

# Making Green Transit Even Greener Using Intelligent Technology

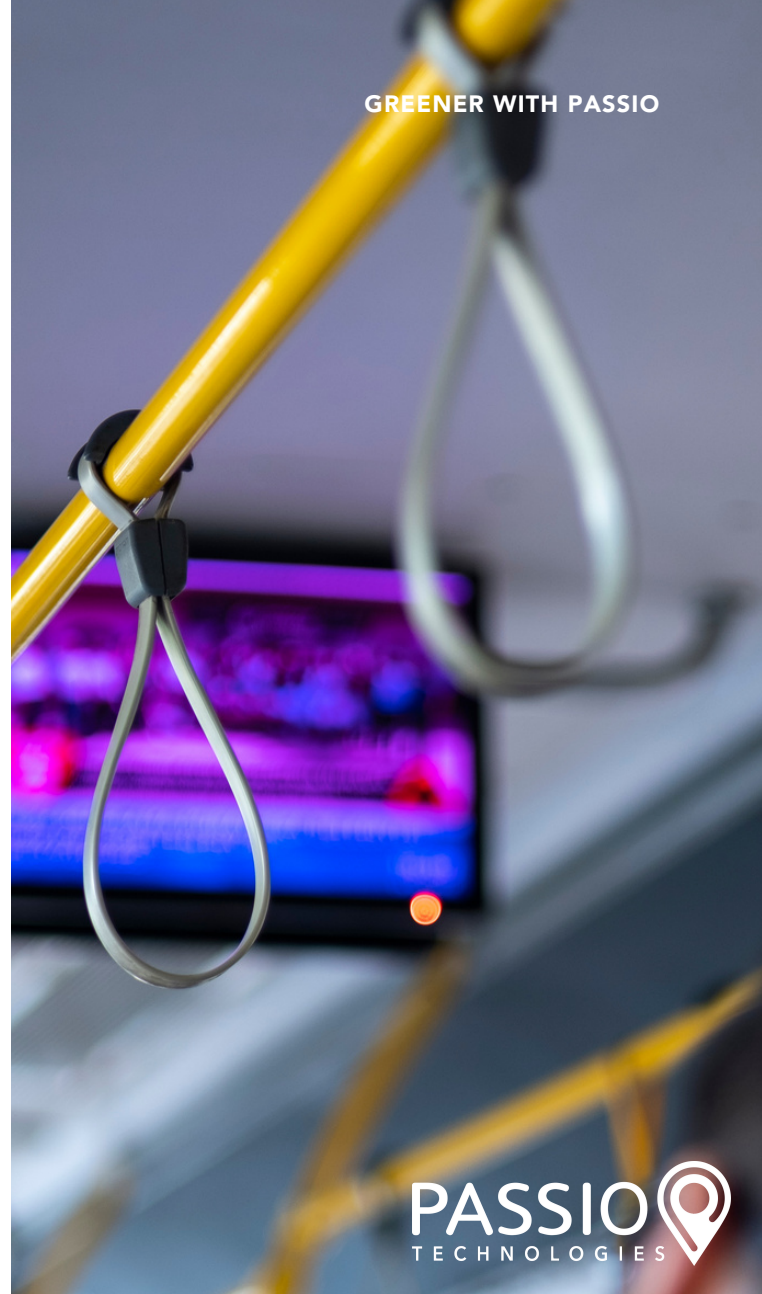
**Buses rock. While 29% of annual U.S. carbon emissions are attached to transportation, only a tiny fraction of that comes from buses, which leads to certain apparent conclusions:**

If more people switch to cost-effective public transit—with a far smaller (per capita) carbon footprint than cars—carbon emissions will naturally decrease. As they will when those transit systems are “greener” (i.e., biodiesel, hybrid or electric). But, there’s one more step...

When those transit systems employ innovative technology that monitors and analyzes the operations of those fleets, and provides those agencies with actionable data, emissions drop even further—while both overall performance and customer service get a boost.

