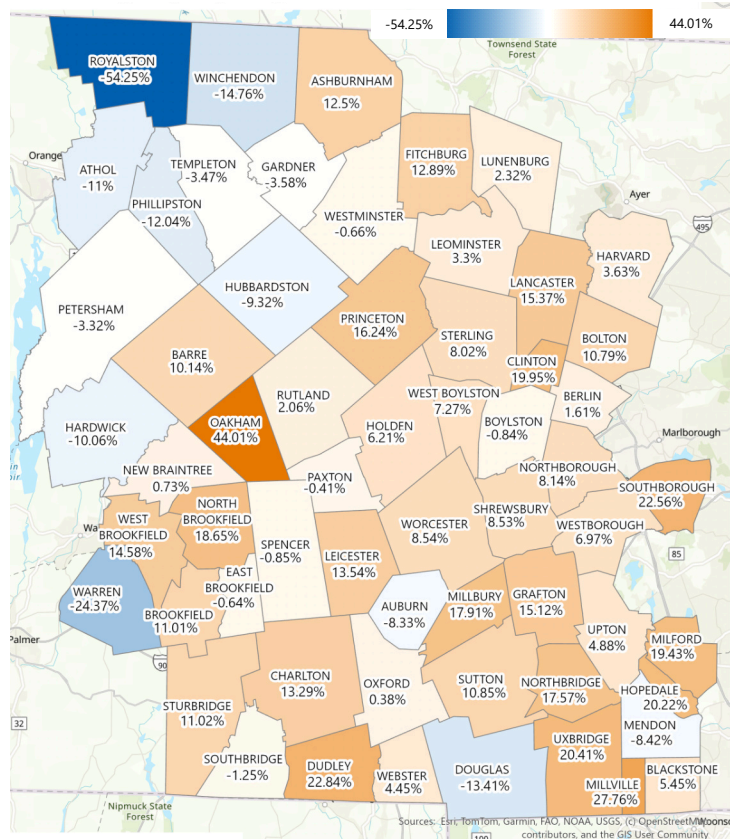
**Map 5** shows the average daily mileage by zero-emission vehicles for January 1, 2026. The darker the blue, the more miles traveled.

**Map 6** shows the percentage change in average daily mileage by the same vehicles between January 2022 and January 2026. White to blue indicates a decrease, while white to orange indicates an increase.

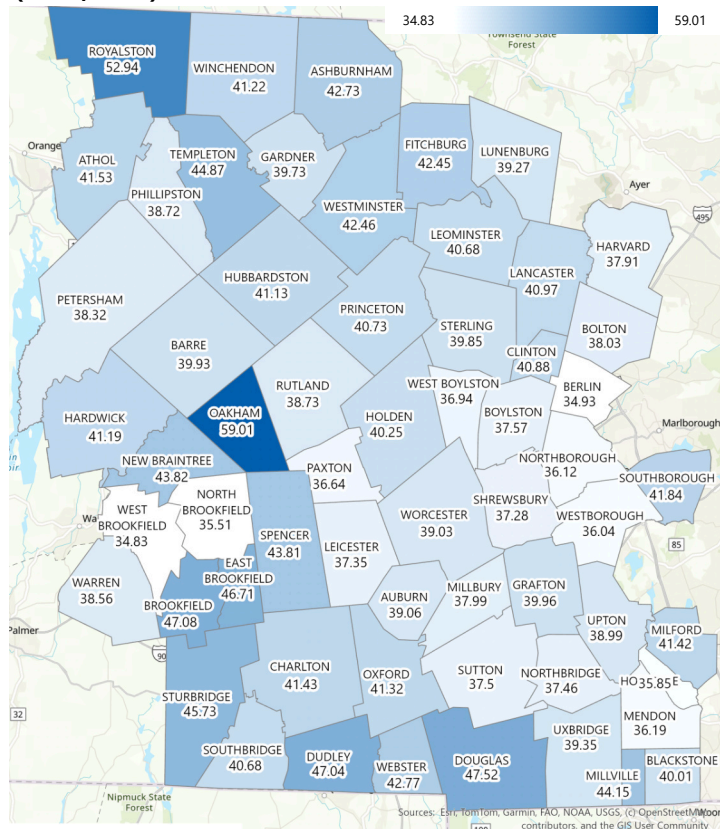
**Map 7** presents the difference in average daily miles between zero-emission and ICEVs in January 2026 (positive numbers indicate more zero-emission miles).

As noted at the beginning, these maps and data have so far included all vehicle uses and types in these communities. The Vehicle Census classifies vehicle use (passenger, commercial, municipal, and state) and type (passenger, ambulance, bus, etc). Filtering to passenger only does not significantly change the **average daily mileage for zero emission vehicles**.

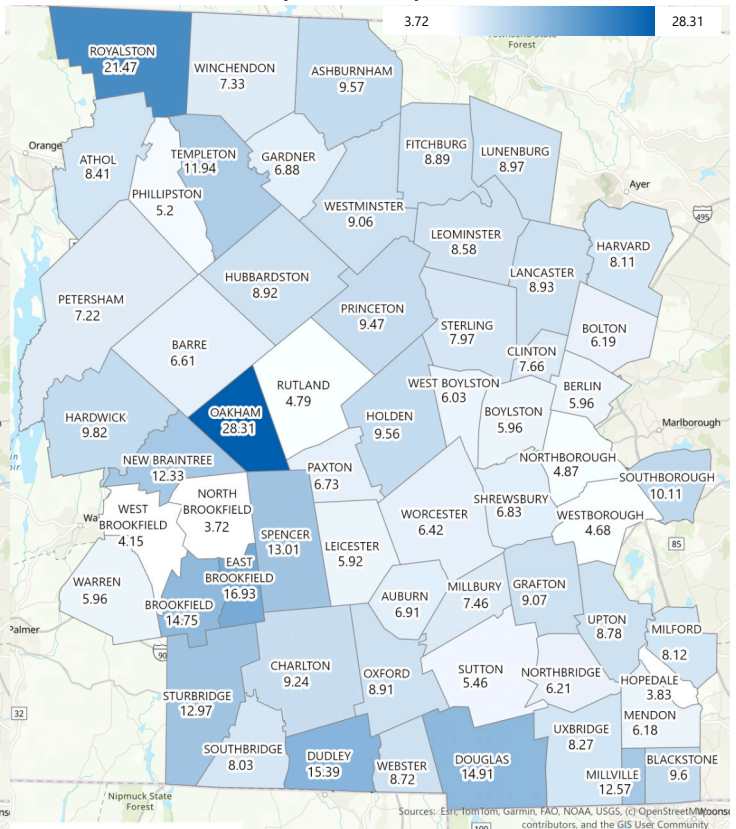
**Map 6: Percent Change (Avg. Daily Mileage), Zero-Emission Vehicles (Jan 1, 2022 - Jan 1, 2026)**



**Map 5: Average Daily Mileage, Zero-Emission Vehicles (Jan 1, 2026)**



**Map 7: Difference in Average Daily Mileage, ICEV and Zero-Emission Vehicles (Jan 1, 2026)**



Source: Massachusetts Vehicle Census, Snapshot Data



## UNDERSTANDING EV OWNERSHIP

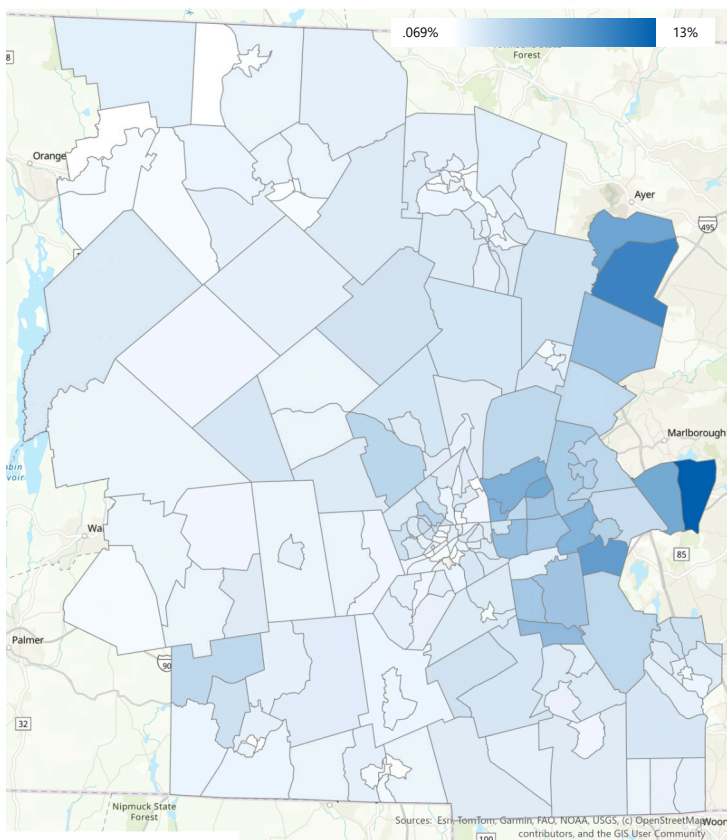
In this next section, The Research Bureau has used census block groups aggregated into census tracts in order to answer the question: who is driving zero-emission vehicles?

