

Transportation Evaluation and Carbon Reduction Tool (TEA-CART)

Examples of TEA-CART in Practice

This short paper illustrates the use of the Transportation Evaluation and Carbon Reduction Tool (TEA-CART), including descriptions of inputs for two hypothetical investment scenarios, which you can download and try for yourself.

“Starter Pack” Investment Scenarios (Try it Yourself):

- [Access TEA-CART](#) (Link takes you to the tool)
- Download Business as Usual Budget Scenario: [TEA-CART-starter_NJ-BAU.xlsx](#)
 - Upload this in TEA-CART using the "Upload User Inputs" option
- Download Multi-Modal Budget Scenario: [TEA-CART-starter_NJ-multi-modal.xlsx](#)
 - Upload this in TEA-CART using the "Upload User Inputs" option
- [TEA-CART User Guide and Methodology \(PDF\)](#)

Illustrative Investment Scenarios

To help demonstrate how TEA-CART works, we generated two different investment scenarios, each of which illustrates ways that different portfolios of investments result in different emissions outcomes. For each scenario, we assume a total budget of \$8 billion dollars in a five-year capital plan. Since emissions outcomes are not likely to be affected by many project types (e.g., bridge replacement, roadway reconstruction, or transit system repairs) we only accounted for \$4 billion worth of capital projects when conducting analysis with TEA-CART.

It's important to note that TEA-CART is designed to inform planning-stage decision making, before highly specific, project-level information is available. For project-level analysis [other tools](#) are available, like the [CMAQ Toolkit](#).

Business-as-Usual Budget Scenario

BAU Inputs:

The first illustrative scenario reflects an investment portfolio that is consistent with the status quo — or business as usual — in a state that is making substantial investments in vehicle electrification strategies. The following image is a screenshot of the funding table that is automatically generated by TEA-CART (in the Inputs/ Budget tab) to summarize levels of funding invested in the sixteen different project types available in the tool.

Funding Start Year: ⓘ	Total Years Covered: ⓘ	Total Budget (\$M) for 2026 - 2031:
2026	5	4000

Budget

No.	Funding Summary (Based on inputs provided in Budget Tables 1-15 below)	Million \$	% Allocated
1	Bicycle and Pedestrian Lane Miles of New Infrastructure	\$498.3	12.5%
2	Transit: Increased Fixed Route Service	\$0.0	0.0%
3	Transit: Increased Demand Response Service	\$0.0	0.0%
4	Transit: Fleet Electrification	\$294.1	7.4%
5	Bus Priority Treatment	\$0.0	0.0%
6	Public Transportation: Rail	\$0.0	0.0%
7	Travel Demand Management	\$11.8	0.3%
8	Micromobility	\$58.8	1.5%
9	Traffic Operations	\$29.4	0.7%
10	Medium- and Heavy-Duty Vehicle Replacement	\$588.2	14.7%
11	Park-and-Ride	\$11.8	0.3%
12	Charging Infrastructure and EV Incentives	\$472.2	11.8%
13	Freight Intermodal Facilities	\$235.3	5.9%
14	Roadway Expansion	\$1,800.0	45.0%
15	Roadway Resurfacing	\$0.0	0.0%
16	Land Use	\$0.0	0.0%
	Total	\$4,000.0	100.0%

As you can see, TEA-CART accepts inputs for a variety of different capital project types:

- 1) Active transportation and transit service expansion:** Investments in multi-modal transportation help to reduce vehicle-miles traveled (VMT) by providing more travel options, as alternatives to single-occupancy vehicle use. In this BAU scenario, we assumed substantial investments in pedestrian and bicycling infrastructure, but no new transit services. This reflects the status quo in most states, where capital budgets for transit are primarily dedicated to maintaining the existing system. Transit services are generally only expanding in a few places (e.g., [Colorado](#), [Illinois](#) and [Washington](#)) where legislatures have committed to policies and dedicated investments in such projects.
- 2) System Efficiency:** Transportation capital plans typically include projects designed to [increase the efficiency](#) of roadways and transportation systems, more generally. Efficiency strategies in TEA-CART include traffic operations, such as improving traffic flow at intersections through resignalling or installing roundabouts. While these

investment strategies generally have the net effect of reducing emissions, they can also induce additional travel, which increases VMT. Other efficiency strategies include investments in freight intermodal facilities and roadway resurfacing (which we did not include in the emissions analysis for this BAU scenario¹).

