

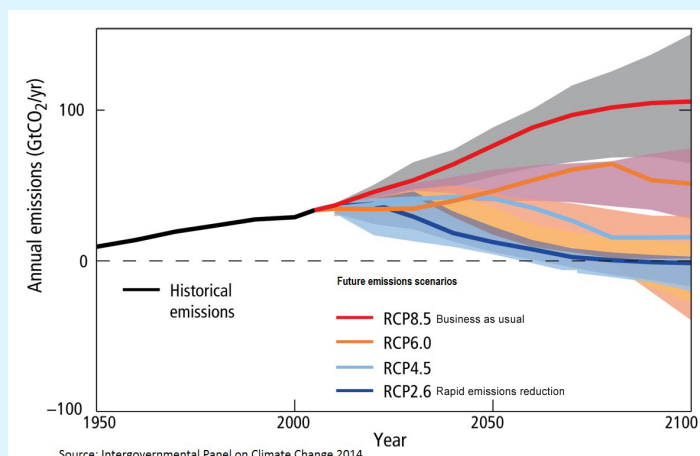
TOWARD LOW CARBON TRANSPORTATION

TRANSPORTATION SECTOR MUST CUT EMISSIONS TO MEET U.S. TARGETS

The magnitude of climate change beyond the next few decades depends primarily on the quantity of greenhouse gas (GHG) emissions humans produce globally. Achieving substantial reductions in GHG emissions is possible, but will require widespread utilization of low-carbon energy, improvements in energy efficiency, and conservation measures that reduce demand for energy. Transportation agencies can help develop climate solutions by implementing measures to limit growth in vehicle miles traveled, improving the efficiency of operations and promoting infrastructure to support low carbon vehicles and fuels.

The U.S. has pledged to reduce GHG emissions 26-28 percent by 2025 and 80 percent or more by 2050. These emissions reductions are consistent with scientific targets for stabilizing atmospheric concentrations of CO₂ at 450 parts per million. The transportation sector is a significant source of U.S. GHG emissions, and will need to achieve major reductions to support national climate commitments.

Tailpipe GHG emissions from transportation sources accounted for 29 percent of total U.S. GHG emissions in 2012, and almost 4 percent of global GHG emissions. Including other life cycle processes—such as the extraction and refining of fuel, the manufacture of vehicles and the construction and maintenance of infrastructure—the U.S. transportation sector accounts for roughly 5 percent of global GHGs.



Under a business-as-usual emissions scenario, global GHG emissions produced each year are expected to nearly triple. Demand for energy is expected to increase along with a growing global economy that continues to derive most of its energy from fossil fuels.

FHWA IS RESPONDING

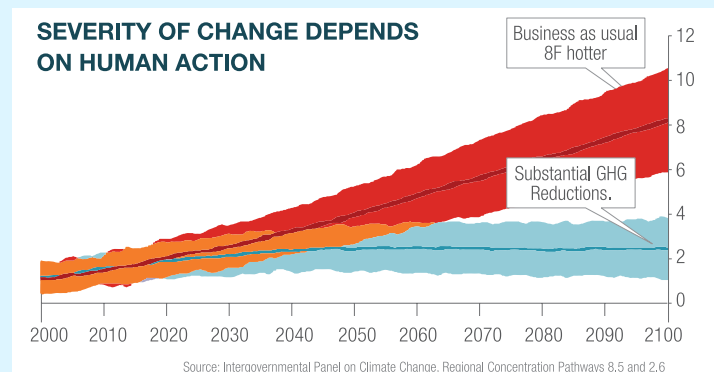
- FHWA developed a series of tools and resources to assist state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) in developing and evaluating effective GHG emissions reduction strategies. Many of these are highlighted in the next section.
- FHWA is working to encourage and promote the use of low carbon vehicles and fuels through partnerships with Federal, state and local partners and stakeholders.
- FHWA works in concert with other federal agencies tasked with regulating fuel economy and advancing low carbon technologies.

WHAT TRANSPORTATION AGENCIES CAN DO

State DOTs and MPOs can integrate GHG reduction analysis into the transportation planning process, deploy infrastructure needed for low carbon fuels, reduce GHG emissions in construction and maintenance practices, and improve system efficiency.