Although zero-emission vehicles have seen growth throughout all of Worcester County's municipalities, the Vehicle Census provides data at the zip code and census block group levels. While the zip code information is valuable, block groups can be combined with other census data to give us insights into where zero emission vehicles have taken off.

**Map 8** shows the percent of total VMT (in each tract) that consisted of zero-emission vehicles. **That percentage ranged from 0.069% to 13% in the eastern half of Southborough.** The census tract maps also show that there is quite a lot of variation in communities between their various census tracts.

Thanks to the snapshot data available from the Vehicle Census, we can also gather a sense of the average daily mileage for each of the census tracts in Worcester County. For zero-emission vehicles, this ranges from 5.5 miles per day (on a tract that is entirely Worcester's Clark University) to 84 miles per day. Both of those are surely outliers, as the

**Map 8: 2025 Percent of Total Vehicle Miles Traveled, Zero-Emission Vehicles Only (Census Tracts)**



Source: Massachusetts Vehicle Census; Annual Data

median in January 2026 was 38.65 among all the tracts in Worcester County. Electric vehicles average more miles a day than ICEVs, but slightly fewer than hybrid.

## ANALYZING CENSUS TRACT DEMOGRAPHIC TRENDS

One of the benefits of having data available at the census tract level is the available demographic data that can be analyzed in combination with VMT data. The following section analyzes this demographic data across the 190 census tracts with VMT data in Worcester County.

### *What are census block groups?*

Block groups are the second level in the Census hierarchy, after blocks. Due to their smaller size, however, most information in the American Community Survey (the yearly estimates that the Census Bureau releases) is not available at their size. That information is more readily available for census tracts.

### *Are there data limitations at this level?*

Unfortunately, the MVC block group data is not quite one-to-one with the municipal data. Aggregated to the county level, the number of miles do match between datasets.

However, there are more than 1.8 billion vehicle miles traveled in Worcester County that are not assigned to any block group. There are also about seven million miles traveled assigned to the municipalities in the county, but in the block group dataset are associated with block group IDs that are not located in Worcester County – or, in some cases, in Massachusetts. In the second case, those seven million miles represent such a small percentage of the total VMT that they make a mostly immaterial difference. In total, these 1.8 billion miles represent about 22% of the County's total VMT. While these unassigned miles could be a result of anonymizing the data, the most likely reason is simply ambiguity in accurately assigning a garaging address to a block group.<sup>4</sup>

That means that census tract maps here only include 6.453 billion of the 8.322 billion vehicle miles traveled in 2025 in Worcester County. Of those, we have 140.5 million vehicle miles out of 200.1 million zero-emissions miles traveled in the county, or 2.2% of total VMT instead of 2.4%.

**Historically, academic literature around electric vehicles has supported a specific kind of buyer:**

“male, high-income, highly educated, homeowners, who have multiple vehicles in their household and have access to charging at home” (Hardman et al., 2021). In a 2018 report from the National Center for Sustainable Transportation, a study of California EV purchases between 2011 and 2015 showed that, “high income buyers are more likely to purchase EVs than low-income buyers; non-Hispanic white and Asian buyers are also more likely to purchase EVs” (Muehlegger & Rapson, 2018, p. 1). A comparison study of the 2017 and the 2022 *National Household Travel Survey (NHTS)* found that between those years:

A direct comparison between EV and non-EV owners consistently shows that EV owners tend to be more affluent and have higher levels of formal education than non-EV owners in both years. They are also more likely to live in [a] high population MSA [Metropolitan Statistical Area] and own their homes (Wang et al., 2026, p. 6).

Many EV owners live in multi-vehicle households. Research has shown that<sup>5</sup> in 2017 “only 10% of U.S. households with an EV are single-vehicle households, compared to 37% of all U.S. households. Thus, households with an EV are almost four times less likely to be single-vehicle households ... overall, U.S. households with an EV have an average of 2.7 vehicles, compared to an average of 2.1 vehicles for all U.S. households” (Davis, 2023, pp. 1909–1910). The 2022 NHTS showed similarly that: “households with both EVs and non-EVs tend to own larger fleets than those with only non-EVs” (Wang et al., 2026, p. 7). However, between those two

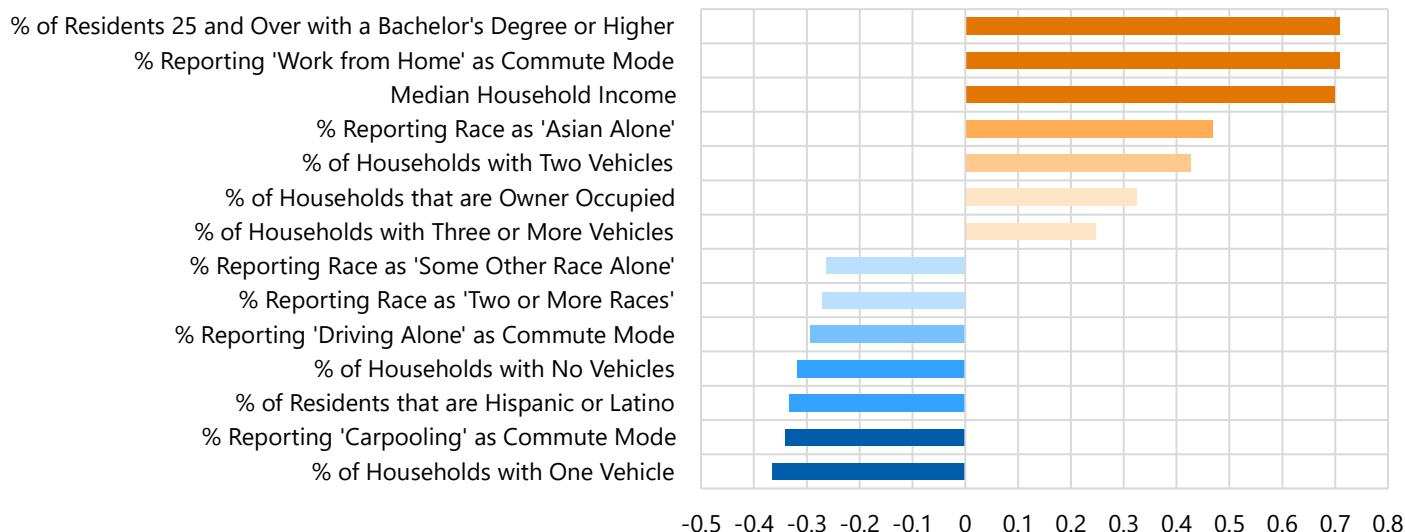
surveys, “the proportion [of households] with exactly two EVs increased substantially—8.6% in 2017 to 28.8% in 2022” (2026, 7). Overall, “current research on EV owners in the United States—whether based on regional data [...] or national-level data—consistently finds that socioeconomic and demographic factors play a key role in determining who adopts EVs” (Wang et al., 2026, p. 3).

