DEPARTMENT OF TRANSPORTATION

Carbon Emissions Tool (CET)

Instructions and Tips

Version: April 22, 2024

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About the CET

The Carbon Emissions Tool (CET) is a spreadsheet tool developed by MnDOT to estimate the carbon emission reductions associated with transportation project investments. The CET may be used to estimate emissions reductions associated with a wide variety of transportation projects.

For applicants seeking funding under the Carbon Reduction Program (CRP), the CET is used as part of the application process. Applicants input information about their proposed projects and use the tool to calculate the estimated cumulative carbon emissions benefits (in metric tons of CO2e) and cost-effectiveness (in dollars per metric ton of CO2e reduced) of those projects. This information, along with information on the co-benefits of these projects, is then used to prioritize projects for CRP funding.

Outside of the CRP application process, the CET may be used to calculate the carbon emission reductions of various transportation projects. Consequently, the CET includes project types that are CRP-eligible and project types that are not CRP-eligible, but eligible for other federal or state funding sources.

Overview of the components of the CET

The CET enables the user to calculate the carbon emissions benefits of 26 transportation project types falling under the Minnesota Carbon Reduction Strategy (CRS) categories of Electrification, Travel Options and Low Carbon Infrastructure and System Management.

The spreadsheet includes individual calculation tabs for specific types of projects. These calculation tabs allow the user to input information about the project to calculate the carbon emissions benefits of the project.

The first three dark green tabs labeled 'Overview', 'Mapping' and 'Results Summary' are where users will likely start and end the analysis. The 'Overview' tab provides descriptions, definitions and examples of project types contained within the tool (Figure 1). The 'Mapping' tab provides information on which project-type calculation tab to use depending on the project (Figure 2). Finally, the 'Results Summary' tab provides the emissions calculation results after a user completes emissions reduction calculations on the project-specific tab or tabs (Figure 3). On the 'Results Summary' tab, users will also be able to input the overall cost of the project, and the CET will determine the cost-effectiveness of the project.

Figure 1. Preview of the Overview tab, Minnesota CET 2024

OVERVIEW OF STRATEGIES

	Project Type	Definition	Example
Electrification			
E1	Expand public EV charging infrastructure network for light duty vehicles	Install public electric vehicle charging stations (EVCS), including both level 2 (L2) and direct-current fast chargers (DCFC) for light duty vehicles (LDVs)	• Install Level 2 chargers for light-duty electric vehicles • Install DCFC chargers for light-duty electric vehicles
E2	Deploy charging infrastructure for medium- and heavy-duty freight vehicles	Install public and depot electric vehicle charging stations (EVCS) for medium- and heavy-duty (MD/HD) vehicles	• Install Level 2 chargers for MD/HD electric vehicles • Install DCFC chargers for MD/HD electric vehicles • Install megawatt charging system (MCS) for MD/HD electric vehicles
E3	Purchase or lease battery electric transit buses	Purchase or lease battery electric buses (BEB) to replace conventional diesel-powered buses; this equipment replacement does not account for any changes related to service coverage, ridership, etc. If the nature of bus service changes, please refer to projects T5 - T10, and T15.	• Replace transit buses powered by gasoline, diesel, natural gas, or other internal combustion engines with electric buses
E4	Purchase or lease battery electric school buses	Purchase or lease battery electric buses (BEB) to replace conventional diesel-powered school buses; this equipment replacement does not account for any changes related to service coverage, ridership, etc.	• Replace school buses powered by gasoline, diesel, natural gas, or other internal combustion engines with electric buses
E5	Transition public fleet through purchase & lease of ZEVs	Purchase or lease zero emissions vehicles (ZEVs) to replace gasoline, compressed natural gas (CNG), and diesel-powered vehicles in a public fleet	• Replace police vehicle powered by gasoline, diesel, natural gas, or other internal combustion engines with electric vehicles. • Replace refuse trucks powered by gasoline, diesel, natural gas, or other internal combustion engines with electric trucks. • Replace utility vehicles powered by gasoline, diesel, natural gas, or other internal combustion engines with electric vehicles.
E6	Initiate ZEV or EV sharing programs.	Implement an electric carshare program; this tool only accounts for primary program benefits due to displaced vehicle miles traveled (VMT) from the program itself and does not include any induced EV purchase. Secondary benefits can be quantified using project T15.	• Launch a community car share program with a 10-vehicle EV fleet.
Travel Options and System Management			
T1	Construct or improve bicycle network	Add bicycle facilities to improve bicycling conditions, displacing vehicle travel by encouraging bicycling instead	• Construct a new bike path along a roadway • Construct a new bike trail that aims to reduce community vehicle miles traveled (VMT) • Convert an on-road bike lane to a separated bikeway
T2	Construct or improve pedestrian network	Add pedestrian facilities to improve the area's walkability, reducing vehicle travel through modal shifts; this methodology requires applicants to acquire information on existing streets within 0.6 mile of the project area. If such information is not available, please refer to project T15 instead.	• Expand the existing pedestrian network • Construct a new sidewalk in the community
T3	Establish or expand micromobility programs	Implement a micromobility program, including e-scooters, e-bicycles, and traditional pedal bicycles	• Expand the current micromobility (bicycles, e-scooter) program • Launch a new micromobility (bicycles, e-scooter) program
T4	Improve street connectivity	Improve street connectivity to reduce the trip distance between a pair of origin and destination	• Increase intersection density in a community • Construct new intersection
T5	Implement Bus Rapid Transit (BRT) systems with dedicated lanes and stations	Implement dedicated lanes and stations for Bus Rapid Transit (BRT) systems, with additional services such as a limited number of stops, intelligent transportation technology (e.g., transit signal priority), advanced technology vehicles, efficient fare payment and branding of the system; this calculation does not require users to provide ridership increase on their own.	• Improve current service with a dedicated all-day bus lane • Construct dedicated stations for the current service • Provide passenger amenities at stations of the current service
T6	Implement bus transit priority treatments	Implement bus transit priority treatments to reduce the travel times and reliability of transit systems by implementing a combination of roadway infrastructure and traffic signal improvements; this calculation requires users to provide ridership increase on their own.	• Convert a conventional transit service to BRT • Implement a combination of multiple measures that result in service ridership improvement without increasing bus mileage
T7	Add or expand bus service	Expand or add bus service in a region to improve the transit coverage area, providing transit service to more people	• Add new local fixed route, bus rapid transit, or demand response services. • Expand coverage and service area of existing local fixed route, bus rapid transit, or demand response services.
T8	Enhance bus frequency or hours of service	Increase bus frequency to reduce wait time for transit users, making bus use more convenient	• increase service frequencies of existing local fixed route, bus rapid transit, demand response, commuter bus, or commuter rail services during a certain time period
T9	Establish or expand intercity bus services	Build or expand intercity bus services allows passengers to use transit to travel between cities rather than using personal light-duty vehicles (LDV)	• Add new intercity or commuter bus services (long-distance bus service). • Expand coverage of existing intercity or commuter bus services (long-distance bus service).
T10	Develop or improve intercity passenger rail service	Develop or improve intercity passenger rail services to provide efficient and comfortable intercity travel options	• Add new intercity or commuter rail services. • Expand coverage of existing intercity or commuter rail services.
T11	Construct, expand, or enhance park and ride facilities	Construct park and ride facilities near transit or high-occupancy vehicle lanes, encouraging people to use transit or car- and van-pooling	• Construct a new park-and-ride facility with 100 parking spaces
T12	Construct roundabout to improve traffic flow	Add a roundabout to an existing 4-way signalized intersection to significantly reduce drivers' travel delays	• Add a roundabout facility at an intersection
T13	Construct left turn lane to improve traffic flow	Add two-way left turn lanes to an existing un-divided roadway to significantly reduce drivers' travel delays	• Add two-way left turn lanes at an intersection
T14	Synchronize traffic signals to reduce delay time	Synchronize traffic signals to reduce travel times that would decrease systemwide emissions	• Synchronize traffic signals along a corridor
T15	Reduce Auto VMT (Generic)	Reduce vehicle miles traveled (VMT) from light-duty and/or medium/heavy-duty vehicles; Any projects that do not fit under E1-E6 or T1-T14 could use this method instead	• Any project that reduces light-duty auto vehicle trips • Any project that reduces medium/heavy-duty vehicle trips
Low Carbon Infrastructure Projects			
LC1	Use low carbon materials in road construction and maintenance	Use low carbon materials in the construction process to minimize carbon footprint of transportation construction and maintenance projects	• Sustainable asphalt
LC2	Recycle pavement on construction sites	Recycle pavement on construction sites	• Pavement recycling
LC3	Replace street lighting and traffic control devices with LEDs	Replace existing street lighting or traffic lights with higher efficiency LED lighting	• Replace a traffic light with LED
Renewable Energy Projects			
RE1	Implement renewable energy projects in highway right-of-way	Install new renewable electricity generation assets in the right-of-way for highway transportation projects	• Install solar panels at highway right-of-way
RE2	Install solar panels on transit stations, rest stops, parking, and other facilities	Install solar panels in spaces controlled by transportation agencies as a means of producing low-cost and low carbon electricity for those spaces and the surrounding grid	• Install a solar panel at a transit hub