Planning

State DOTs and MPOs can integrate GHG emission reduction considerations into the transportation planning process. Transportation system planning carries a large potential for transportation GHG reduction, as this is where communities make decisions on future transportation investments. Those decisions, in



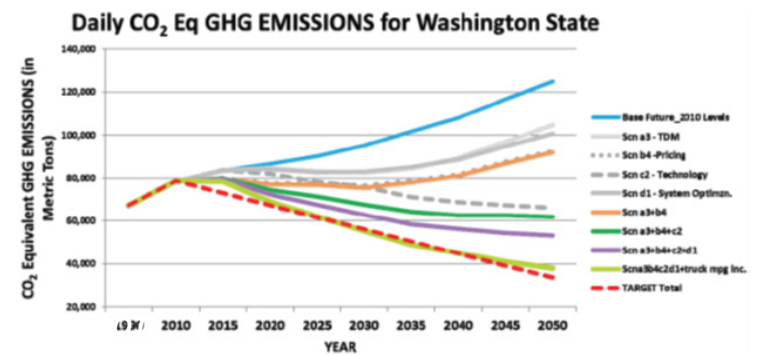
Based on the business-as-usual scenario mentioned above, surface temperatures are expected to increase 8 degrees or more by the end-of-century, with further increases very likely thereafter. This level of warming will lead to high to very high risk of severe, widespread, and irreversible impacts globally — including heat waves, sea level rise, and changes in precipitation patterns — threatening human health, infrastructure, agriculture, and livelihoods. Future warming and associated impacts can be much less severe, but will require significant reductions in GHGs below current annual levels.



FHWA is partnering with states and regions across the country to reduce GHG emissions.

Partnerships include pooled fund studies, implementation of the Strategic Highway Research Program (SHRP2) product on GHG emissions reduction, and pilots of GHG analysis approaches -- such as use of FHWA's Energy and Emissions Reduction Policy Analysis Tool (EERPAT).

- Alternative fuels pooled fund study
- Strategic Highway Research Program 2 Sites
- Pilots



Under the Strategic Highway Research Program, Washington State DOT is conducting GHG analysis at a corridor level and enhancing the agency's efforts to link the environmental review process with the system planning process. The study focuses on the I-5 corridor in the Seattle area, where light rail expansion is planned. Communities there have started to identify the decisions and actions needed to support ridership and improve multimodal connections.

Southern California Association of Governments analyzed GHG emissions from multimodal public transportation trips, including car, bus, bike, and walking trips to and from rail stations. The findings will be used to prioritize the most effective transportation and land-use planning strategies for optimizing GHG reductions achieved from public transit investments.

Oregon DOT, in coordination with FHWA and other state DOTs, initiated a pooled fund study to assist transportation agencies interested in promoting the use of alternative vehicle and fuel technologies at a state, regional, or corridor scale and provide tools, information, and knowledge to do so. <http://altfueltoolkit.org/>.

The MPO for the greater **Albuquerque, NM** area used scenario planning to analyze strategies to reduce greenhouse gas emissions and adapt to climate change impacts, alongside other community goals. The project demonstrated how climate change considerations can be incorporated into transportation and land use scenario planning and provided analysis that was incorporated into the region's long range transportation plan.

Under the Strategic Highway Research Program, **Massachusetts DOT** is working with MPOs in the state on GHG analysis in the project development and selection processes as well as incorporating GHG considerations into freight planning.

Maryland's Greenhouse Gas Reduction Act of 2009 requires the state to reduce statewide GHG emissions by 25% from 2006 levels by 2020. **Maryland DOT** used FHWA's EERPAT tool to model strategies and combinations of strategies for meeting the target.

Washington State DOT modeled GHG reduction strategies using EERPAT and found that a combination of aggressive strategies came close to meeting the state's target for transportation GHG reductions.

Colorado DOT conducted a pilot of FHWA's policy analysis tool, EERPAT, to analyze the effectiveness of Colorado's Energy Smart Transportation Initiative in reducing GHG emissions.

Under the Strategic Highway Research Program, the **Denver Region Council of Governments (DRCOG)** is exploring land use and transportation scenarios and their impacts on GHG emissions.

East-West Gateway Council of Governments estimated GHG emissions from on-road vehicles at the regional and sub-regional scales, and analyzed future emissions for multiple policy and land use scenarios.

Massachusetts DOT used FHWA's policy analysis tool, EERPAT, to analyze and quantify GHG benefits from current activities, as well as estimate the impact of a set of potential future strategies to help the State meet its GHG targets.

Vermont Agency of Transportation used FHWA's EERPAT to analyze the effectiveness of strategies in meeting the state's GHG reduction target for transportation of 75% below 1990 levels by 2050. Vermont analyzed a combination of policies: travel demand management, parking pricing, increased biking and walking, and alternatives fuels for heavy duty vehicles.