Still, we should be cautious considering the profiles given above. The technology powering electric vehicles has improved since the 2017 and 2022 NHTS surveys were released, and the pace of change has not slowed down. Prices, too, have changed significantly. The overall demographics of those buying and driving EVs may be changing along with them.

Comparing electric vehicle uptake – whether through the percent of annual miles driven by zero-emissions vehicles, or by comparing point-in-time vehicle counts – across the census tracts of Worcester County confirms many of these trends. For the following analysis, The Research Bureau chose several race, income, household-vehicle access, employment, commute modes, and other values to test correlation with higher zero-emission VMT percentages. **Figure 5** shows some of the key factors influencing that percentage across these 190 tracts. **The correlations range from -1 to 1. The closer to either end, the stronger the correlation. Positive values indicate a positive association with zero-emissions VMT share; negative values indicate a negative association.**<sup>6</sup>

Having a bachelor’s degree, working from home, and higher median household incomes all have strong correlations with a higher percentage of VMT coming from zero-emissions vehicles. Tracts with more households with two or

**Figure 5: Characteristics Correlated with the Share of VMT from Zero-Emission Vehicles, 2025**



Source: Massachusetts Vehicle Census, Annual Data; American Community Survey, 2024 5-YR Estimates

more vehicles also tend to be higher in this category, as are tracts with more owner-occupied units compared to renter-occupied units. Tracts with more residents reporting race as “Asian Alone” also correlate with greater VMT miles. Some negative correlations exist in tracts where driving alone or carpooling to work are greater, as well as those tracts with more residents that identify as Hispanic or Latino. The strongest negative correlation is in households with one vehicle – indicating that when households do have one vehicle, it is likely not a zero-emissions vehicle. Some may notice that workers using public transit is not on this table. In these census tracts, there is no significant relation between these two variables.

In a vacuum with no other factors, **every \$10,000 increase in median household income adds 0.0031% to the zero-emissions VMT. Separately, every 1% increase in the percent of residents with a BA or higher increases it by 0.072%.**

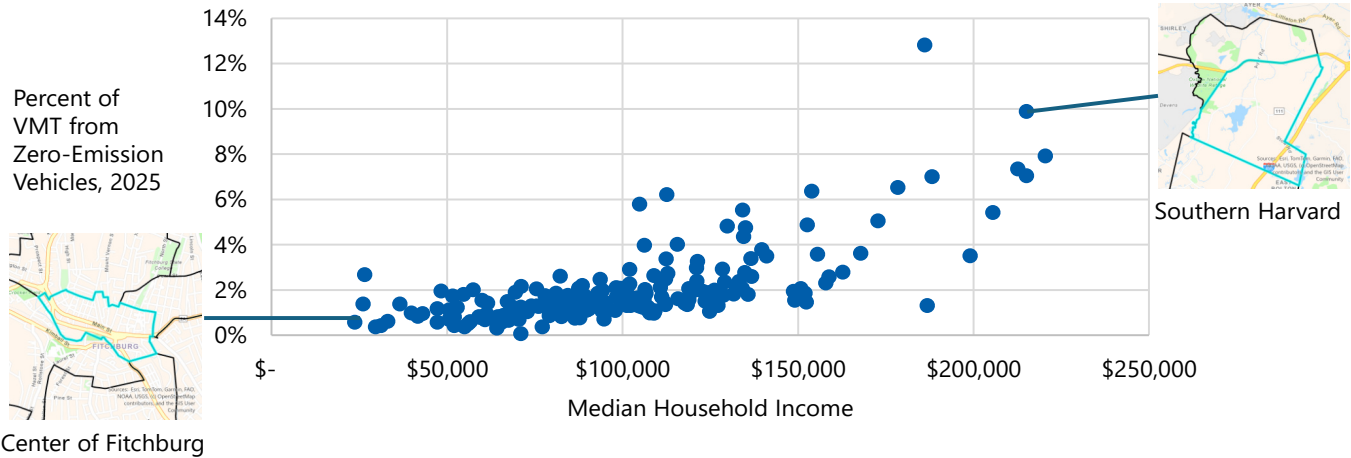
Correlation is not causation. Each of these factors cannot be taken in a vacuum; many are related to one another. For example, median household income is highly correlated

with both working from home and having a bachelor’s degree. Still, these correlations can provide a start to understanding how or why some census tracts (or municipalities) significantly differ from others in terms of zero-emissions mileage.

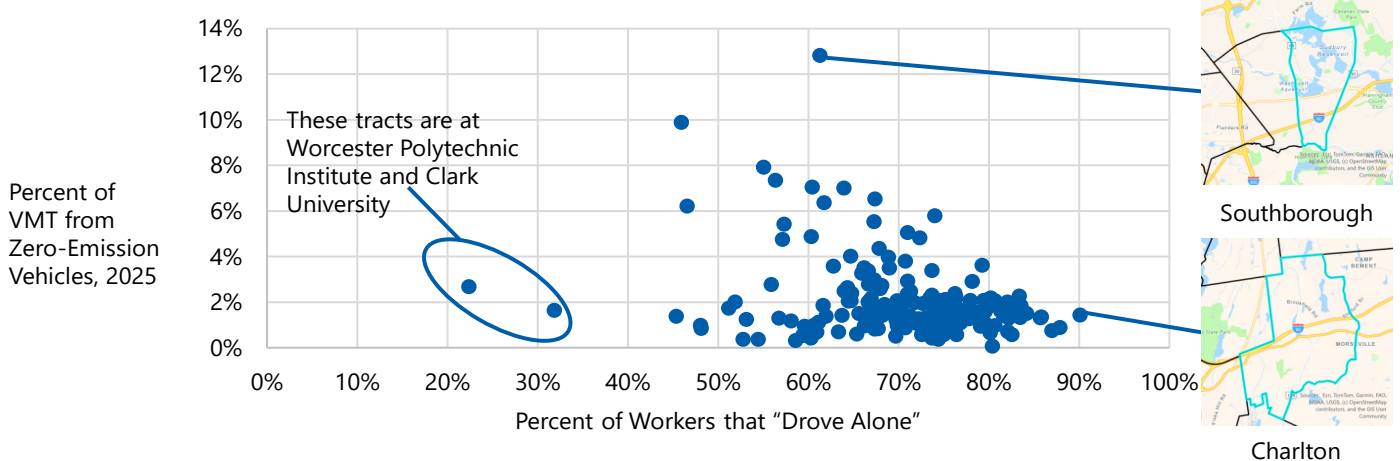
The scatterplots for household income, educational attainment, multi-vehicle households, and working from home all look very similar to one another. Below, we can see the scatterplot (Figure 6) of median household income and VMT percentage – as income increases, VMT share goes up as well. Included are two map examples of tracts on either end of the income spectrum, from Fitchburg and Harvard. Although both tracts differ significantly in physical size and urbanity, the dependent variable remains a percentage, allowing some comparison between them.

Figure 7 shows a negative correlation between VMT percentage and driving alone as a commute mode. Driving alone is not as strongly correlated as median income, but it still has an effect. That scatterplot includes a map of a census tract in Charlton where 90% of workers report “driving alone” but less than 2% of all VMT is from zero-

**Figure 6: Median Household Income and Zero-Emission VMT Percentage, by Census Tract**



**Figure 7: Driving Alone for a Work Commute and Zero-Emission VMT Percentage, by Census Tract**



Source: Massachusetts Vehicle Census, Annual Data; American Community Survey, 2024 5-YR Estimates



emissions vehicles. On the other hand, a census tract in the eastern half of Southborough shows slightly more than 60% of workers reporting driving alone, but 13% of its VMT comes from zero-emissions vehicles. Two points on the bottom left corner are from census tracts in Worcester that are centered on universities.

Again, many of the key variables that influence zero-emissions VMT are related to one another. Having a higher household income is correlated with having access to higher education, living in an owner household, working from home, and having more than one vehicle. But why might electric vehicles be attractive to these households in particular?