- 3) **Vehicle Electrification:** To reduce emissions and prepare for future demands – and to take advantage of federal [funding](#) — electrification strategies have become a more common feature in many state transportation capital plans (e.g. In [Massachusetts](#), [Virginia](#), [Washington](#)). TEA-CART allows inputs of several different project types and this BAU scenario assumes investments in transit bus electrification, public charging infrastructure, and incentives for private fleets to replace diesel trucks with electric alternatives.²
- 4) **Roadway Expansion:** Most state capital plans include substantial levels of investment in projects that [expand](#) roadway capacities. It is [well-established](#) that these types of investments induce demand for vehicle travel, and, therefore lead to greater future emissions.

Links:

The BAU investment scenario spreadsheet: [TEA-CART-starter_NJ-BAU.xlsx](#)

- You can see the details by downloading this file, then uploading it to TEA-CART using the "Upload User Inputs" option

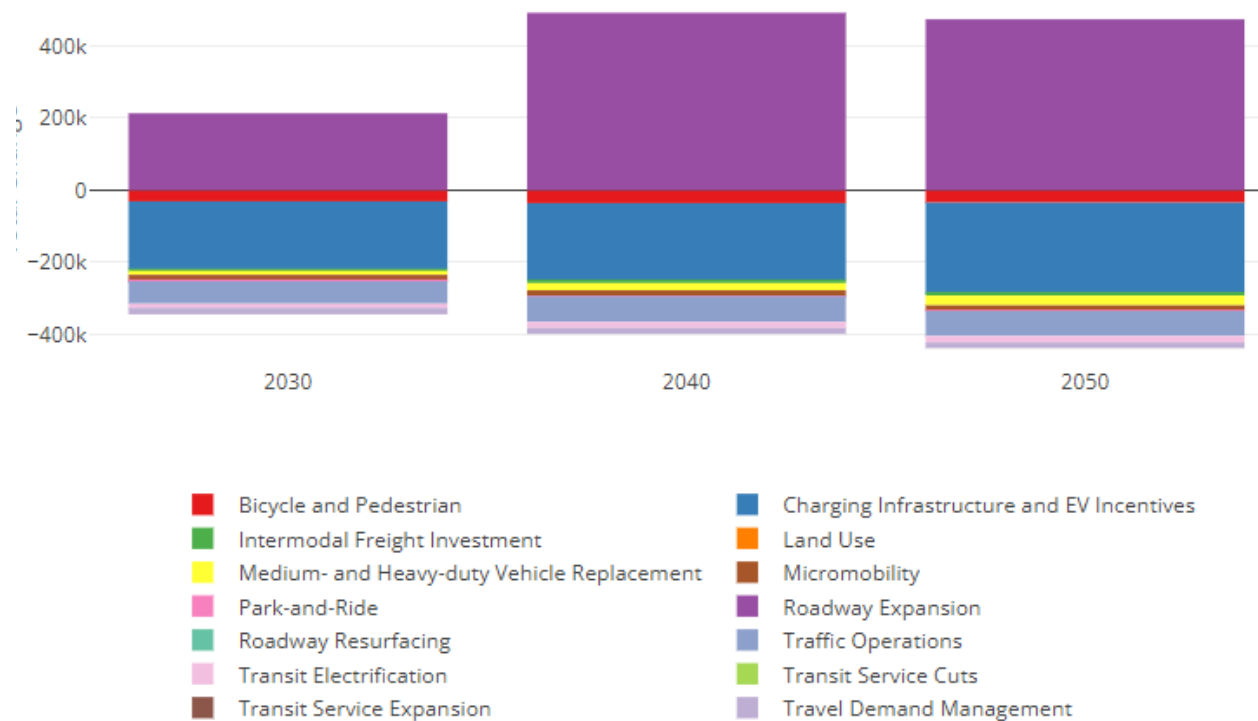
[TEA-CART User Guide and Methodology Documentation \(PDF\)](#)

BAU Scenario Outputs

The following stacked bar chart illustrates estimated changes in emissions (metric tons of carbon dioxide equivalent) at three different, user-selected time horizons (in this case, 2030, 2040, and 2050). This shows the Strategy Summary tab in TEA-CART, which attributes changes in emissions (in this case, tons of carbon dioxide equivalent) to each type of project in the BAU scenario.