**U.S. Transportation GHG Emissions**  
(Tg CO<sub>2</sub> Equivalent)

Source									Change from 1990 to 2019	
	1990	2005	2015	2016	2017	2018	2019	Absolute	Percent	
<b>On-Road Vehicles*</b>	<b>1,206.8</b>	<b>1,647.4</b>	<b>1,510.5</b>	<b>1,534.6</b>	<b>1,540.7</b>	<b>1,563.9</b>	<b>1,555.7</b>	<b>348.9</b>	<b>28.9</b>	
Passenger Cars	639.6	691.7	752.5	763.5	760.6	770.3	762.3	122.8	19.2	
Light-Duty Trucks	326.7	537.7	320.9	330.2	324.3	325.7	323.1	-3.6	-1.1	
Motorcycles	1.7	1.6	3.7	3.9	3.8	3.8	3.6	1.9	111.4	
Buses	8.5	12.3	19.6	19.1	20.6	22.0	22.2	13.7	162	
Medium- and Heavy-Duty Trucks	230.3	404.1	413.9	417.9	431.4	442.1	444.4	214.1	92.9	
<b>Aircraft</b>	<b>189.2</b>	<b>193.6</b>	<b>160.5</b>	<b>169.0</b>	<b>174.8</b>	<b>175.5</b>	<b>181.1</b>	<b>-8.1</b>	<b>-4.3</b>	
Commercial Aviation	110.9	134.0	120.1	121.5	129.2	130.8	135.4	24.5	22.1	
Military Aircraft	35.3	19.5	13.6	12.4	12.3	11.9	12.0	-23.3	-66.1	
General Aviation	42.9	40.1	26.8	35.1	33.3	32.8	33.7	-9.3	-21.6	
<b>Ships and Boats</b>	<b>47.0</b>	<b>45.4</b>	<b>33.8</b>	<b>40.8</b>	<b>43.9</b>	<b>41.2</b>	<b>40.4</b>	<b>-6.6</b>	<b>-14.0</b>	
Rail	35.8	46.6	40.3	36.8	38.1	39.9	37.6	1.8	4.9	
Pipelines <sup>†</sup>	36.0	32.4	38.5	39.2	41.3	49.9	53.7	17.7	49.2	
Lubricants	11.8	10.2	11.0	10.4	9.6	9.2	8.9	-3.0	-24.9	
<b>Transportation Total</b>	<b>1,526.6</b>	<b>1,975.6</b>	<b>1,794.6</b>	<b>1,830.7</b>	<b>1,848.3</b>	<b>1,879.6</b>	<b>1,877.4</b>	<b>350.8</b>	<b>23.0</b>	



**PUBLIC TRANSIT HAS A FAR LOWER PER CAPITA CARBON FOOTPRINT THAN CARS, LOWER STILL WITH ELECTRIC OR HYBRID BUSES, AND EVEN LOWER WHEN COMBINED WITH INNOVATIVE TRANSIT-TECHNOLOGY PLATFORMS.**

\*EPA chart, showing the small % of emissions generated by buses. From EPA.gov

### Buses Are Better

According to the Center for Climate and Energy Solutions, individuals can save close to \$10,000 by utilizing public transit instead of driving, adding, "Communities with strong public transportation can reduce the nation's carbon emissions by 37 million metric tons yearly."

In fact, if just one driver switched from a 20-mile, single-occupancy-vehicle commute to public transit, it would reduce their annual CO2 emissions by 48,000 pounds. Not to mention the huge reductions in gas consumption and road congestion.

The 2021 Bipartisan Infrastructure Law demonstrates that the federal government also sees the potential in public transit and its ability to further "decarbonization goals." It marks the largest investment in America's infrastructure in decades, with \$107 billion being earmarked for transit.

\$39 billion of that is specifically focused on public transit upgrades, including reducing maintenance backlogs; modernizing aging fleets with greener vehicles, upgrading infrastructure, and increasing accessibility.

### Next Stop: Greener Buses

While public transportation already contributes to lowering fuel emissions by reducing the number of vehicles on the road, low-emission vehicles take it to another level.

Bloomberg New Energy Finance predicts that nearly 60% of bus fleets will be electric in 2040. CALSTART, a nonprofit committed to clean, high-tech transportation industry, reports that demand for E-buses is outstripping supply, with hundreds of backlogged orders.

It's no mystery what's driving the trend: greater awareness of the environmental benefits (bolstered by government incentives).

Don't forget to consider increasingly lower-cost batteries, greater charging infrastructure, and bottom-line cost savings, and even the bean-counters are sold.

### Green Saves Green

Electric bus manufacturer New Flyer estimates that, over its lifespan, an electric bus could save \$400,000 in fuel costs, and \$125,000 in maintenance costs. Plus, they simply offer a better, cleaner transit experience: a lot less noise and vibration, and no exhaust.

When the current administration announced in January 2021 plans to eventually transform all government vehicles to electric, it not only promised to boost electric vehicles in general, but it also mirrored a trend already in motion. According to the 2021 Rocky Mountain Institute (RMI) report, 81% of "local and state governments, utilities, universities, private technology companies, and delivery services" have started electrifying their fleets.



A January 2022 SmartCitiesDive article noted that the number of electric buses on order or operating in the U.S. rose 112% from 2018 to 2021. California holds the #1 spot with nearly 1,400 electric buses on the road or on order, followed by Washington, New York, and Florida.

While major metros such as Austin, Seattle, Los Angeles, and Oakland are electric-bus leaders, even smaller cities like Portland (ME), Duluth (MN), and Gainesville (FL) are also jumping on the BEB (battery-electric bus) bandwagon.

