

# CO<sub>2</sub> Benefits of CMAQ Projects

## CO<sub>2</sub> Emissions and Energy Consumption Reduction



### What is CMAQ?

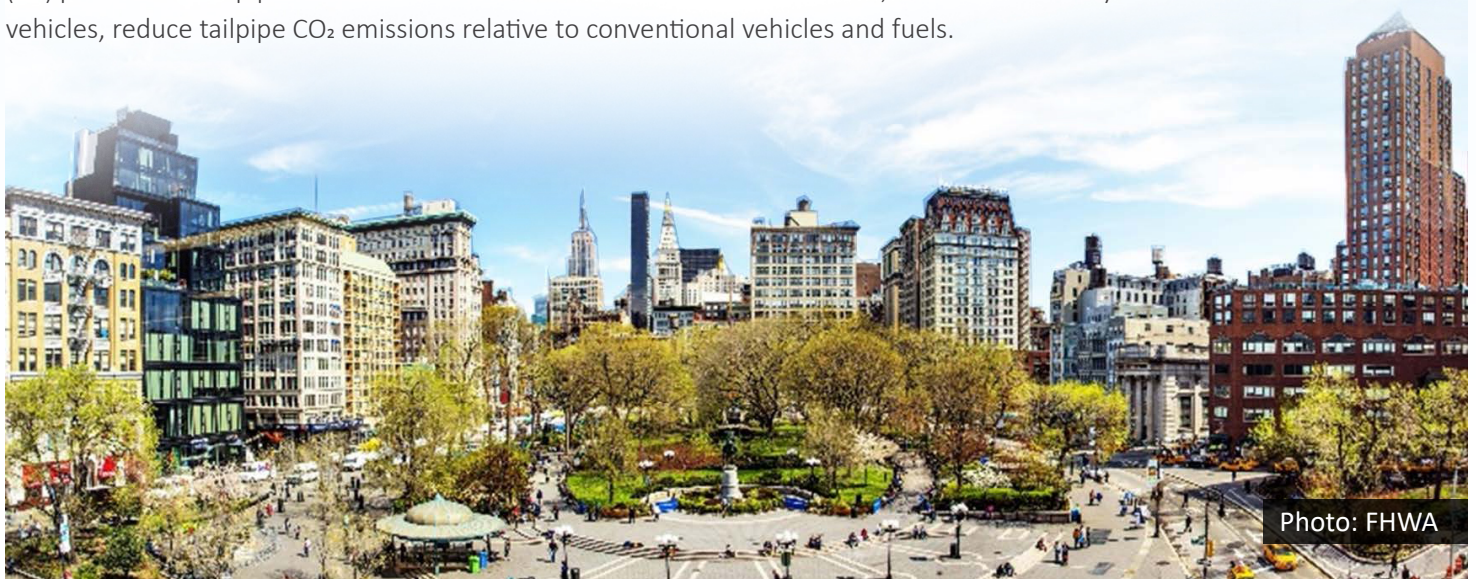
The Congestion Mitigation and Air Quality Improvement (CMAQ) Program provides funding for surface transportation projects and programs to help meet requirements of the Clean Air Act and its amendments. CMAQ funded projects are required to contribute to attainment and/or maintenance of National Ambient Air Quality Standards (NAAQS) for ozone, carbon monoxide, particulate matter, and their precursors. States without nonattainment and maintenance areas may use CMAQ funds to support projects that are eligible under CMAQ or the Surface Transportation Block Grant Program. Though the CMAQ Program was created to lower NAAQS levels, certain CMAQ funded projects may additionally contribute to lowering greenhouse gas (GHG) emissions as well as decreasing energy consumption.

### What are Greenhouse Gases?

GHGs are gases that absorb energy and reradiate this energy into the atmosphere. These GHGs contribute to climate change, causing more severe weather, higher temperatures, sea level rise, and melting ice caps. The transportation sector emits approximately 29% of GHGs in the U.S.<sup>1</sup> These emissions come primarily from combustion of petroleum-based fuels for cars, trucks, planes, trains, and ships. The majority of GHG emissions from transportation are carbon dioxide (CO<sub>2</sub>) emissions from fuel combustion, along with smaller amounts of methane and nitrous oxide. Small amounts of hydrofluorocarbons are also emitted from mobile air conditioners and refrigerated transport.