For one, owning one's own home provides some advantages for electric vehicles. Unlike ICEVs, EVs can be charged in one's own home, an amenity that renters might not have access to. There are publicly accessible chargers throughout Worcester County, but they are not evenly distributed, making access in some communities difficult to come by. Range anxiety, and a perceived lack of publicly accessible chargers, might play some role in this phenomenon.

Two, as we've seen, working from home is positively related with a higher share of VMT from zero-emissions vehicles. Why? Even though working from home could allow multiple household residents to share vehicles, it is **positively** correlated with having two or more vehicles. As we know already, people are more likely to own electric vehicles in conjunction with another vehicle, and in some of those cases it is a "mixed fuel" household. Research has shown that compared to "BEV-only owners and non-BEV owners, BEV-mixed-fuel owners tend to ... have more household vehicles, be more likely to own homes, and report slightly more daily trips" (Logansen et al., 2026, p. 2).<sup>7</sup>

Electric vehicle owners – especially those living in multiple vehicle households – may choose their EVs for some trips over others. In one recent study (using the 2017 NHTS), weekday shopping trips, work commutes, and home-based weekday errands were negatively related to EV-mode choice, while longer social and recreational trips, as well as weekend-based shopping were positively related (Chowdhury et al., 2024). Those researchers came to a few conclusions from these findings, which might help explain why driving alone to work is negatively correlated with zero-emission miles:

Firstly, it implies that multi-vehicle households prefer to reserve their EVs for trips that are less frequent, less time-sensitive, and discretionary in nature. [...] This finding aligns well with a Swedish

study on two-car households, which found that the driving distance of EVs is 80% greater than CVs [conventional vehicles] during the weekends. [...] Given the disparity in charging time and sensitivity, as well as higher insurance payments, multi-vehicle households might prefer to reserve their EVs for trips that are less frequent, less time-sensitive, and discretionary in nature (Chowdhury et al., 2024).

Drivers with the option of an EV might choose to take one for less important trips, rather than as a daily driver. Indeed, the Logansen 2026 study referenced above concluded that mixed-fuel households,

Tend to be more motivated by the symbolic values of BEVs, including their association with technological innovation and perceived environmental benefits. Their continued access to conventional vehicles helps mitigate range anxiety, enabling them to engage in more long-distance travel and use interstates or highways more frequently. It is possible that BEV usage could increase if these vehicles offered attributes more comparable to those of users' conventional vehicles – such as driving range, size, seating capacity, and storage space (Logansen et al., 2026, p. 28).<sup>8</sup>

Finally, it should be noted that **higher rates of public transit usage in Worcester County are associated with a lower percentage of zero-emissions VMT**. But that reduction is statistically insignificant, meaning that the effect witnessed there could easily be a coincidence or related to other, unknown, reasons.

**To repeat, median household income is related to all these factors – communities with the highest EV uptake are also those with the highest median household income and with a higher percentage of residents working from home.** The market for new EVs remains expensive as well. According to Kelley Blue Book, in December 2025 the average new car buyer spent \$50,326; the average EV was \$58,034. Still, the average EV was cheaper than a full-size truck, which sold for \$66,386 (Tucker, 2026). Between depreciation, fuel, finance, and insurance, **AAA estimates that a new electric vehicle driven 15,000 miles in its first year costs \$0.7121 a mile to operate** (Goldberg, 2026).<sup>9</sup> That's less than a mid or full-size pickup or medium SUV, but more than a compact SUV or medium sedan. It should be noted that as EVs have matured, there are now more used EVs available for sale for a fraction of the cost of buying new – an increasingly



popular option as the prices to buy and operate ICEV continue to increase.

### **Rebates and Purchase Incentives**

One way that purchasers might mitigate the (historically) higher cost of new EVs is through tax credits and incentive programs. The buyer might have to qualify for the vehicle loan upfront (therefore potentially limiting buyers to those with higher incomes) but can later receive rebates to offset that cost. While there was a federal tax incentive (of up to \$7,500 on new vehicles), it ended for all vehicles purchased after September 30, 2025 (Internal Revenue Service, 2026). However, there is a Massachusetts incentive, the *"Massachusetts Offers Rebates for Electric Vehicles" program (or MOR-EV)* that **provides between \$3,500 and \$6,000 when buying a vehicle in Massachusetts**.<sup>10</sup> In brief, the program provides a rebate on new light-duty vehicles for all customers (at point of sale at participating dealers; or through an application process within 90 days afterwards), and on used light-duty vehicles for income-qualified customers. There is an additional rebate (of up to \$1,000) if consumers also trade in an ICEV (Center for Sustainable Energy & MA Department of Energy Resources, n.d.).

The MOR-EV program provides several useful statistics to help us understand these rebates. The numbers do come with some caveats for years prior to 2023.<sup>11</sup> We can map (by zip code) where residents are taking advantage of the rebates offered. **Figure 8** shows the rebate dollar amounts back to 2014 (going by when the program received an application), though note that the program underwent some significant changes starting in 2023, including increasing the incentive amount. Rebates climbed from less than \$1,000,000 to more than \$4,000,000. Similarly, the **number of vehicles that received rebates in Worcester County grew from 364 in 2022 to 1,315 in 2023, 1,820 in**

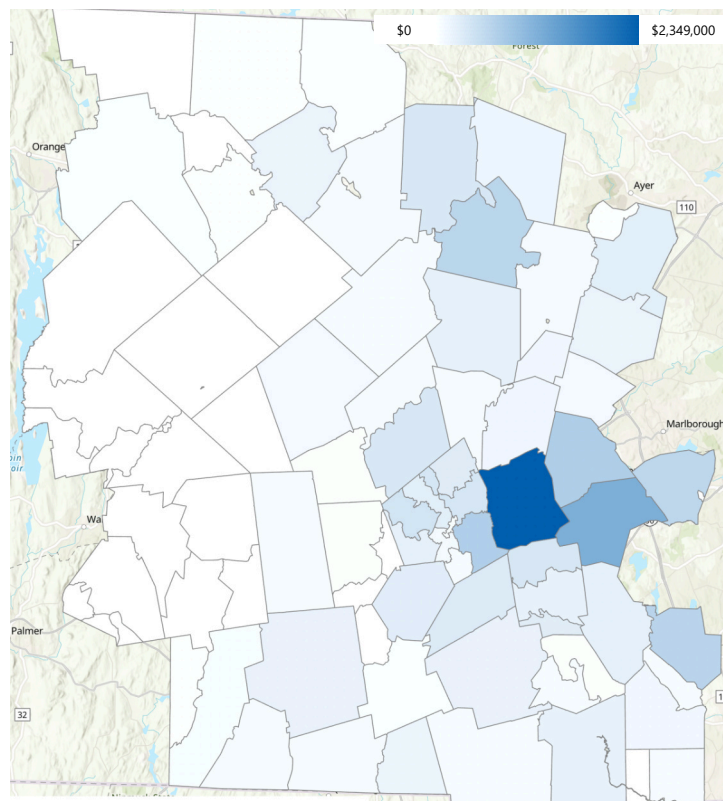
**2024, and 1,763 in 2025**. As of May 20, 2026, there have been 252 rebates so far this year.

In 2025, about **41.3% of the light-duty rebate dollars went towards leased EVs**. The following two maps show which zip codes and which municipalities have residents who have received the greatest amount of rebates. These maps aggregate rebate figures from 2023 through 2026.

**Map 9** is separated by zip codes, and shows the total amount of rebates for light-duty vehicles awarded to applications from those zip codes between 2023 and 2026. The most rebates during this time period went to residents in Shrewsbury, which comprises one zip code, and those residents received nearly \$2.35 million – nearly 13% of all rebates received in Worcester County.