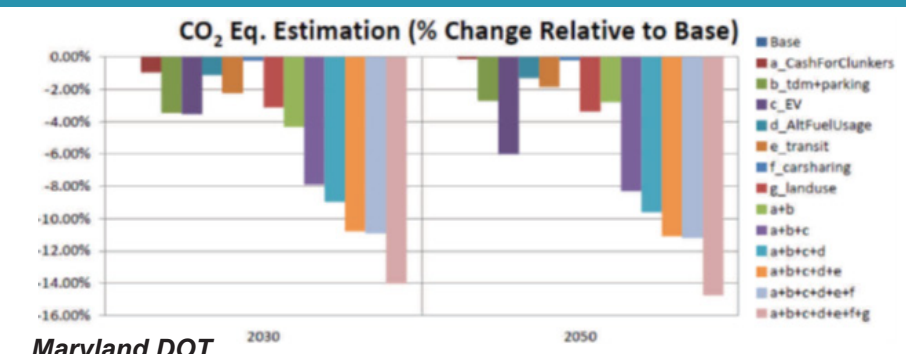
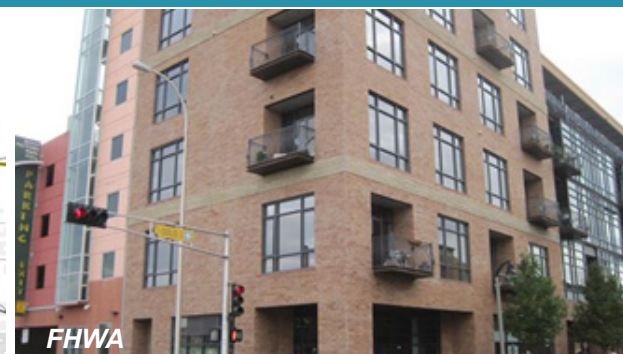


Delaware Valley Regional Planning Council is developing a spreadsheet tool to determine the changes in energy use and GHG emissions associated with different electric vehicle and compressed natural gas vehicle deployment scenarios in the region. The tool can be used by other transportation agencies around the country.



2040 Household Differences
 --- Future Roadways
 --- Trend
 --- Trend
 --- Ineligible
 --- Preferred
 --- Preferred
 --- Preferred

This map shows the difference between Trend and Preferred Scenarios for number of households in the year 2040. The data is classified by Natural Breaks.



Planning (continued)

In addition to local level land use decisions, will influence travel patterns and emissions from vehicles on the system for many decades. Transportation practitioners are often asked to respond to questions from the public and decision makers about the implications transportation plans and projects have on GHG emissions.

FHWA tools and resources to assist include:

- *The Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process* presents practices for the evaluation of GHG emissions at the transportation program level, and demonstrates how such evaluation may be integrated into the transportation planning process.
- *The Energy and Emissions Reduction Policy Analysis Tool (EERPAT)* is an integrated, state-level modeling system designed specifically to evaluate strategies for reducing surface transportation GHG emissions. It is sensitive to a number of strategies that are difficult to analyze using travel demand models, especially at the state level, and can be used to evaluate the contribution of policy scenarios to GHG reduction goals.
- *FHWA's Reference Sourcebook for Reducing GHG Emissions from Transportation Sources* describes various GHG emission mitigation strategies, estimates the potential range of GHG emissions reductions, estimates costs, identifies barriers to implementation, identifies example projects, and describes any associated co-benefits or disadvantages.
- *A Performance-Based Approach to Addressing Greenhouse Gas Emissions in Transportation Planning* serves as a resource for State DOTs and MPOs in developing GHG performance measures and using them to support investment choices.
- *PlanWorks* is a web resource that supports collaborative decision making in transportation planning and project development. It includes a GHG technical process, decision guide, and examples from practice.
- Scenario planning techniques, by examining multiple policy scenarios and multiple futures, lend themselves well to climate analysis. FHWA-funded projects in Cape Cod and New Mexico developed guides and lessons learned for other areas.

Alternative Fuels and Energy Efficiency

FHWA is working with state and local partners on strategic deployment of infrastructure needed to support low carbon vehicles and fuels. An FHWA research study evaluated the prospects and expectations for short and long-term deployment of electric vehicles and analyzed the potential impact of this

deployment on the mission of the FHWA. Under a pooled fund initiative, led by the Oregon DOT, FHWA and eight state DOTs, are implementing a series of workshops around the country and developing a web-based toolkit for state and local transportation agencies that will facilitate their deployment of alternative fuel vehicles and related technologies.



Construction and Maintenance

State DOTs can consider the infrastructure-related GHG emissions when making planning decisions and considering project alternatives. This information can be especially valuable in evaluating the extent to which projects help to reduce GHG emissions on a life-cycle basis. FHWA's *Infrastructure Carbon Estimator (ICE)* is a spreadsheet tool that evaluates GHGs from construction and maintenance of transportation facilities. It can also be used to evaluate the benefits of strategies to reduce infrastructure-related carbon emissions, including preventive maintenance, energy efficient construction vehicles and sustainable pavements.

System Efficiency

Transportation agencies can reduce the carbon intensity of travel by employing system efficiency strategies such as advanced signal timing, pricing, and ITS. FHWA's report, *Highway Operations and Maintenance Strategies to Reduce Greenhouse Gas Emissions* investigates the relationship between traffic improvements and traveler behavior, travel demand and emissions.

LEARN MORE

FHWA's climate change website offers publications, tools, and other resources for analyzing and implementing transportation GHG reduction strategies.

http://www.fhwa.dot.gov/environment/climate_change/mitigation/

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