### How do Certain CMAQ Projects Contribute to CO<sub>2</sub> Emission Reductions?

In addition to reductions in applicable NAAQS emissions, many CMAQ-eligible projects also reduce petroleum consumption and CO<sub>2</sub> emissions, helping to limit climate change and its related effects. Example projects that contribute to CO<sub>2</sub> emissions reductions include those that encourage a shift from single occupancy passenger vehicles to mass transit or non-motorized modes, as well as projects that support use of cleaner fuels and newer engines, including electric options. Electric vehicles (EV) produce no tailpipe CO<sub>2</sub> emissions. Other alternative fuels and vehicles, such as E85 and hybrid-electric vehicles, reduce tailpipe CO<sub>2</sub> emissions relative to conventional vehicles and fuels.



## How to Calculate CO<sub>2</sub> and Energy Reductions for CMAQ-eligible Projects?

The CMAQ Emissions Calculator Toolkit is a series of spreadsheet-based tools that facilitate the calculation of representative air quality benefit data for CMAQ-eligible projects. The Toolkit estimates emissions reduction of criteria air pollutants and CO<sub>2</sub> and energy reductions.

The CMAQ Toolkit covers a wide range of project types, including transit improvements, managed lanes, alternative fuel vehicles and infrastructure, bicycle and pedestrian improvements, and congestion reduction and traffic flow improvements. Additional tools are being developed to cover more project types.

## How are CO<sub>2</sub> and Energy Reductions Estimated Using the CMAQ Toolkit?

CMAQ Toolkit uses emissions and vehicle activity data from different models to calculate CO<sub>2</sub> and energy consumption, including EPA's Motor Vehicle Emissions Simulator, EPA's Diesel Emissions Quantifier, and Argonne National Laboratory's Alternative Fuel Life-Cycle Environmental and Economic Transportation Tool (AFLEET).

CMAQ Tool	Sample Scenario	Sample Criteria Pollutant Benefits	Sample CO <sub>2</sub> and Energy Benefits
Alternative Fuel and Electric Vehicles and Infrastructure	A county purchases 50 electric cars to replace a municipal fleet of older gasoline vehicles	5.3 kg/day CO <sub>2</sub> 0.014 kg/day PM <sub>2.5</sub> 0.21 kg/NO <sub>x</sub> 0.22 kg/day VOC	CO <sub>2</sub> equivalent (CO <sub>2e</sub> ) reduction of 498 kg/day Energy saving of 6.5 MMBTU/day
Bicycle and Pedestrian Improvements	A city finds that 91% of 41,000 daily work trips rely on personal cars. They are considering installing new protected bike infrastructure that would divert up to 10% of car trips to bicycle trips.	21.1 kg/day CO <sub>2</sub> 0.07 kg/day PM <sub>2.5</sub> 1.6 kg/day NO <sub>x</sub> 1.2 kg/day VOC	CO <sub>2</sub> reduction of 2028 kg/day Energy savings of 26 MMBTU/day

## CMAQ Project Highlight: Hybrid Electric Ferry Conversion | Seattle, WA

Washington State Department of Transportation has a three-phase program to transition to a zero-carbon emissions ferry fleet. The Hybrid Electric Ferry Conversion Project is the first part of this program. It converted two ferries to hybrid electric propulsion systems by removing two of the four diesel generators and integrating battery storage. The remaining diesel generators recharge the batteries.

This project has the following impacts:

- Reduced CO<sub>2</sub> emissions by 25%
- Reduced fuel consumption
- Reduced CO<sub>2</sub> by 436 kilograms per day (kg/day), NO<sub>x</sub> by 854 kg/day, and PM<sub>2.5</sub> by 44 kg/day
- Annual operating costs savings of \$14 million.



Photo: FHWA

### For more information, please contact:

U.S. Department of Transportation Federal Highway Administration  
Office of Natural Environment

1200 New Jersey Avenue, S.E., Washington, D.C. 20590  
202-366-4053

[http://www.fhwa.dot.gov/environment/air\\_quality/cmaq/](http://www.fhwa.dot.gov/environment/air_quality/cmaq/)