Overview | Mapping | Results Summary | E1 LD EV Chargers | E2 MHD EV Chargers | E3 Electric Transit Buses | E4 Electri

Figure 2. Preview of the Mapping tab, Minnesota CET 2024

	Calculator Strategy	CRS Category	CRS Strategy	CRS Project Type
E1	Expand public EV charging infrastructure network for light duty vehicles	Electrification	Install EV charging infrastructure	• Expand public EV charging infrastructure network for light duty vehicles
E2	Deploy charging infrastructure for medium- and heavy-duty freight vehicles	Electrification	Install EV charging infrastructure	• Implement public and depot EV charging infrastructure for transit buses • Provide EV charging infrastructure grants for school districts • Deploy public/shared private charging infrastructure for medium and heavy-duty freight vehicles
E3	Purchase or lease battery electric transit buses	Electrification	Purchase/lease EVs or other ZEVs	• Zero emission transit buses
E4	Purchase or lease battery electric school buses	Electrification	Purchase/lease EVs or other ZEVs	• Zero emission school buses
E5	Transition public fleet through purchase & lease of ZEVs	Electrification	Purchase/lease EVs or other ZEVs	• Transition public fleet (e.g., vehicles operated by municipalities, such as police vehicles or fleet vehicles) through purchase and lease of ZEVs or Evs
E6	Initiate ZEV or EV sharing programs.	Electrification	Purchase/lease EVs or other ZEVs	• Initiate ZEV or EV sharing programs (e.g., making ZEVs or EVs accessible to more people without the commitment of ownership)
T1	Construct or improve bicycle network	Travel Options	Install and maintain infrastructure network improvements for walking, rolling and bicycling	• Construct or improve bicycle network (e.g., add on-street bike lane, add protected bike lane/separated bikeway, shared use paths, trails)
T2	Construct or improve pedestrian network	Travel Options	Install and maintain infrastructure network improvements for walking, rolling and bicycling	• Construct or improve pedestrian network (e.g., add sidewalks, expand sidewalks, fill gaps in sidewalk network, shared use paths, trails) *[Note: This methodology is primarily designed for sidewalk/path network improvements, and may not be applicable for some types of pedestrian connections such as connection to a transit station or activity center, which may require off-tool calculation]*
T3	Establish or expand micromobility programs	Travel Options	Install and maintain infrastructure network improvements for walking, rolling and bicycling	• Establish or expand micromobility programs (e.g., bicycle sharing stations, scooter sharing program)
T4	Improve street connectivity	Travel Options	Implement context sensitive design for travel options	• Improve street connectivity (e.g., increasing vehicle intersection density allowing shorter and more efficient trips between destinations, reducing travel times and congestion)
T5	Implement Bus Rapid Transit (BRT) systems with dedicated lanes and stations	Travel Options	Add high-capacity public transit options (operations & capital)	• Implement Bus Rapid Transit (BRT) systems that use dedicated lanes and stations with off-board fare collection to provide faster and more efficient service
T6	Implement bus transit priority treatments	Travel Options	Add high-capacity public transit options (operations & capital)	• Implement bus transit priority treatments (e.g., transit signal priority to reduce travel time and enhance reliability, infrastructure improvements such as bus only lanes during certain hours)
T7	Add or expand bus service	Travel Options	Add high-capacity public transit options (operations & capital)	• Expand or add bus service (e.g., expanded coverage area, new bus routes or on-demand services) *[Note: Only transit capital projects are eligible for CRP funding, not transit operations]*
T8	Enhance bus frequency or hours of service	Travel Options	Add high-capacity public transit options (operations & capital)	• Enhance bus frequency or hours of service *[Note: Only transit capital projects are eligible for CRP funding, not transit operations]*
T9	Establish or expand intercity bus services	Travel Options	Add intercity and regional public transit options (operations & capital)	• Establish or expand intercity bus services that connect different towns and cities *[Note: Only transit capital projects are eligible for CRP funding, not transit operations]*
T10	Develop or improve intercity passenger rail service	Travel Options	Add intercity and regional public transit options (operations & capital)	• Develop and improve intercity passenger rail service *[Note: Only transit capital projects are eligible for CRP funding, not transit operations]*
T11	Construct, expand, or enhance park and ride facilities	Travel Options	Add intercity and regional public transit options (operations & capital)	• Develop mobility hubs (e.g., stations that connect transit routes to other travel options and between regions considering land use and amenities, stations that include park and ride facilities to encourage commuters to leave vehicles and use transit)
T12	Construct roundabout to improve traffic flow	Low-Carbon Infrastructure and System Management	Optimize transportation system management and operations	• Implement intersection improvements (e.g., roundabouts, turn lanes)
T13	Construct left turn lane to improve traffic flow	Low-Carbon Infrastructure and System Management	Optimize transportation system management and operations	• Implement intersection improvements (e.g., roundabouts, turn lanes)
T14	Synchronize traffic signals to reduce delay time	Low-Carbon Infrastructure and System Management	Optimize transportation system management and operations	• Implement traffic signal improvements to reduce delays and improve traffic flow (e.g., adaptive traffic signal systems that adjust signal timings based on real-time traffic conditions, signal coordination)
T15	Other projects that reduce vehicle miles travel (VMT) by fossil fueled vehicles	Travel Options	Multiple strategy types	This calculation tab may be used to calculate the carbon emissions benefit of any project that reduces light-duty or medium/heavy-duty vehicle travel in conventionally fueled vehicles. The user must conduct an off-model calculation of the VMT reduction as an input. This calculation may be used for any of the types of project options listed in the table below, or as an alternative to using the calculation procedures on other tabs if there are unique factors that should be accounted for. **[See table below]**
LC1	Use low carbon materials	Low-Carbon Infrastructure and System Management	Utilize low-carbon transportation infrastructure and construction	• Use low carbon materials and recycled materials in the construction process to minimize carbon footprint of transportation construction/maintenance projects (e.g., sustainable asphalt)
LC2	Recycle pavement on construction sites	Low-Carbon Infrastructure and System Management	Utilize low-carbon transportation infrastructure and construction	• Recycle pavement on construction sites (e.g., maximize the amount of recycled pavement used on a construction site)
LC3	Replace street lighting and traffic control devices with LEDs	Low-Carbon Infrastructure and System Management	Utilize low-carbon transportation infrastructure and construction	• Replace street lighting and traffic control devices with energy-efficient alternatives (e.g., LED lighting)
RE1	Implement renewable energy projects in highway right-of-way	Low-Carbon Infrastructure and System Management	Support renewable energy generation	• Implement renewable energy projects in highway right-of-way
RE2	Install solar panels on transit stations, rest stops, parking, and other facilities	Low-Carbon Infrastructure and System Management	Support renewable energy generation	• Implement solar panels or other renewable energy generation on transit stations, rest stops, parking and other facilities.