¹ In this scenario, we assumed that roadway resurfacing is only occurring to a modest extent, consistent with [levels necessary to maintain current](#) road conditions. Therefore, we didn't account for the emissions benefits of those investments in our analysis of this particular scenario.

² Examples of investments in these project types can be found on the CMAQ Project Dashboard, here: https://www.fhwa.dot.gov/environment/air_quality/cmaq/reference/maps/



The above graph shows that projected emissions in the BAU scenario are close to breaking even, i.e. no net change in emissions relative to a no-new-investment scenario. In other words, increases in emissions from investments in roadway expansions are projected to roughly offset emission reductions resulting from investments in vehicle electrification and various projects that increase multi-modal transportation options and increase system efficiency.

In addition to the graphic, shown above, TEA-CART also provides detailed output tables, including net changes in emissions for each of the horizon years (i.e. 2030, 2040 and 2050). Other outputs include changes in emissions of NO_x, PM_{2.5}, plus VMT, and active daily trips. Output tables also include estimates for the relative cost-effectiveness of different investment strategies, from a CO₂e emissions perspective.

Multi-Modal Budget Scenario

Multi-Modal Inputs:

For the second, hypothetical scenario, we assumed only 5% of investments were made in capacity expansion projects and that investment decisions placed a higher priority on roadway maintenance and increasing multi-modal transportation options. The following image shows the funding summary table generated by TEA-CART for this alternative investment scenario.

Funding Start Year: ⓘ	Total Years Covered: ⓘ	Total Budget (\$M) for 2026 - 2031:
2026	5	4000

Budget			
No.	Funding Summary (Based on inputs provided in Budget Tables 1-15 below)	Million \$	% Allocated
1	Bicycle and Pedestrian Lane Miles of New Infrastructure	\$804.4	20.1%
2	Transit: Increased Fixed Route Service	\$360.0	9.0%
3	Transit: Increased Demand Response Service	\$140.0	3.5%
4	Transit: Fleet Electrification	\$294.1	7.4%
5	Bus Priority Treatment	\$0.0	0.0%
6	Public Transportation: Rail	\$140.0	3.5%
7	Travel Demand Management	\$28.0	0.7%
8	Micromobility	\$160.0	4.0%
9	Traffic Operations	\$29.4	0.7%
10	Medium- and Heavy-Duty Vehicle Replacement	\$588.2	14.7%
11	Park-and-Ride	\$83.5	2.1%
12	Charging Infrastructure and EV Incentives	\$472.2	11.8%
13	Freight Intermodal Facilities	\$260.0	6.5%
14	Roadway Expansion	\$200.0	5.0%
15	Roadway Resurfacing	\$200.0	5.0%
16	Land Use	\$240.0	6.0%
	Total	\$4,000.0	100.0%

Here are some of the ways that this alternative scenario differs from the BAU scenario:

- 1) **Active transportation and transit service expansion:** In this multi-modal scenario, we assumed greater levels of investment in pedestrian and bicycling infrastructure, in addition to substantial investments in new transit services. This includes new fixed route bus service, new rail service, increased paratransit (i.e., demand response), bus priority treatment, (i.e., Bus Rapid Transit), and also microtransit (i.e., e-bike purchase incentives).
- 2) **System Efficiency:** For the multi-modal scenario, we assumed the same levels of investment in most strategies, but, with a greater emphasis on roadway maintenance, we assumed a 5% increase (greater-than-BAU levels) of investment in roadway resurfacing strategies.
- 3) **Vehicle Electrification:** For this scenario, we kept levels of investment in vehicle electrification unchanged, compared to BAU.
- 4) **Roadway Expansion:** As noted above, for this hypothetical scenario, we assumed 5% of investments were kept for roadway expansion.
- 5) **Land use:** For this multi-modal investment scenario, in addition to the investments in new transit services, noted above, we also applied TEA-CART's "Land Use Multiplier to Transit Investment" (in the Baseline tab) and then assumed that 6% of investments were directed toward incentives for local zoning reforms to enable mixed-use and transit-oriented development.