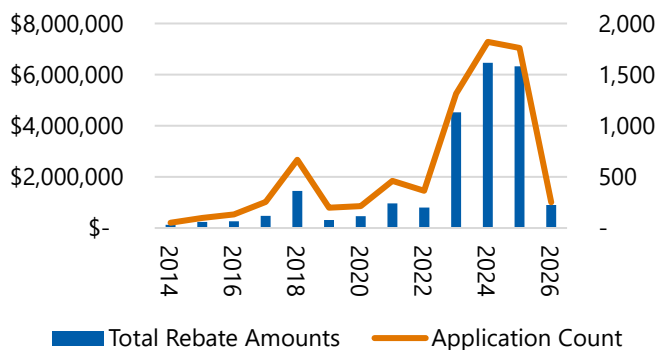
However, while the raw amount of funds is relatively high for this zip code compared to others, zip codes do not contain an equal number of residents. If we look at the amount received by municipalities, and normalize it by population, a different picture emerges in **Map 10** (following page). First, caveats: zip codes occasionally cross community boundaries, so the "community" assigned to a particular zip code may not be correct in some cases (and there's no way to know, as the data provided by the MOR-

**Map 9: Total MOR-EV Rebates for Light-Duty Vehicles, 2023-2026 (by Zip Code; data as of 5/20/2026)**



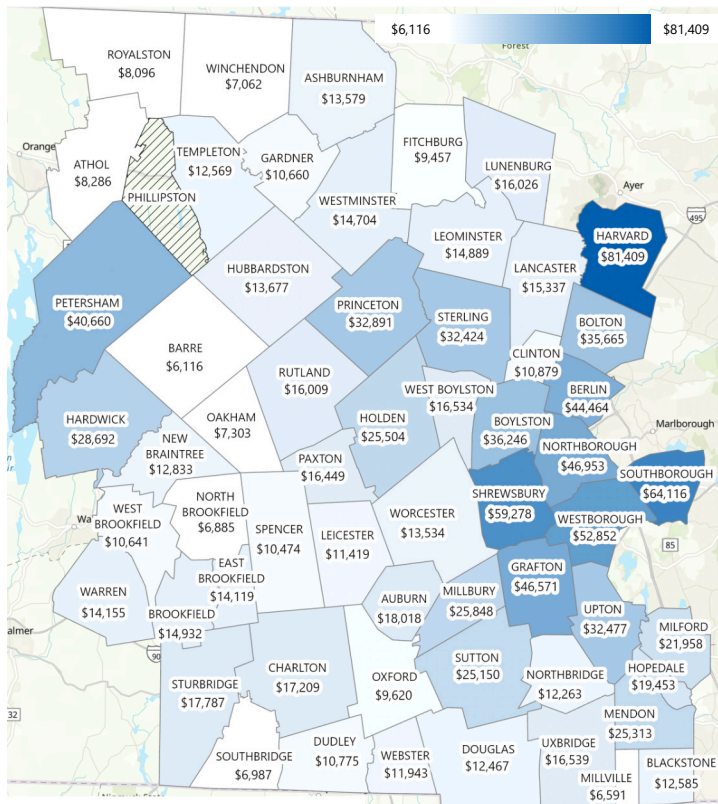
Source: MOR-EV; Center for Sustainable Energy (2026); Massachusetts Department of Energy Resources, Rebate Statistics; U.S. Census Population Estimates (2025)

**Figure 8: Total MOR-EV Rebates (in \$) and Application Counts in Worcester County for Light Duty Vehicles (data as of 5/20/2026)**



Source: MOR-EV; Center for Sustainable Energy (2026); Massachusetts Department of Energy Resources, Rebate Statistics

**Map 10: Total MOR-EV Rebates (per 1,000 residents);  
Light-Duty Vehicles, 2023-2026 (data as of 5/20/2026)**



Source: MOR-EV; Center for Sustainable Energy (2026); Massachusetts Department of Energy Resources, Rebate Statistics; U.S. Census Population Estimates (2025)

EV program is simply provided on a zip code basis). Phillipston, for example, is blank in the second map because it entirely shares a zip code with Athol, and Athol was the assigned community name for said zip code in the Mass GIS dataset that was used. Second, though the rebates are the combined figures for 2023-2026, we used the 2025 Census Population Estimates to normalize the data.

The pattern is consistent with the broader geographic distribution of EV uptake described earlier: communities in eastern Worcester County are applying for and receiving rebates on EV purchases more often. Shrewsbury, when adjusted for population, is not as much of an outlier as in the zip code map. Rather, **Harvard has an outsized share of rebates, with \$81,000 in rebates for every 1,000 residents in that community.**

This previous section has demonstrated that **Worcester County's tract-level patterns are broadly consistent with prior research.** Those with more residents with higher education, higher incomes, and multiple vehicles in their households tend to be the tracts that have the most zero-emission miles. Residents across Worcester County are taking advantage of the MOR-EV program, the only

government incentive for buying EVs as of October 2025. Those living in areas with more electric vehicle uptake, as in the eastern third of the County, have applied for rebates at higher rates than other areas of the county, even after normalizing by population.

Although higher incomes may lead some households to be more likely to purchase and use electric vehicles, lower incomes may not be the only barrier to higher EV uptake. Owning a home is also a factor correlated with higher EV use. One big advantage of owning a home is the ability to install your own charger for your electric vehicle, including applying for and receiving rebates specifically for installation. Indeed, rebate programs for charging infrastructure, such as [National Grid's EV Charging Upgrade Program](#), are another advantage that homeowners have when deciding whether or not to purchase an EV.

However, for non-homeowners otherwise interested in purchasing an EV, installing a charger might not be an option. And in that case, driving range concerns might impact consumer choice. While public chargers exist, they face some problems that gas stations do not.

## CHARGING INFRASTRUCTURE

Many consumers report hesitation to buy EVs because of range. However, over the last fifteen years the driving range available for EVs has increased significantly with cheaper and improved battery technology. According to the U.S. Department of Energy, battery costs for light-duty vehicles were 90% less in 2023 than they were in 2008 (U.S. Department of Energy, 2024a). **Moreover, the median range available for EVs has increased by 316% between 2011 and 2024 – from 68 to 283 miles for EVs sold in the United States** (U.S. Department of Energy, 2024b). The cars with the most range have seen an increase of 449% (from 94 to 516 miles) (2024b). These ranges are more than sufficient for most households, as “in 2022, according to the National Household Travel Survey, over 73% of all on-road passenger trips were 10 miles or less, and over 98% were less than 75 miles” (US EPA, 2026). Still, **there could be lingering perceptions among some that electric vehicle ranges are small, as well as fear of an inability to find an appropriate (and vacant) charging station when needed.** After all, gas station infrastructure is ubiquitous, obvious (there’s no mistaking a gas station), fast, and easy to access by comparison.

According to the U.S. Department of Energy, as of May 19, 2026, in **Worcester County there are 1,075 charging ports spread across 366 different locations.** Eight hundred and thirty-five of those ports are Level 2 (78%), while **240 are DC Fast chargers.** EV chargers come in three types, the two mentioned above, and Level 1. Level 1

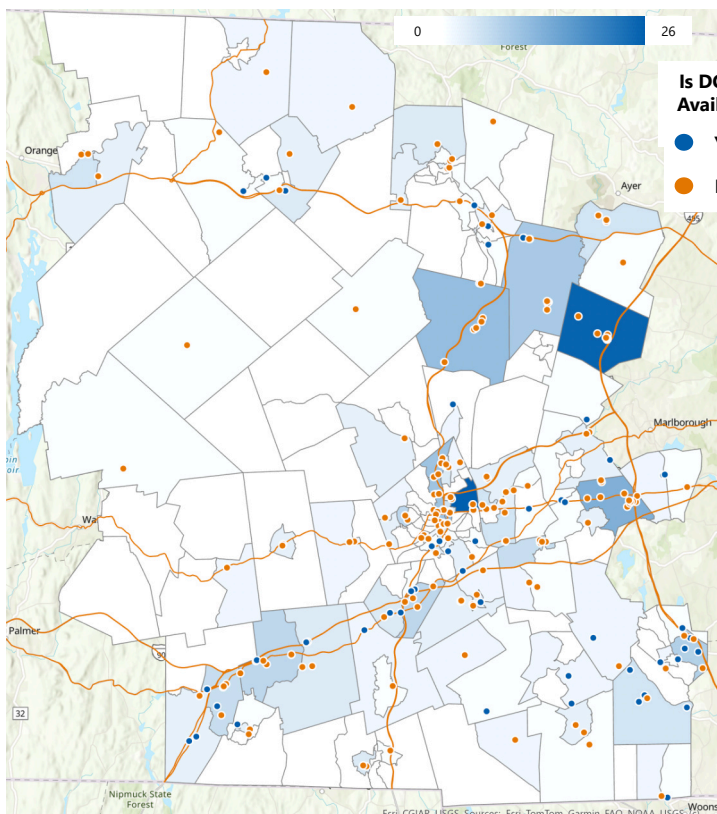
**Table 4: Charger Types and Speeds<sup>12</sup>**