Overview | Mapping | Results Summary | E1 LD EV Chargers | E2 MHD EV Chargers | E3 Electric Transit Buses | E4 Electric School Buses | E5 Public EV Fleet | E6 EV Car

Figure 3. Preview of the Results Summary tab, Minnesota CET 2024

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	Strategy	Year 1 emissions reduction (CO2 e MT per year)	Cumulative emissions reduction (CO2 e MT)	Total Costs ($) USER INPUT REQUIRED	Cost Effectiveness ($/MT)
E1	Expand public EV charging infrastructure network for light duty vehicles				
E2	Deploy charging infrastructure for medium- and heavy-duty freight vehicles				
E3	Purchase or lease battery electric transit buses				
E4	Purchase or lease battery electric school buses				
E5	Transition public fleet through purchase & lease of ZEVs				
E6	Initiate ZEV or EV sharing programs.				
T1	Construct or improve bicycle network				
T2	Construct or improve pedestrian network				
T3	Establish or expand micromobility programs				
T4	Improve street connectivity				
T5	Implement Bus Rapid Transit (BRT) systems with dedicated lanes and stations				
T6	Implement bus transit priority treatments				
T7	Add or expand bus service				
T8	Enhance bus frequency or hours of service				
T9	Establish or expand intercity bus services				
T10	Develop or improve intercity passenger rail services				
T11	Construct, expand, or enhance park and ride facilities				
T12	Construct roundabout to improve traffic flow				
T13	Construct left turn lane to improve traffic flow				
T14	Synchronize traffic signals to reduce delay time				
T15	Reduce vehicle miles traveled				
LC1	Use low carbon materials in road construction and maintenance				
LC2	Used recycled pavement on construction sites				
LC3	Replace street lighting and traffic control devices with LEDs				
RE1	Implement renewable energy projects in highway right-of-way				
RE2	Install solar panels on transit stations, rest stops, parking, and other facilities				
	Total	0.00	0.00	$0	$0

Overview | Mapping | Results Summary | E1 LD EV Chargers | E2 MHD EV Chargers | E3 Electric Transit Buses | E4 Electric School Buses | E5 Public EV Fleet | E6 EV Car Share | T1 Bicycle Network | T2 Pedestrian Network | T3 Micromobility | T4 Street Conne

The CET is generally intended to be used to analyze individual projects. That said, if a project contains multiple types of project elements that reduce carbon emissions, the user may input the project data on different tabs and see the results of the total project display on the 'Results Summary' tab.[1][2] If the project involves more than one project type strategy, users need to enter the cost components by strategy type so that the sum of all components equals the overall project cost and use the "**Total**" row to calculate for the overall emissions benefits.

Each project type tab within the calculator has three different sections: INPUTS, CONSTANTS & INTERIM CALCULATIONS and RESULTS. Directions are also provided on top of each tab to provide guidance on how to use the calculator.

Default values for some parameters are listed on each project type tab and filled in for the user. These defaults should be replaced by the user if more appropriate project-specific information is available.

[1] Note, however, if a user has multiple projects within a specific project category, the user will need to calculate each project separately with the tool and record each result in an alternative location.

[2] A project might have multiple components that could be analyzed on separate tabs and the "**Total**" row on the 'Results Summary' tab can then be used to sum the total cumulative emissions benefits and overall cost-effectiveness of the project.

Each tab also has a “Reset to Default” button to clear user input and start over with pre-populated default parameters.

Figure 4. Example project type tab showing directions and calculator layout, Minnesota CET 2024

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PROJECT TYPE: E1 – EXPAND PUBLIC EV CHARGING INFRASTRUCTURE NETWORK FOR LIGHT DUTY VEHICLES

DIRECTIONS:

Enter project data needed within the “**INPUTS**” section below. Note that default values are available for many inputs, which are shown to the right and are pre-populated in the calculator. You may replace the default values in the calculation with your own data if you have project-specific data. Click the “Reset to Default” button if you would like to go back to using all default values.

The “**CONSTANTS & INTERIM CALCULATIONS**” section shows assumptions that cannot be changed or interim results that are calculated by the tool based on the project input data.

The “**RESULTS**” section shows the results of the carbon emissions calculations, both estimated emission reductions in year 1 and cumulative emission reductions over the duration of the project.

INPUTS — Reset to Default

Variables		***Unit***	***Minnesota Region Default Value (For Reference Only)***
Year of project implementation		-	
Number of Level 2 Ports installed		-	
Number of DC Fast Ports installed		-	
Project lifetime	10	years	10
Level 2 charger power level	6.6	kW	6.6
DC fast charger power level	50	kW	50
Average L2 charger utilization rate	10.0%	percent	10%
Average DC fast charger utilization rate	5.0%	percent	5%
Annual hours in use of charging facility	8760	hours/year	8760

CONSTANTS & INTERIM CALCULATIONS

Variables	***Value***	***Unit***
Average EV energy efficiency	0.294	kWh/mi
Regional light-duty vehicle (LDV) fleet average GHG emission factor (Year 1)	#N/A	g CO2e/mi
Regional light-duty vehicle (LDV) fleet average GHG emission factor (average of project lifetime)	#N/A	g CO2e/mi

RESULTS

Variables	***Value***	***Unit***
Emissions reduction in year 1	#N/A	CO2 e MT per year
Cumulative emissions reduction	#N/A	CO2 e MT

Steps to use the CET

The following sections provide more information on steps to use the CET, things to consider when using the CET and tips for ensuring the most accurate results for purposes of project comparisons.

Step 1: Identify the project type for analysis in the CET

The first step in the process is to select the project type or types that align with the proposed project. Within the ‘Overview’ tab there is a list of example projects that fit within each project type.

Once a user selects a project type, the user can click the corresponding link or scroll through the project type calculator tabs. The full list of project types is within the 'Mapping' tab (see Figure 2).

What to do if your project type does not appear in the CET?