Links:

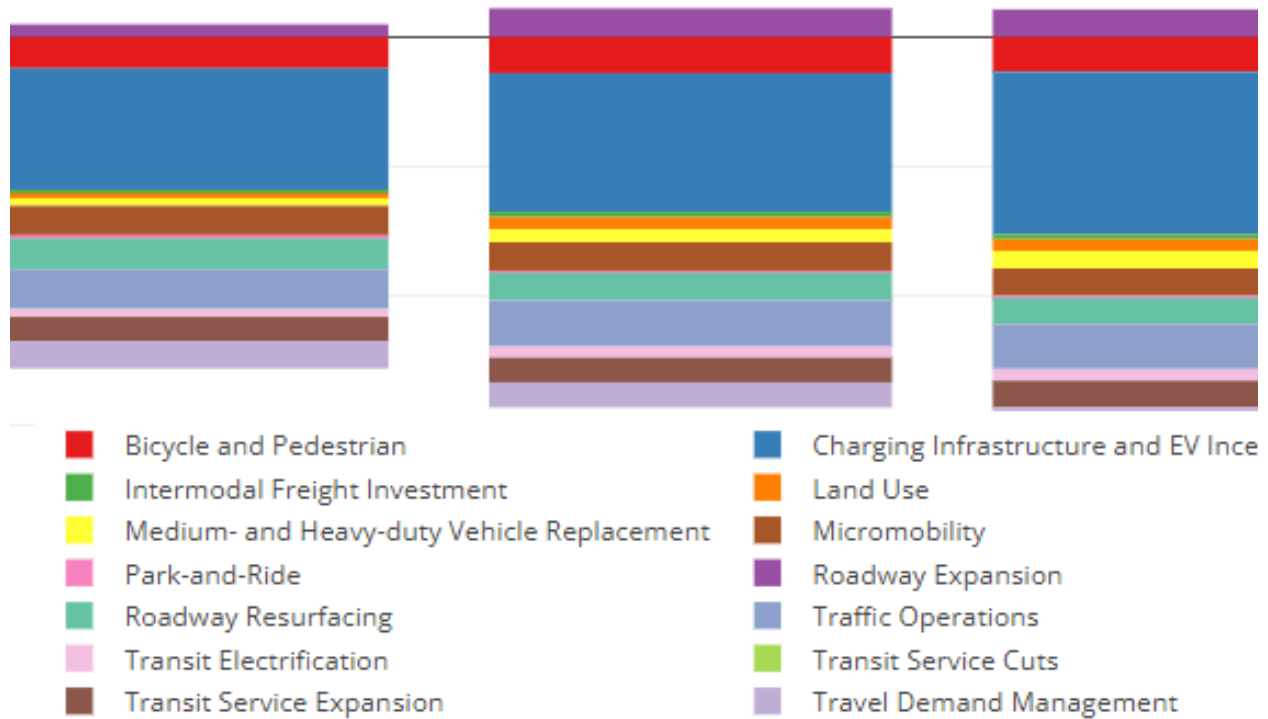
Multi-modal investment scenario spreadsheet: [TEA-CART-starter_NJ-multi-modal.xlsx](#)

- You can see the details by downloading this file, then uploading it to TEA-CART using the "Upload User Inputs" option

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Multi-Modal Scenario Outputs

The following stacked bar chart illustrates estimated changes in emissions (metric tons of carbon dioxide equivalent) at three different, user-selected time horizons. This shows the Strategy Summary tab in TEA-CART, which attributes changes in carbon dioxide emissions to each type of project in the Multi-Modal scenario.



The above graph shows that future emissions under this multi-modal investment scenario are projected to achieve a net reduction in annual carbon dioxide emissions by roughly 600,000 tons by 2030 and thereafter. These emission reductions would result from the decision to minimize investments in capacity expansion projects while redirecting highway funding toward strategies that accelerate vehicle electrification and expand multi-modal transportation options.