| Charger Type | Definition                                                                                                                                                                                                                                                                                                                                                     |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Level 1      | Provides charge through a common 120-volt AC (alternating current) outlet. Can take 40+ hours to charge a fully battery electric vehicle to 80% from zero, charging at a rate of 2-5 miles an hour. Uses a J1772 connector. Typically, anyone could plug in an EV at home and charge through this method. Plug-in hybrid compatible.                           |
| Level 2      | Provides charge through 240-volt AC outlet (at home) or 280-volt (commercial uses). Can charge from empty to 80% in 4-10 hours, charging at a rate of 10-20 miles an hour. Also uses J1772 connector. Need specialized equipment at home and proper electrical work to install one. This is the most common type of public charger. Plug-in hybrid compatible. |
| DC Fast      | The “best-of-the-best” chargers, these are often found in heavily trafficked areas (such as highway rest stops) because they can charge so quickly. They use DC (direct current) to charge batteries to 80% from empty in 20 minutes to an hour, at a rate of 180-240 miles an hour. In North America, these typically use connector types called “CCS.”       |

Source: U.S. Department of Transportation (2025)

chargers are not found at any of the public charging stations in Worcester County. **The U.S. Department of Transportation defines the three types of chargers in Table 4 (U.S. Department of Transportation, 2025).**

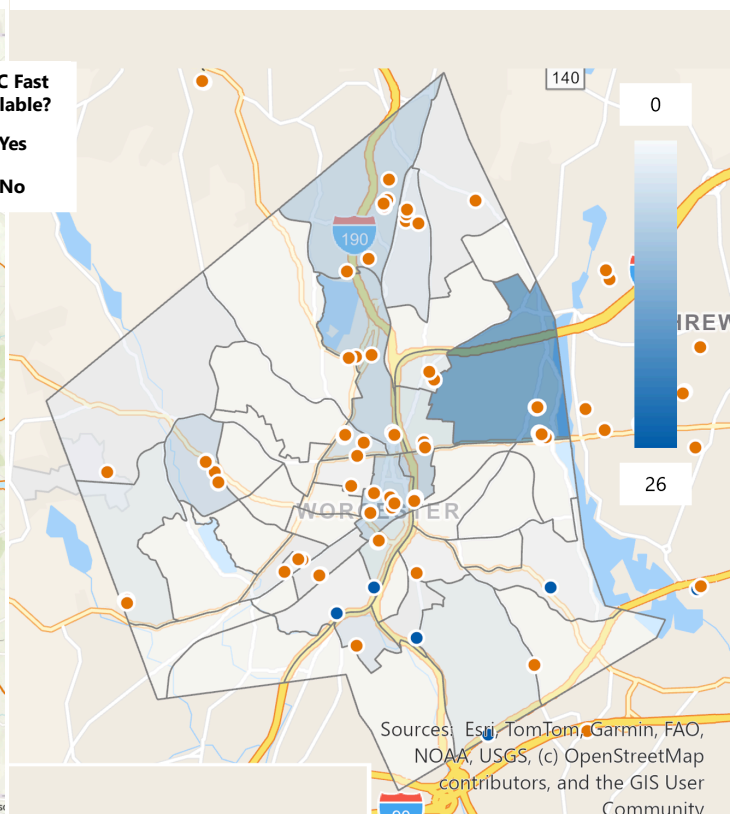
**Map 11** shows the number of charging stations (not ports) in Worcester County by census tract, using data from the U.S. Department of Energy’s Alternative Fuels Data Center. Worcester has the most charging stations, with 120 (Worcester itself is **Map 12**). The map also includes the specific locations of each charging station, differentiated by whether they include DC Fast chargers. Also, remember that any outlet rated at 120v could be used as a Level 1 charger.

**Map 11: Number and Location of Charging Stations Per Census Tract (data as of 5-19-2026)**

Source: U.S. Department of Energy, Alternative Fuels Data Center

Major highways and numbered routes are included on the map for reference. Chargers that “loosely” follow I-90 are following Route 20 instead. A line of chargers in the northern part of the county loosely follows Route 2, and there are several down Route 9. Each station contains multiple ports for charging.

**The U.S. Department of Energy lists these chargers as public, but that might not be fully true depending on the location.** Some may be totally public, such as those located in [Worcester’s publicly owned garages](#). Others may only be available to employees, students, or business patrons. For example, the Alternative Fuels Data Center lists

**Map 12: Number and Location of Charging Stations Per Census Tract (City of Worcester Only; data as of 5-19-2026)**

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community

several public chargers at The College of the Holy Cross. However, Holy Cross's [website notes that only those with a valid parking permit can use them](#). Similarly, there are dozens of chargers available at [UMass Chan Medical School, for employees and students only](#). Many other charging points may carry similar restrictions.

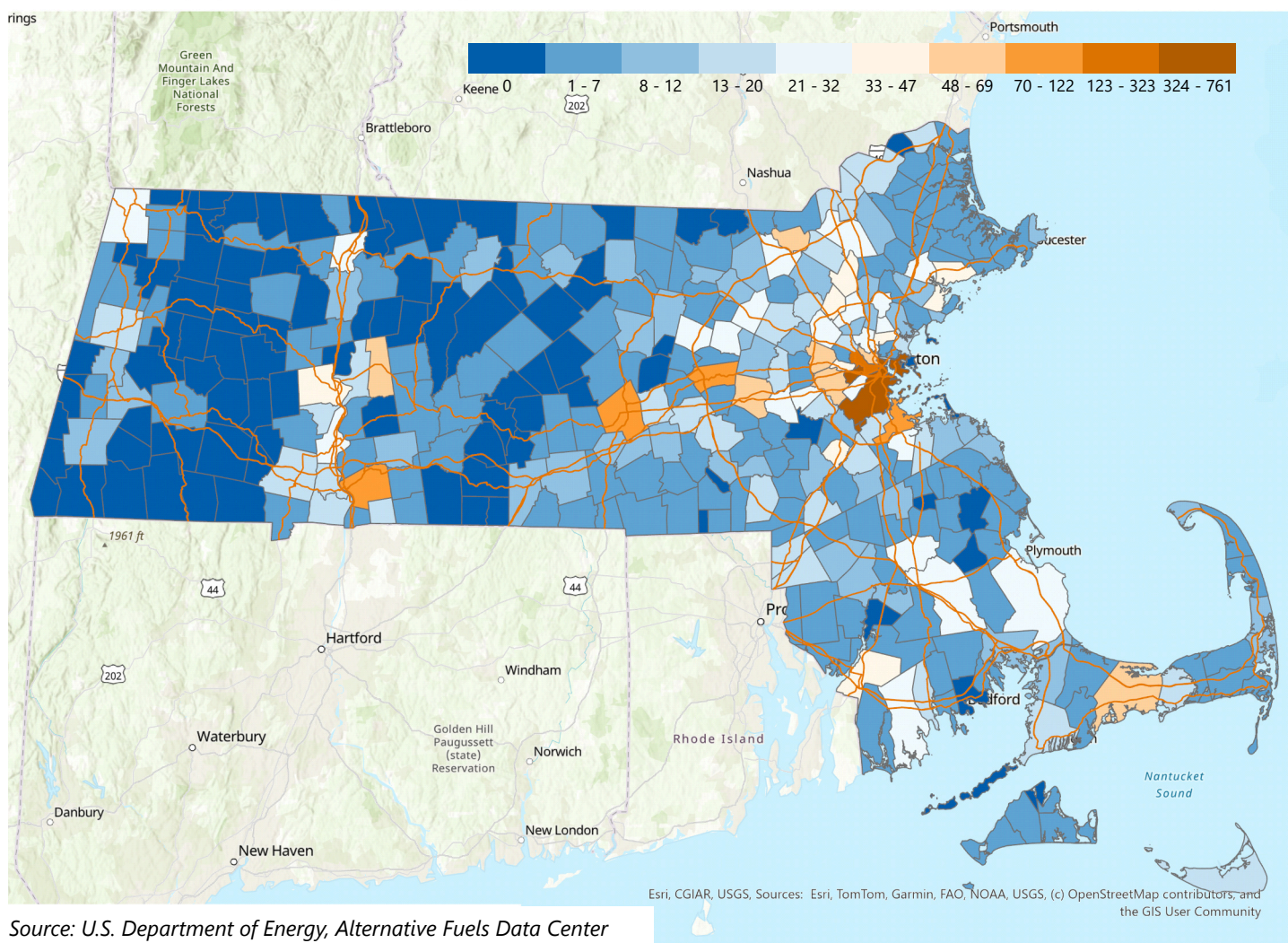
There are likely thousands more charging ports available in individual homes, and perhaps others unreported at additional private locations. Just as most of the zero-emission vehicles are found on the eastern side of the county, so too are the most chargers found in those areas. Those without easy access to home or employer charging in western Worcester County may hesitate more to make the transition to zero-emission vehicles based on this map.