Note that several types of Electrification and Travel Options project types do not have their own calculation tab but emissions effects may be calculated using the 'T15 Reduce VMT' calculation tab. If the specific project type is not directly listed but the project is designed to reduce VMT from passenger vehicles or medium- or heavy-duty vehicles that are powered by internal combustion engines (e.g., through encouraging shifts to electric vehicles, transit, bicycling, walking, ridesharing, or other options) users may use the 'T15 Reduce VMT' tab. This project type tab requires users to calculate the light-duty and medium- or heavy-duty VMT that is anticipated to be reduced by the project outside of the tool. Then that VMT reduction value is input into the CET to calculate the emissions reduction.[3]

For the two types of CRS Low Carbon Infrastructure and System Management projects[4] whose emissions benefits cannot be captured by the 'T15 Reduce VMT' calculation tab in the CET, applicants should provide justification and the calculation methodology to quantify emission reductions in their application.

Step 2: Enter project-specific information

The next step is to enter the information about the project into the CET. There is inherently some uncertainty around these numbers, so it is appropriate to use estimates. Common project information that a user may need to prepare includes the following[5]:

- Year of project implementation
- Project lifetime
- Number of units being implemented (e.g., number of level 2 EV chargers, number of buses being converted to battery electric, number of EVs deployed in a program)
- Average annual vehicle miles traveled (VMT) of vehicles being replaced

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[3] CRP project applicants should document the methodology and assumptions that are used to estimate the VMT reduction level and include the information with their project application.

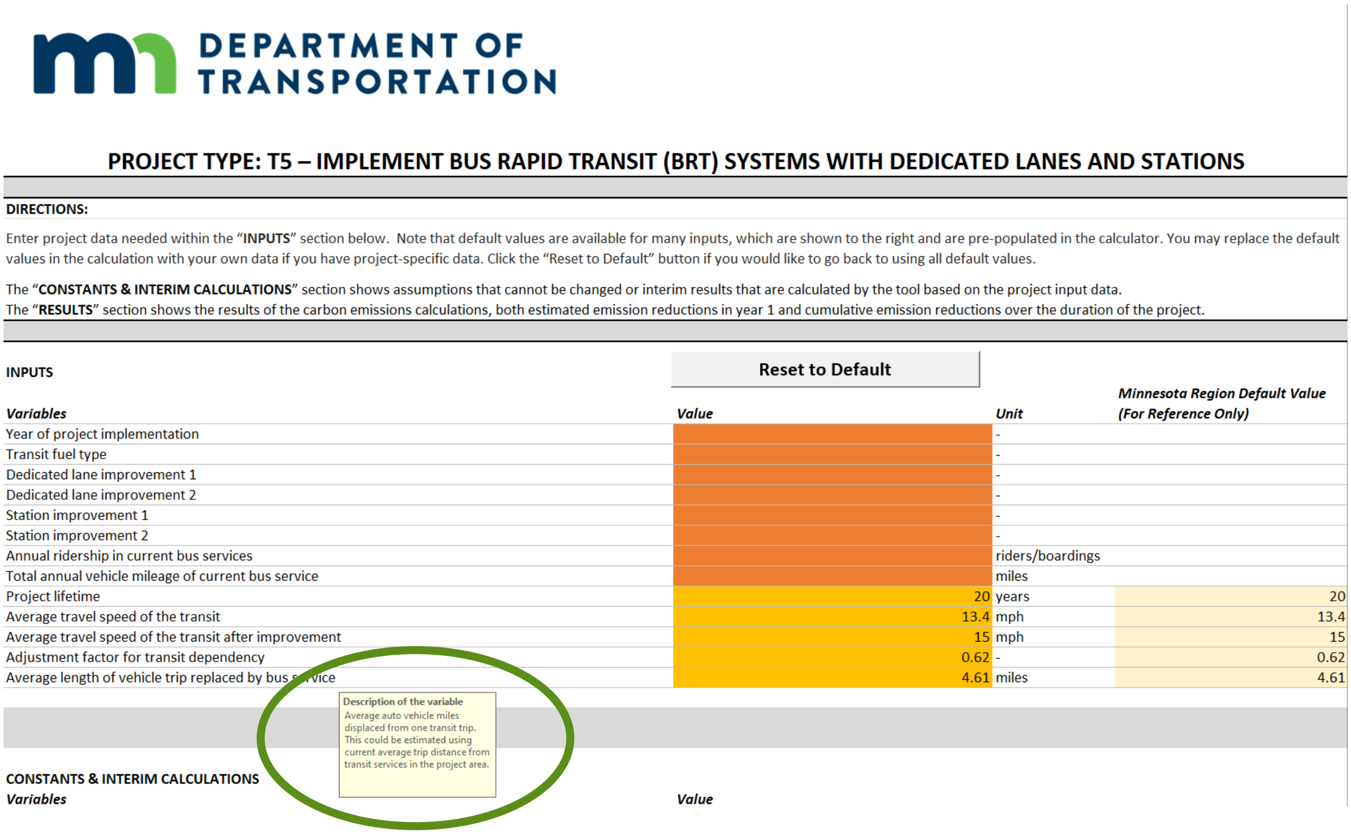
[4] These project types include "Invest in low-cost design and maintenance improvements and other operational programs to improve safety and address travel delays due to incidents, weather and other conditions" and "Increase the application of green infrastructure through projects (e.g., vegetation and roadside tree canopy)." Low-cost design and maintenance improvements and other operational programs may be analyzed by estimating the delay reduction associated with improvements and multiplying by an idling emissions factor. Green infrastructure projects would involve estimating the carbon sequestration benefits of vegetation. Note, that green infrastructure projects are not eligible for CRP funding.

[5] Note that these inputs are not exhaustive but rather a sample of inputs. See the specific project type tab or tabs for what specific information is required for the project the user is calculating.

- Facility information (e.g., project length, city/town type, type of facility, number of destinations within a certain distance, average annual days in use of facility)

For many project inputs, additional guidance is provided within the spreadsheet via pop-up boxes (Figure 5). More detailed information on the project calculations and project inputs can be found in Appendix D of the [2023 Minnesota CRS](), available at [Carbon Reduction Program (state.mn.us)]().

Figure 5: Example of a pop-up box describing a variable within a calculation, Minnesota CET 2024



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PROJECT TYPE: T5 – IMPLEMENT BUS RAPID TRANSIT (BRT) SYSTEMS WITH DEDICATED LANES AND STATIONS

DIRECTIONS:

Enter project data needed within the "**INPUTS**" section below. Note that default values are available for many inputs, which are shown to the right and are pre-populated in the calculator. You may replace the default values in the calculation with your own data if you have project-specific data. Click the "Reset to Default" button if you would like to go back to using all default values.

The "**CONSTANTS & INTERIM CALCULATIONS**" section shows assumptions that cannot be changed or interim results that are calculated by the tool based on the project input data.
The "**RESULTS**" section shows the results of the carbon emissions calculations, both estimated emission reductions in year 1 and cumulative emission reductions over the duration of the project.

INPUTS Reset to Default

Variables	***Value***	***Unit***	***Minnesota Region Default Value (For Reference Only)***
Year of project implementation		-	
Transit fuel type		-	
Dedicated lane improvement 1		-	
Dedicated lane improvement 2		-	
Station improvement 1		-	
Station improvement 2		-	
Annual ridership in current bus services		riders/boardings	
Total annual vehicle mileage of current bus service		miles	
Project lifetime	20	years	20
Average travel speed of the transit	13.4	mph	13.4
Average travel speed of the transit after improvement	15	mph	15
Adjustment factor for transit dependency	0.62	-	0.62
Average length of vehicle trip replaced by bus service	4.61	miles	4.61

Description of the variable
Average auto vehicle miles displaced from one transit trip. This could be estimated using current average trip distance from transit services in the project area.