MBTA in Boston averages a weekday ridership of 276,000 on 1,150 buses and 180 routes. In 2019, MBTA purchased five electric buses, with a goal of running an all-electric fleet by 2040.

### Greener Transit Gets Educated

Not surprisingly, transit systems on American college campuses often lead the charge for carbon neutrality. In 2009, 650 universities pledged to make measurable progress by 2020 towards lowering emissions—with nine schools reaching carbon neutrality in 2020.

Investments have included everything from buses running on biodiesel, biodiesel/electric hybrids or the newer zero-emission, all-electric vehicles.

Passio Technologies client, Harvard University made a recent move to replace a few of its biodiesel buses with battery-electric buses, making over 30% of its fleet zero-emission. In 2018, Harvard set a goal to eliminate the use of fossil fuels on its campus by 2050, and they're now on track to be carbon neutral by 2026.

Another Passio client, University of Georgia, currently boasts 30 all-electric buses—one of the "greenest" university fleets in the country—on its way to an all-electric fleet. Energy costs for the new zero-emission Proterra buses are reportedly about \$10 per bus per day (vs. \$100/day for their diesel buses), and yearly maintenance costs have plummeted by 2/3—from \$22,000 to roughly \$7,500 per bus.

According to UGA's TPS (Transportation and Parking Services), the new buses represent, "a tremendous step forward in reducing emissions and increasing opportunities for experiential learning and research."

### Greener Buses Make \$ense

For fleets considering the switch to BEBs (battery-electric buses), there are plenty of reasons to get into gear:

- Zero-emission BEBs deliver dramatic health benefits to riders and their communities.
- BEBs have longer driving ranges (on an overnight charge) than gas-powered buses, so transit routes can be longer, which will better serve riders.
- BEBs operate far more cheaply, thanks to substantial ongoing savings in gas, and with only 1/10th the number of parts of a regular engine, maintenance costs will plummet.
- When riders know their choices can help reduce their carbon footprint, they're more likely to choose mass transit.

### It's Not Always Easy Being Green

While the growing number of electric buses is certainly good news, the ride towards greener transit isn't always smooth. BEBs, while having less carbon emissions, still often tap a grid powered by fossil fuels but, over time, as those grids transition to more sustainable ones, overall emissions will drop.

Additionally, faulty connections between vehicles and chargers often meant charge reliability of 50% or less, but improving charger technology is boosting reliability to 90%+.

Then there's reduced battery range in cold climates like Boston, where more energy has to go to heating the bus, leaving less drive time before charging is required. But again, evolving technology and empirical experience leads to inevitable improvements.



Transit systems looking to "green" their fleets to electric (or hybrid vehicles) need to think long term. Translation: Far better to decide to convert an entire fleet to electric than just make incremental changes. The "piecemeal" approach, according to the RMI report discussed earlier, can cost agencies four times as much as a long-term strategy would, and, "you'll...wind up with more stranded assets."

Agencies that go "big" can reap economies of scale that will reduce vehicle and infrastructure costs, while streamlining both the processes of permitting and utility interconnection. However, according to the RMI report, "Done badly, it can be a series of very costly errors."

**Turbo-charge your “Electrifying” Decision**

A few things are clear: public transit is far greener than millions of solo drivers, and the “greening” of transit fleets everywhere is growing by leaps and bounds.

There’s one more step that transit agencies can take to dramatically enhance their decision to modernize their fleets: adopt a transit-technology solution that tracks your fleet’s operations, providing “good-as-gold” insights into how to improve performance.

One solid market offering is the online cloud-based tool, Passio Navigator, from Atlanta-based Passio Technologies.

**Navigator’s Electric Vehicle Dashboard:**

- Automatically calculates estimated savings in gas and maintenance (in \$); reduction in carbon footprint (vs. gas buses, which emit three times as much CO2); reduction in noise pollution; number of trees saved, and more.
- Tracks drivers and monitors their feedback on routes and electric vehicles. Managers can view each vehicle on a live map and see when they were last serviced and when they’ll require maintenance again.
- Generates invaluable fleet data that allows transit agencies to better understand their new fleets, which, in turn, drives better transit decision-making (e.g., to charge routes and stops)—decisions that ultimately can improve customer service, increase ridership, more effectively utilize resources, further reduce carbon emissions and save even more money.
- Offers measurable proof of an agency’s reduced impact on the environment, which can be used in marketing initiatives to green-conscious riders, to encourage even more riders to “get onboard.”



**Passio President Mitch Skyer states, “Passio is proud to be an agent of change towards electric transit. Solutions like ours will provide our customers with concrete evidence of money saved, carbon reduced, and their commitment to a cleaner world.”**

**Contact us to learn more about our new Electric Vehicle Dashboard and Passio Navigator at [www.passiotech.com](http://www.passiotech.com) or call 678-825-3456**