**Map 13** shows the number of charging stations (again, with multiple ports each) in each municipality across the entire state. Major routes and highways are included for reference. There are 88 communities, primarily located west of 495,

that have no publicly accessible charging stations according to the U.S. Department of Energy.

Having publicly available charging stations in one's community provides an incentive to purchase an EV if you do not have access to charging infrastructure at home. **Since nearly 73% of all vehicle trips in the US are less than 10 miles**, having nearby (and plentiful) charging infrastructure is key. Having a network of chargers when one travels further distances is important as well. **As Massachusetts continues to build out its charging infrastructure, ensuring that there are charging stations at least along major routes and highways is critical for encouraging drivers to make that switch. These charging stations must be available for all drivers not just employees, students, or business patrons.** One benefit to EV charging is that employers, universities, hospitals, and more can install chargers anywhere as a perk for their users. But to get maximum benefit, and to encourage more residents to purchase EVs, charging must be easily available.

**Map 13: Number of Charging Stations by Municipality Across Massachusetts (data as of 5-19-2026)**





**Massachusetts must also use the \$64 million it received from the National Electric Vehicle Infrastructure (NEVI) program to build fast chargers along its highways.** It has yet to build even one with those funds, according to Commonwealth Beacon (Wolman, 2026). As the state looks to see where it can install them, it should prioritize the major highways that crisscross Worcester County.

Another way to increase the number of charging stations across the Commonwealth is by working with existing property owners. Commercial property owners, for example, can use grant programs like the [Massachusetts Electric Vehicle Incentive Program \(MassEVIP\)](#) to build charging stations of their own. MassEVIP provides grants for EV charging stations of all speeds at "publicly accessible locations, workplaces, multi-unit dwellings, and educational campuses, and for vehicle fleets." Municipalities could also work with existing (and future) property owners by offering zoning benefits, such as reduced parking minimums and density bonuses, in exchange for building publicly accessible charging of all speed levels on their site. These types of programs would serve to further increase the density and ubiquity of the charging network.

Gas stations may be ubiquitous, but one benefit that gas stations have that publicly available chargers do not is that they are fast. It takes minutes, if that, to refuel an ICEV. Most

gas stations have multiple pumps available, and even if not it is quick and easy for a queue of cars to move through. One could imagine a handful of pumps handling hundreds of ICEV per hour. While 79 communities in Massachusetts have no gas fueling center at all, their ease and speed of use makes them much more convenient for users. The density of charging stations **needs** to be higher to accommodate the longer charging times of EVs.

Because of the ease of using a gas station, DC Fast charging must become more readily available to the public to make public charging more attractive. These chargers might still take longer to refuel than a gas station, but they have a significant speed advantage over Level 2 chargers. DC Fast needs to be available for both long- and short-term trips. It needs to be available along major routes and highways so that people on trips can fill up without fear of running out of electricity. It needs to be available at grocery stores and in parking garages where people spend a moderate amount of time. Charging requires rethinking behaviors from refilling an ICEV, but a dense charging network outside of the home will go a long way to enabling that change.

## **CONCLUSIONS, RECOMMENDATIONS, AND FINAL THOUGHTS**

Between 2022 and 2025, Worcester County saw a 229% increase in the number of miles driven by zero-emissions vehicles; the share of VMT from zero-emissions vehicles in the county grew from 0.8% to 2.4%. Zero-emissions vehicles are making inroads into our communities, at a crucial time: Massachusetts' Climate Plan sets a lofty goal of 97% of all light-duty and 93% of all medium- and heavy-duty vehicles to be EVs by 2050. Since transportation accounts for nearly 40% of all carbon dioxide emissions in the United States, this would substantially affect pollution across the Commonwealth.

More widespread adoption of EVs faces hurdles, however. Their cost is one. While personal vehicles are already expensive, the average new EV buyer spent \$58,000 in December 2025, \$8,000 more than the average price of a new car (inclusive of all car types). EVs depreciate quickly so they also currently "cost" more than other vehicles to operate. Right now, higher income households in Worcester County are more likely to have access to the means to buy an EV. **Cheaper EV models, as well as a growing market of high quality used EVs, will go a long way towards solving these problems (Mims, 2026).**<sup>13</sup>

As another way to reduce cost burdens, we should do everything we can to ensure residents, home owners, and

developers know about [available incentives and rebates for building charging infrastructure, such as the Massachusetts Electric Vehicle Incentive Program \(MassEVIP\) and National Grid's EV Charging Upgrade Program](#). These programs provide grants and rebates for charging infrastructure for both residential and commercial property owners. MassEVIP, for example, provides grants for publicly accessible EV charging stations, and for those at workplaces and multi-unit dwellings.

Another hurdle is the infrastructure. While there are hundreds of charging stations across Worcester County, and thousands across Massachusetts, charging an EV outside of the home does not match the convenience of refueling an ICEV. Depending on the charger and the capacity of your battery, an EV could take anywhere from 20 minutes to 10 hours to fill to 80%. If you do not have access to chargers at work or at home, the trade-off in time and convenience might not be worth it. A gas station can refill many more vehicles an hour, even with just a few pumps, than a few charging stations can. Based on the evidence we have, buying an EV is more attractive to homeowners, who can install charging at home. But to make it more attractive to renters—and to those homeowners who cannot install chargers—the **density of charging stations available to everyone, especially with DC Fast ports, must increase.**



Seventy-three percent of all vehicle trips in the United States are for under 10 miles, according to the 2022 National Household Travel Survey. The median EV's 283-mile range is more than enough for most trips, including for regular fill ups. More charging stations, in combination with growing range availability, may convince some to make the switch to zero-emissions vehicles. **Municipal initiatives, like getting public input on curbside locations for charging stations, as Worcester has done, are critical for reaching those who otherwise wouldn't have access. Amending zoning codes to incentivize private EV charging development is another solution municipalities could adopt.** While zoning could explicitly require EV charging infrastructure in new development, **there are likely more cost effective ways to incentivize their construction.** One such way to do so is by **offering reductions in overall parking burden** in exchange for public charging stations, or in exchange for a certain percentage of fast charging ports. Another option could be **offering density bonuses** for residential developments in exchange for charging infrastructure.

Still, because EVs do not stay in municipal bounds, regional cooperation for installing charging stations would greatly improve the user experience. Whether through direct partnerships between municipalities, working with regional planning agencies like CMRPC, or facilitated with the State, greater regional density of chargers is crucial.