CONSTANTS & INTERIM CALCULATIONS

Variables	***Value***

Developing appropriate inputs/assumptions

When developing the inputs for a given project, use project-specific data when available instead of the default value provided. Project-specific information provides the most accurate estimates of project-level impacts. When developing inputs, note the assumptions being made and the source of these assumptions. If local or project-specific data is not available, the default value can be used, as it is tailored to Minnesota wherever it was possible.

Also, some inputs are project-specific and do not have default values (e.g., number of buses, year of project implementation). These must be input by the user.

Estimating timeframe for duration of project emissions benefits

The duration of project benefits associated with the project is a key factor used to calculate cumulative emissions benefits.[6] Default lifetimes are available for most, but not all, project types (Table 1).

Table 1. Project lifetime defaults and sources, Minnesota CET 2024

Default Project Duration (yrs.)	Project Type	Project ID	Source
20	Bicycle/pedestrian/roadway (roundabouts, turn lanes)/BRT infrastructure, solar panels and renewable energy projects	T1, T2, T4, T5, T6, T10, T11, T12, T13, RE1, RE2	USDOT Benefit-Cost Analysis Guidance
14	Bus replacements (transit buses[7], school buses), heavy-duty vehicle replacements	E3, E4, E5	FTA Useful Life Benchmarks (ULB)
10	EV charging infrastructure, docked micromobility equipment, street lighting	E1, E2, LC3	Assumptions used by MnDOT for NEVI program for EV charging infrastructure; best available estimate on micromobilty from Minnesota
8	Light-duty vehicles in fleets or carsharing programs	E5, E6	FTA Useful Life Benchmarks; typical life of light-duty vehicles
7	Synchronized traffic signals	T14	USDOT Benefit-Cost Analysis Guidance
5	Dockless micromobility equipment	T3	Best available estimate on micromobility from Minnesota

For other project types that involve operational costs no default is provided. These include:

- Expand bus service or add new bus service (T7)
- Enhance bus frequency or hours of service (T8)
- Establish or expand intercity bus service (T9)
- Travel demand management programs and outreach (which may be analyzed off-tool and input into T15)

[6] Note that the maximum duration of project benefits calculated is 20 years, reflecting typical long range planning horizons.
[7] Transit bus useful life can differ based on body type and applications; according to the FTA ULB, although most buses (articulated, over-the-road, standard, double decked) have a useful life of 14 years, cutaway bus only has a useful life of 10 years, and trolley bus has a useful life of 13 years. Users may need to adjust this value on a case-by-case basis.

The lifetime of these projects should be selected to match the time period over which the project or program will be funded[8].

Low Carbon Infrastructure projects (e.g., use low carbon materials in road construction and maintenance, use of recycled pavement on construction sites), the emissions benefits account for lifecycle emissions.

What to do if the project does not seem to fit the parameters of the calculation in the CET?

Be aware that some types of projects may not fit exactly within the project type parameters in the CET.

VMT calculations

Many of the calculation methods in the CET for projects that reduce VMT (e.g., T1 through T10) are designed to calculate the impacts of a project on VMT.

> *Example:*
>
> *"T2 Pedestrian Network" project category methodology is designed primarily to analyze the addition of sidewalks within a community street network. It requires the following inputs to calculate the reduction in VMT:*
>
> - *Length of the new facility*
> - *Length of existing streets within 0.6 mile of the project area (to estimate the increase in the pedestrian network)*
>
> *The T2 project type is not applicable for certain types of pedestrian improvements. Two examples where T2 project type calculations are not appropriate are:*
>
> - *A pedestrian bridge crossing a highway. It would be better to examine the anticipated use of the bridge based on connections between activity centers to calculate the VMT reduction.*
> - *Pedestrian improvements around a transit station. This may yield larger VMT reductions than calculated in the CET by connecting people to transit and yielding greater VMT reductions from longer trips that include both walking and transit use.*

If the project calculation methodology does not fit well for a project that reduces VMT, users should estimate the VMT reduction outside of the CET and then use the "T15 Reduce VMT" calculation tab to calculate the carbon emissions reduction.

Characteristics outside available inputs

In some cases, a project may have characteristics that do not exactly fit the input parameters.

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[8] Note that transit operation costs are not an eligible expense for CRP funds.

Example:

"E1 LD EV Chargers" project category methodology asks for information about the number of Level 2 ports installed and number of DC fast ports installed and the power level of each. However, if the project involves Level 2 ports or DC fast ports with multiple different power levels, then you must average the power levels as an input to the tool.

Please use your best judgement to adjust the parameters for your project to be able to be used in the CET.

What about secondary impacts?

The CET calculates the direct impacts of transportation projects and does not calculate indirect or secondary impacts. It is important to be aware of this limitation.

Applicants for CRP funding may wish to qualitatively describe indirect impacts that may occur or in some cases may attempt to calculate these effects separately. If an applicant chooses to attempt to calculate the effects outside of the CET it is encouraged that the applicant provide justification and the calculation methodology in their application.

Example:

"E6 Initiate or Expand ZEV Carsharing Programs" accounts for reduced emissions from reduced VMT of those using the carshare program. It is possible that a ZEV carshare program may encourage consumers to shift to electric vehicles or zero emission vehicles (EVs/ZEVs) since people may have tried using a ZEV and may see more ZEVs on the road, and this may improve consumer confidence in the technology and lead to higher ZEV ownership in the region. Such secondary impact on reducing VMT by conventionally fueled vehicles could be estimated outside of the CET, such as by making an assumption about how many people might switch their vehicle purchase decisions in response. The reduced VMT from owners that switch to EVs could then be input into "T15 Reduce VMT" to calculate the additional emissions reduced by conventional vehicles that are replaced by ZEVs.

These figures are very uncertain, however, so caution should be used to carefully document assumptions and the research basis for such assumptions.

Table 2 identifies the direct project impacts that are calculated and the potential indirect or secondary impacts that are not calculated for several project types.

Table 2. Direct project impacts calculated and indirect or secondary impacts not calculated, Minnesota CET 2024[9]

Project ID	Project Types	Direct Project Impact Calculated	Indirect or Secondary Impact Not Calculated
E1, E2, E3, E4, E5, E6	EV charging infrastructure and replacement of conventional buses or fleet vehicles with EVs	Reduced emissions due to replacement of conventional fuel by EVs	Potential for EV charging infrastructure/buses/public fleets to encourage households or private sector fleets to switch from conventional fueled vehicles to EVs
T5, T6, T7, T8, T9, T10	Transit enhancements (BRT, bus priority treatment, new bus service, bus frequency improvements, intercity bus and passenger rail)	Reduced emissions due to mode shifts to transit	Potential for transit infrastructure or transit improvements to support land use changes and transit-oriented development that yields further vehicle trip reductions through more walking or biking trips and shorter trip distances
T12, T13, T14	Roundabouts, left turn lanes, traffic signal synchronization	Reduced emissions due to reduced vehicle delay	Potential for project to enhance pedestrian or bicycling environment as part of the project design Potential to induce additional vehicle travel (which would negate some of the emissions benefits)

Conducting off-tool analysis

Users that need to make calculations or assumptions outside of the CET should document their assumptions in the project funding application.

Calculating Changes in VMT by Conventional Vehicles

For projects using the 'T15 Reduce VMT' tab (Figure 6) the estimated reduction in VMT by conventional fossil fueled vehicles will need to be calculated separately. Users should document the assumptions used for the calculation, based on experience with similar projects or assumptions associated with the specific project.

Example: T1 Bicycle Network facility project

[9] Note that the project emission impacts calculated in the CET reflect a reduction in tailpipe emissions only and do not account for full life-cycle emissions. The following project types are exceptions and calculate the full life-cycle emissions in the CET: 'LC3 LED Street Lights', 'RE1 Renewable Energy', 'RE2 Solar Panels, and other low carbon infrastructure projects that are analyzed separately by MICE.

If users do not have inputs (i.e., average annual daily traffic (AADT) on the road parallel or adjacent to the facility) or have a better way to estimate the use of the facility and likely shifts from driving, users may explain how the estimated VMT from the project was estimated, instead of using the 'T1 Bicycle Network' tab.

Figure 6: T15 tab for Estimating VMT Reduction, Minnesota CET 2024

DEPARTMENT OF TRANSPORTATION

PROJECT TYPE: T15 - REDUCE VEHICLE MILES TRAVELED

DIRECTIONS:
Enter project data needed within the "**INPUTS**" section below. Click the "Reset to Default" button to clear all user input.
The "**CONSTANTS & INTERIM CALCULATIONS**" section shows assumptions that cannot be changed or interim results that are calculated by the tool based on the project input data.
The "**RESULTS**" section shows the results of the carbon emissions calculations, both estimated emission reductions in year 1 and cumulative emission reductions over the duration of the project.

Reset to Default

INPUTS

Variables	***Value***	***Unit***
Year of project implementation		-
Project lifetime		years
Annual reduction in light duty passenger vehicle miles traveled (total)		miles/yr
Annual reduction in medium/heavy duty vehicle miles traveled (total)		miles/yr

CONSTANTS & INTERIM CALCULATIONS

Variables	***Value***	
Regional light-duty vehicle (LDV) fleet average GHG emission factor (Year 1)	#N/A	g CO2e/mi
Regional light-duty vehicle (LDV) fleet average GHG emission factor (average of project lifetime)	#N/A	g CO2e/mi
Regional medium/heavy duty fleet average GHG emission factor (Year 1)	#N/A	g CO2e/mi
Regional medium/heavy duty fleet average GHG emission factor (average of project lifetime)	#N/A	g CO2e/mi

RESULTS

Variables	***Value***	***Unit***
Emissions reduction in year 1	#N/A	CO2 e MT per year
Cumulative emissions reduction	#N/A	CO2 e MT

Calculating Travel Time Savings

The CET suggests other tools or resources that may be helpful to retrieve the required input information. This can mean there are extra steps for users when calculating these project types.

Example:

Projects T12, T13 and T14 include implementing intersection improvements and projects to optimize transportation system management and operations. These require estimation of travel time savings or delay reductions as inputs for the CET.

Users may use FHWA's Congestion Mitigation and Air Quality Improvement (CMAQ) Emissions Calculator Toolkit to calculate these inputs. Although the available project emissions tools in the FHWA CMAQ Emissions Calculator Toolkit can provide emission reductions along with travel time savings directly, the tools do not reflect the latest vehicle emission factors for Minnesota as *embedded in the CET. Therefore, CET requires an extra step to calculate emissions based on CMAQ output, using Minnesota carbon emission factors. Users may also have conducted their own project-specific analyses of changes in delay or travel time, which may be incorporated into the CET.*

Using the MICE Tool

For Low Carbon Infrastructure projects (e.g., sustainable pavements (LC1) or recycled asphalt (LC2)), applicants should use the [Minnesota Infrastructure Carbon Estimator (MICE) tool](). MICE is a custom-built tool designed to estimate the life-cycle carbon emissions benefits of different types of construction and maintenance treatments. After using MICE, users should then enter the carbon emissions benefits from MICE into the designated project tab. The CET will then calculate the cost-effectiveness of the project by dividing the emissions benefit by the user-input cost using the 'Results Summary' tab (see Step 3 for further information on appropriate cost to use in the calculations).

Step 3: Enter project-related cost information

On the 'Results Summary' tab, input costs data for the corresponding strategy, as shown in Figure 7. This cost information is used to calculate the cost-effectiveness of each project at reducing carbon emissions. The costs reflected in the "Total" row should account for the total costs associated with implementing the emissions reduction project. Some guidelines for entering costs are provided below.

Figure 7: 'Results Summary' tab, Minnesota CET 2024

DEPARTMENT OF TRANSPORTATION

	Strategy	Year 1 emissions reduction (CO_2 e MT per year)	Cumulative emissions reduction (CO_2 e MT)	Total Costs ($) USER INPUT REQUIRED	Cost Effectiveness ($/MT)
E1	Expand public EV charging infrastructure for light duty vehicles				
E2	Deploy charging infrastructure for medium- and heavy-duty freight vehicles				
E3	Purchase or lease battery electric transit buses				
E4	Purchase or lease battery electric school buses				
E5	Transition public fleet through purchase & lease of ZEVs				
E6	Initiate ZEV or EV sharing programs.				
T1	Construct or improve bicycle network				
T2	Construct or improve pedestrian network				
T3	Establish or expand micromobility programs				
T4	Improve street connectivity				
T5	Implement Bus Rapid Transit (BRT) systems with dedicated lanes and stations				
T6	Implement bus transit priority treatments				
T7	Add or expand bus service				
T8	Enhance bus frequency or hours of service				
T9	Establish or expand intercity bus services				
T10	Develop or improve intercity passenger rail services				
T11	Construct, expand, or enhance park and ride facilities				
T12	Construct roundabout to improve traffic flow				
T13	Construct left turn lane to improve traffic flow				
T14	Synchronize traffic signals to reduce delay time				
T15	Reduce vehicle miles traveled				
LC1	Use low carbon materials in road construction and maintenance				
LC2	Used recycled pavement on construction sites				
LC3	Replace street lighting and traffic control devices with LEDs				
RE1	Implement renewable energy projects in highway right-of-way				
RE2	Install solar panels on transit stations, rest stops, parking, and other facilities				
	Total	**0.00**	**0.00**	**$0**	**$0**

Include the full costs associated with the emissions reduction project, not just funds requested through the CRP.

The intent of the cost-effectiveness calculation is to determine the overall cost-effectiveness of the project at reducing carbon emissions. As such, the user should input the costs that are needed to implement the project, which would not have been incurred without the project.

Project type specific costs

Pedestrian and bicycle network projects

When a pedestrian or bicycle network improvement occurs on its own, only the applicable project type tabs (e.g., T1, T2) should be completed. The cost associated with the 'Results Summary' tab should be the total of the pedestrian and/or bicycle improvement. Both calculation methods below create the same outcome in the Total Cost-effectiveness.

- [Total shared use path cost] = Cost
- [1/2 of cost for shared use path input in bicycle (T1) cost cell] + [1/2 of cost for shared use path input in pedestrian (T2) cost cell] = Cost

Sometimes pedestrian and bicycle improvements are components of roadway reconstruction projects. When these occur, the applicable project type tabs (e.g., T1, T2) should be completed in addition to other roadway project type tabs (e.g., roundabout, recycled materials). On the 'Results Summary' tab, the total cost of the project will be entered in one of the cost cells.

- [1/2 of cost for shared use path input in bicycle (T1) cost cell] + [1/2 of cost for shared use path input in pedestrian (T2) cost cell] + [LC1* cost cell] = Cost

*In this example LC1 is a placeholder for all potential other project type tabs.