According to the American Community Survey, in 2024 nearly 72% of workers in Worcester County reported driving alone as their main mode of commuting to work; an additional 8.5% carpooled. **In other words, the personal vehicle itself will remain the main mode of transportation for many of Worcester County's residents. Because the private car will remain so for long into the foreseeable future, municipalities (and the Commonwealth writ large) should make the necessary infrastructure investments that will encourage residents without the ability to charge at home to consider an EV as their next purchase.** Meeting Massachusetts' climate goals requires the transition to electric vehicles by as many residents, organizations, and municipalities as possible.

*Electric Vehicles in Worcester County is supported by a grant from the Barr Foundation.*

*The opinions expressed in this report do not necessarily reflect the views of the Barr Foundation.*

## **ELECTRIC VEHICLES ARE STILL VEHICLES**

EVs share the problems of other personal vehicles, and switching to them will not solve all the problems of cars and car-centric infrastructure. They need to be parked somewhere, exacerbating the problems of parking. So long as they are driven by human beings, EVs are just as prone to accidents as any other vehicle. **The switch to EVs should be made in conjunction with other changes, investments, and adaptations in the choices residents have to get around.** In recent years, the Worcester Regional Research Bureau has written extensively on these transportation issues, thanks to support from the Barr Foundation.

First, a lot of land in our communities is dedicated to parking. **Parking lots use valuable space that could be used for housing, commercial developments, or parks, and make our cities hotter and uninteresting for pedestrians.** The Research Bureau previously wrote about [Worcester's heat islands](#) (this report was not Barr funded; these islands are overwhelmingly concentrated in high-asphalt areas, including those with plenty of parking, in Worcester) and the [need to reduce parking minimums](#).

Second, human drivers are prone to the same driving mistakes in EVs as they are in ICEVs. **In 2024, The Research Bureau wrote about vulnerable road user safety in Worcester. Finding ways to encourage and protect walking and biking is crucial.** Still, changes in technology may mean that within a few decades, many electric vehicles may be autonomous, and new safety features may lower the risks of accidents involving pedestrians substantially.

Finally, continued investments should be made in regional transit authorities and in commuter rail services. These serve both local and regional trips to and from home. In the spring of 2023, The Research Bureau wrote about the [Worcester Regional Transit Authority](#), and in [summer 2025](#) and [spring 2026](#) wrote about the Worcester/Framingham Commuter Rail Line. **Reliable, speedy, and stronger local public transit service both inside and outside of Worcester County gives residents a choice besides their cars for getting around.**



## NOTES TO THE TEXT

<sup>1</sup> (page 3) Determined by averaging the number of “new” vehicles across the four quarterly snapshots available in the Vehicle Census.

<sup>2</sup> (page 4) Until a complete transition away from fossil fuels in power generation, EVs will still draw on electricity from sources that emit greenhouse gases. According to the U.S. EIA, electricity generation accounted for 30% of all carbon dioxide emissions in 2024 – second to transportation.

<sup>3</sup> (page 4) Although plug-in hybrid vehicles still use traditional internal combustion engines when their battery is discharged, for the purposes of this report “zero-emissions” will continue to include them. Although at the municipality level the MVC differentiates between the various types of zero-emissions vehicles, going down to the census block group level (and the census tract level) the MVC only differentiates whether vehicles are hybrid, zero-emissions, or “not advanced” i.e., fully internal combustion in order to maintain anonymity. In order to maintain continuity, unless otherwise noted, this report will focus on the catch-all zero-emissions category.

<sup>4</sup> (page 11) The Research Bureau did reach out to MassDOT GIS Services about this, but did not receive a response.

<sup>5</sup> (page 12) As of the time of the 2017 National Household Travel Survey.

<sup>6</sup> (page 12) For this chart, the Bureau has chosen the variables with the most significant effect ( $p < 0.001$ ). Other variables will, of course, have their own effects, some stronger than others.

<sup>7</sup> (page 14) Unfortunately, the Massachusetts Vehicle Census does not include household level data, including likelihood of owning more than one vehicle, so we cannot with any certainty say how many households in a municipality, zip code, or census tract are multi-vehicle households with electric and non-electric vehicles.

<sup>8</sup> (page 14) Range anxiety refers to the phenomenon where electric vehicle owners (or, even, potential owners) worry about whether they can make it to their destination and back on a battery charge; and, if they are close to running out of charge, whether the appropriate infrastructure exists to recharge.

<sup>9</sup> (page 14) Notably, this cost is largely in depreciation, as EVs depreciate faster than other types of vehicles. Indeed, according to one study, between 2020 and 2023 “the average depreciation rate of EVs was 51% [...] vs. 31% for ICE vehicles” (Gautam et al., 2024) The reason, however, is not

because they lack utility compared to other vehicles, but rather “fast technological progress and incentives that effectively made new EVs more affordable are two of the causes of EVs fast depreciation compared with equivalent ICE vehicles” (2024). Subsidies on new vehicles made them more attractive than buying used vehicles, potentially depressing their sale. The end of EV incentives for new vehicles may have an effect on limiting depreciation.

<sup>10</sup> (page 15) The program is managed by the Massachusetts Executive Office of Energy and Environmental Affairs’ Department of Energy Resources, and administered by the Center for Sustainable Energy. You can find more information about the program at [www.mor-ev.org/about](http://www.mor-ev.org/about).

<sup>11</sup> (page 15) Namely, starting in November 2022 rebates increased to \$3,500, with a sales price cap of \$55,000. As of July 2023, plug-in hybrids were not eligible for a rebate. In August 2023, rebates-at-the-dealership became available, as well as the \$3,500 rebate for used vehicles. In December 2023, the \$1,000 trade-in offer became available. For more information, see [www.mor-ev.org/statistics](http://www.mor-ev.org/statistics) (Center for Sustainable Energy & Massachusetts Department of Energy Resources, 2026).

<sup>12</sup> (page 17) A quick note on the “80%” figure. According to the U.S. Department of Transportation, “charging speed slows as the battery gets closer to full to prevent damage to the battery. Therefore, it is more cost- and time-efficient for EV drivers to use direct current (DC) fast charging until the battery reaches 80 percent, and then continue on their trip. **It can take about as long to charge the last 10 percent of an EV battery as the first 90 percent** (U.S. Department of Transportation, 2025).” (Emphasis ours)

<sup>13</sup> (page 19) For example, because of domestic competition, Chinese EVs are remarkably cheap. They’re just not generally available in the U.S. (Felton, 2026).



## **M E T H O D O L O G Y**

All data from the Massachusetts Vehicle Census was current for April 2026. We downloaded and utilized the data in May and June 2026.

The Massachusetts Vehicle Census contains data for municipalities, zip codes, and U.S. Census block groups. Block groups are the second smallest census hierarchy, each composed of blocks. However, each block group can easily be aggregated into the census tract of which it is a part. To enable an analysis of demographic and vehicle data, we aggregated all 570 block groups in Worcester County into the 190 tracts that they create, using their GEOID (Example: "250277316022" is in Massachusetts (25). Worcester County (027), and is the second block group in tract 7316.02, which is in Worcester).

The census tract data itself comes from the American Community Survey, 2024 5-YR estimates. We used DP02, DP03, DP04, and DP05 as our main data sets. Specific data was extracted from the Census using R. Where possible, percentages are compared with percentages – for example, rather than comparing the number of people over 25 with a Bachelor's Degree or higher with the total number of zero-emission VMT, we compare the share of residents with bachelor's degrees and the share of zero-emission VMT.

Simple linear regressions (using one variable) were run in R for a few variables, including median household income vs. percent of VMT that was from zero-emissions vehicles, and percent of residents with a bachelor's degree or higher (see page 13).

The correlation table in Figure 5 (also page 13) was made in Excel. Correlations were run in Excel using the CORREL function. Figures in the table were chosen if they had p values of less than 0.001. Some of these correlations were different versions of the same statistic (for example, median household income and median household income per 1,000 residents). After discarding repeats, and removing at least one variable in inverse relation pairs where the correlation values were exact opposites (such as residents owning homes vs. residents renting), we selected the top seven positive and top seven negative correlations.

All maps were constructed in ArcGIS using Massachusetts Vehicle Census, U.S. Census Bureau, and U.S. Department of Energy Alternative Fuels Data Center data.

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