Transit projects

For transit projects, costs may include both capital and operating costs. For instance, expanding transit services may involve both capital components (e.g., purchase of new buses) and operating costs of the new service (e.g., driver costs, fueling costs). For a bus rapid transit (BRT) project or transit priority project that is along an existing bus route or corridor. However, it is generally assumed that the existing service has operating costs, so only the incremental costs beyond existing operating costs should be included (or may assume generally no change or minimal change in operating costs).

- [New service operating costs] – [Existing service operating costs] = Operating Cost

Engineering or planning studies

For engineering or planning studies (e.g., a planning study on bicycle network improvements), the costs should account not only for the study costs but also include an estimate of construction costs for the improvements, since the engineering or planning study will not yield emission reductions without the actual construction of infrastructure.

- [Engineering study cost] + [Estimated construction costs] = Cost

Low Carbon Infrastructure projects

For low carbon infrastructure projects, only account for the incremental cost associated with the low carbon treatment. There are two approaches to these costs. Choose the option that best aligns with the specifications of the project.

- [Expense of higher recycled material pavement – only that line item, not the entire project expenses] = Cost
- [Total cost of project with higher recycled material specification] – [Total cost of project with standard specification cost of project] = Cost

Please consult MnDOT or your project team to develop an estimate of these incremental costs.

Step 4: Review the Results Summary

Once all the inputs have been entered, the 'Results Summary' tab (Figure 7) will display the total results.

- Year 1 emissions reduction (CO_2e MT per year)
- Cumulative (tailpipe) emissions reduction over the life of the project (CO_2e MT)[10]
- Cost-effectiveness ($/MT)

<u>For those applying for CRP funds, the results displayed on the 'Results Summary' tab should be included on the CRP project application.</u>

Keep in mind that the CET produces an estimate of each of these figures and that different types of projects have different levels of certainty associated with the results. Table 3 summarizes general

[10] Note that the project emission impacts calculated in the CET reflect a reduction in tailpipe emissions only and do not account for full life-cycle emissions. The following project types are exceptions and calculate the full life-cycle emissions in the CET: 'LC3 LED Street Lights', 'RE1 Renewable Energy', 'RE2 Solar Panels', and other low carbon infrastructure projects that are analyzed separately by MICE.

levels of uncertainty and factors that affect uncertainty of the emissions impacts associated with each project type.

Table 3. Uncertainty associated with project emissions benefits, Minnesota CET 2024

Project ID	Project Type	Level of Uncertainty	Rationale
E1	Expand public EV charging infrastructure network for light duty vehicles	High	Does not account for the extent to which EV charging infrastructure encourages shift in vehicle purchase decisions; accounts for displaced fuel used by EVs, but owners already have opted for EVs
E2	Deploy charging infrastructure for medium- and heavy-duty freight vehicles	High	Does not account for the extent to which EV charging infrastructure encourages shift in vehicle purchase decisions; accounts for displaced fuel used by EVs, but owners already have opted for EVs
E3	Purchase or lease battery electric transit buses	Low	Bus operators generally have good information on bus use
E4	Purchase or lease battery electric school buses	Low	Bus operators generally have good information on bus use
E5	Transition public fleet through purchase & lease of ZEVs	Low	Fleet operators generally have good information on vehicle use
E6	Initiate ZEV or EV sharing programs.	High	Uncertainty associated with how different car sharing programs affect VMT; does not account for the extent to which the program may encourage shifts in vehicle purchase decisions
T1	Construct or improve bicycle network	Medium	Uncertainty associated with how network improvements affect VMT
T2	Construct or improve pedestrian network	Medium	Uncertainty associated with how network improvements affect VMT
T3	Establish or expand micromobility programs	Medium	Uncertainty associated with how network improvements affect VMT
T4	Improve street connectivity	High	Uncertainty associated with how network improvements affect VMT
T5	Implement Bus Rapid Transit (BRT) systems with dedicated lanes and stations	Medium	Uncertainty associated with effects on ridership and reducing VMT
T6	Implement bus transit priority treatments	Medium	Uncertainty associated with effects on ridership and reducing VMT
T7a	Expand bus service	Medium	Uncertainty associated with effects on ridership and reducing VMT
T7b	New bus service	Medium	Uncertainty associated with effects on ridership and reducing VMT

T8	Enhance bus frequency or hours of service	Medium	Uncertainty associated with effects on ridership and reducing VMT
T9	Establish or expand intercity bus services	Medium	Uncertainty associated with effects on ridership and reducing VMT
T10	Develop or improve intercity passenger rail service	Medium	Uncertainty associated with effects on ridership and reducing VMT
T11	Construct, expand, or enhance park and ride facilities	Low	Generally, have relatively good estimates of use of facilities
T12	Construct roundabout to improve traffic flow	High	Uncertainty about impacts on delay, and indirect effects on travel demand
T13	Construct left turn lane to improve traffic flow	High	Uncertainty about impacts on delay, and indirect effects on travel demand
T14	Synchronize traffic signals to reduce delay time	High	Uncertainty about impacts on delay, and indirect effects on travel demand
T15	Reduce vehicle miles traveled	High	Depends on assumptions about project
LC3	Replace street lighting and traffic control devices with LEDs	Medium	Generally, should have good estimates of electricity use, but uncertainty about future electricity emissions factors
RE1	Implement renewable energy projects in highway right-of-way	Medium	Generally, should have good estimates of electricity generation, but uncertainty about future electricity emissions factors
RE2	Install solar panels on transit stations, rest stops, parking, and other facilities	Medium	Generally, should have good estimates of electricity generation, but uncertainty about future electricity emissions factors

Frequently Asked Questions

Electric Vehicle purchases and leases

Are EVs eligible to purchase or lease?

Electric Vehicle purchases and leases are eligible. Coordinate with Anna Pierce, MnDOT's Carbon Reduction Program Coordinator, and Rachel Broughton, MnDOT State Aid, for details.

EV chargers

How do you calculate the annual hours of use for a new EV charger that doesn't have any previous data?

Use the default values for a new install. The defaults are based on Minnesota regional data. Over time as applicants learn what the usage of chargers are in their specific area, then users may want to modify the utilization rates for future project applications.

What are the project requirements for federalizing an EV charger?

See Federally Funded EV Guidance document. This will be posted as a resource on the CRP website by June 2024.

Pedestrian and bicycle network improvements

Are recreational trails eligible for CRP funding?

Recreational trails are not eligible if primarily serving motorized vehicles, such as ATVs and snowmobiles. If a trail is constructed as the primary purpose for bicyclists and pedestrians, it is eligible. Coordinate with Anna Pierce and Rachel Broughton for details.

T1 – Bicycle Network, are there inputs for estimated use on the trail itself versus the AADT of the adjacent roadway?

The methodology assumes the usage of the facility will depend on the AADT of the adjacent roadway, with detailed adjustments shown below in Table 4. A larger adjustment factor suggests higher facility usage.

Table 4. Adjustment Factors for Active Transportation

Average Annual Daily Traffic (vehicle trips per day)	Facility Length (miles)	Adjustment Factor for Population > 250,000 or Non-university Town with Population < 250,000	Adjustment Factor for University Town with Population < 250,000
1 to 12,000	1	0.0019	0.0104
1 to 12,000	1.01 to 2	0.0029	0.0155
1 to 12,000	>2	0.0038	0.0207
12,001 to 24,000	1	0.0014	0.0073
12,001 to 24,000	1.01 to 2	0.0020	0.0109
12,001 to 24,000	>2	0.0027	0.0145
24,001 to 30,000	1	0.0010	0.0052
24,001 to 30,000	1.01 to 2	0.0014	0.0078
24,001 to 30,000	>2	0.0019	0.0104

If the bicycle project is not within a network of adjacent roads (e.g., a bike trail that traverses a park or recreational area) or if there are unique factors that might influence use (e.g., filling a gap in the bicycle network between two major activity centers or connecting to a transit station), the user should estimate the VMT reduction outside of the CET and then use the 'T15 Reduce VMT' tab to calculate the carbon emissions reduction instead of the 'T1 Bicylce Network' tab.

The extent of increase in bicycle use will depend on many context-specific factors, such as land uses in the area surrounding the project, existing bicycle facilities within the vicinity of the project, and whether the project is a filling a gap in bicycle networks. National research is limited in terms of providing guidelines on how to estimate bicycle use of a new facility. However, example ways that a user may estimate VMT reduction associated with the bicycle network improvement include:

- Gather data on vehicle travel between activity centers and estimate the share of vehicle trips that may switch to bicycling with the project, drawing on estimates of bicycle mode share at other similar activity centers with bicycle access (make sure to account for existing bicycle use prior to implementation of the project).
- For bicycle projects along existing roadways, gather data on existing bicycle use on the corridor, and estimate an increase in bicycling use. One review of several studies found median increases of 48% for Class I bicycle paths, 73% for Class II bicycle lanes and 67% for Class IV cycle tracks.[11] Note that an estimate should also be made for the share of new bicycle users that otherwise

[11] Volker, Jamey, and Susan Handy. 2019. "Projecting Reductions in Vehicle Kilometers Traveled from New Bicycle Facilities." Transport Findings, April. https://doi.org/10.32866/7766

would have driven a personal vehicle, since not all new bicycle trips will be substituting driving trips.

T2 Pedestrian Network, how can we estimate average monthly VMT within 0.6 mile of the project area?

VMT information is needed to understand the reduction potential from building or expanding the current pedestrian network. It could be calculated using AADT[12] (divided by 12 to get monthly average) multiplied by lane miles for roadways within 0.6 mile of the project area.

For T2 Pedestrian Network, is there an alternative approach for calculating the impact if we are not able to estimate average monthly VMT within 0.6 mile of the project area?

There are two alternative approaches if AADT or roadway lane miles are not available for a pedestrian project. Option 1 is the preferred alternative as of April 2024.

1. A user may go to 'T1 Bicycle Network' and calculate the pedestrian component of the facility the same as an unseparated bicycle facility. In this case, under T1, users should choose "Unseparated Facilities" (e.g., Bike Lane, Paved Shoulders, Bicycle Boulevard) as "Types of bike facility" in the calculator[13]. The original source of the 'T1 Bicycle Network' methodology allows using the same approach for both bicycle facilities and pedestrian facilities, using the factors associated with Unseparated Facilities.[14] If using 'T1 Bicycle Network' for a pedestrian network emissions calculation, the "Average length of vehicle trip replaced by bicycle" needs to be adjusted using the regional pedestrian trip length. A recommended value to use is 0.6 mile.

2. Users may use an alternative approach to estimate VMT based on population. Under this approach, the user would estimate population living within 0.6 mile of the project area and VMT per capita to estimate the total community VMT in the area. According to the most recent MnDOT data, VMT per capita was 9,937 miles in 2022 in Minnesota.[15]

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[12] Data available through MnDOT website: https://www.dot.state.mn.us/traffic/data/

[13] Note that regardless of pedestrian facility types, the "Adjustment factor for active transportation" of pedestrian facilities is the same as that of unseparated bicycle facilities. Therefore, in order for users to use 'T1 Bicycle Network' to calculate pedestrian projects, users should choose "Unseparated Facilities" (e.g., Bike Lane, Paved Shoulders, Bicycle Boulevard) as "Types of bike facility" in the calculator.

[14] More information can be found at: https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/Clean_Mobility_QM_FINAL_November2023.pdf

[15] Data available through MnDOT website: https://dot.mn.gov/measures/vehicle-miles-traveled.html

If a project is adding a side path that will be used by people walking and bicycling, would we choose whether to use the 'T1 Bicycle Network' or 'T2 Pedestrian Network' tab in the CET, or is there a recommendation on how to handle a multimodal facility?

Since the 'T2 Pedestrian Network' can be quantified using 'T1 Bicycle Network', instead of using two different project calculators, users should select the 'T1 Bicycle Network' tab in the case of a multiuse (pedestrian/bicycle) path.

Within the tab, select "Separated Facilities (e.g., Sidepaths, Shared Use Path, Separated Bike Lane)" and change the Average length of vehicle trip replaced by bicycle to account for both bicycle and pedestrian trips using the following equation:

$$\text{Trip Length}_{\text{Multi-Use}} = \text{Trip Length}_{\text{Bicycle}} + \text{Trip Length}_{\text{Pedestrian}} \times \frac{1}{1.54}$$

[The 1.54 figure is derived from the assumptions used in relation to impacts on mode shifts from driving to walking.] If users do not have specific trip length estimates for the project based on local activity, they may use 2.4 miles directly as the Average length of vehicle trip replaced, which accounts for an average bicycle trip length of 2.01 mile and average pedestrian trip length of 0.6 mile.

If adding LED lights as part of a trails project, where should that be noted?

Users may use 'LC3 LED Street Lights' in addition to a 'T1 Bicycle Network' or 'T2 Pedestrian Network'. Note that this should only be incorporated if the LED lights are replacing existing lighting that uses incandescent light bulbs, since the LC3 methodology focuses on the reduction in energy used in lighting. If new lighting is being added as part of the project that is LED, no additional emissions reduction should be counted.

Recycled materials

Is there a threshold for the amount of recycled materials that need to be used on a project for the project to be considered eligible for CRP funding?

Projects that are applying for CRP funding, and are only eligible because they use recycled pavement, should coordinate with the MnDOT Office of Sustainability and Public Health Carbon Reduction Program Coordinator for more project specific information.

How can I determine carbon reduction benefits from recycling bituminous material on construction projects?

Users may use the MICE tool and enter benefits calculation results from MICE on 'LC2 Recycled Pavement'.

Multiple project types on one project

Can we apply for an EV along with a charging station to power the EV? Or can we only apply for one?

Yes, they can be submitted together, though it is recommended that they be submitted separately due to the National Environmental Policy Act (NEPA) requirements with EV charging projects. Coordinate with the District State Aid Engineer and the MnDOT Carbon Reduction Program Coordinator on project specifics.

If we are applying for a project that includes multiple components or strategies, would we divide the project cost between different strategies?

In the 'Results Summary' tab, a user could put the whole cost in one of cell associated with any of the project types or break it out between the different project type components of the total project. Either way the total cost-effectiveness of the overall project calculates to be the same.

CRP application submittals

Metropolitan Planning Organizations (MPOs) and Area Transportation Partnerships (ATPs) are leading the project selection, prioritization, ranking and awarding of CRP funded projects, as of April 2024. To ensure consistency throughout Minnesota, the MnDOT Office of Sustainability and Public Health has provided guidance to the MPOs, ATPs and MnDOT Districts.

How does MnDOT want Review Committees to submit application materials back to the state? What materials are needed?

After applications are submitted to the Metropolitan Planning Organizations (MPOs) or Area Transportation Partnerships (ATPs) and projects are selected. The awarding organization will coordinate with MnDOT Office of Sustainability and Public Health to provide appropriate documentation for the project selection process.