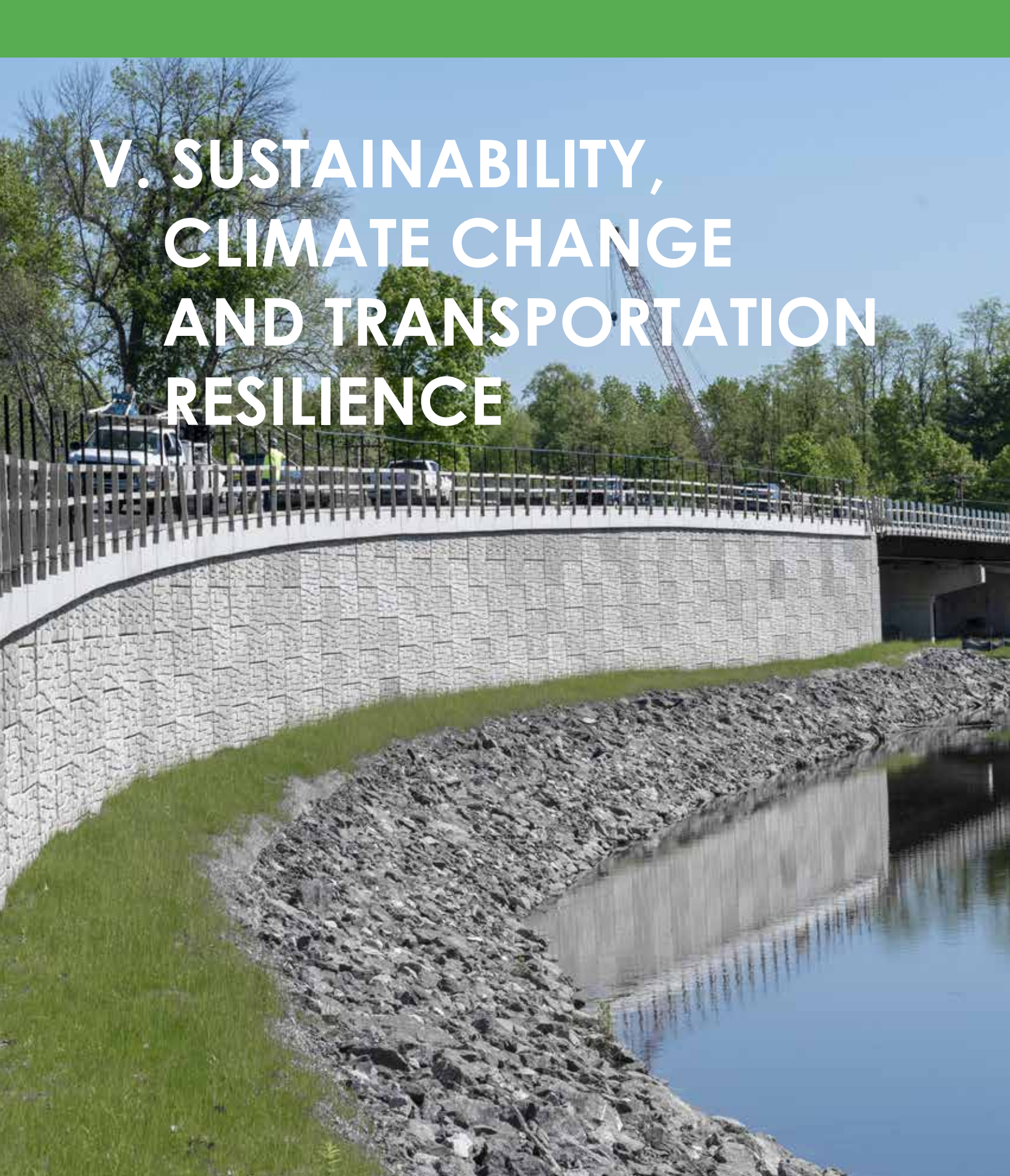


# V. SUSTAINABILITY, CLIMATE CHANGE AND TRANSPORTATION RESILIENCE



*Photo by: KC Engineering and Land Surveying, PC*

## MITIGATION OF TRANSPORTATION IMPACTS ON THE ENVIRONMENT

“A long-range transportation plan shall include a discussion of types of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan.”

*23USC134(i)(2)(D)*

It is incumbent on UCTC to broadly consider the potential environmental impacts of the actions proposed in the long-range transportation plan, and programmatic means to mitigate those impacts. In doing so, it is important to differentiate this discussion from the detailed project-level environmental analysis that is required under the National Environmental Protection Act (NEPA). An example of a programmatic mitigation is addressing air quality impacts from emissions from construction equipment involved in pavement and bridge projects.

There are many different types of environmentally sensitive areas and potential impacts to the natural and human environment that may be affected by various actions associated with the 2045 LRTP.

These include (but are not necessarily limited to):

- ▶ Threatened and Endangered Species
- ▶ Wetlands
- ▶ Floodplains
- ▶ Surface and Ground Waters
- ▶ Stormwater Management and Erosion and Sediment Control
- ▶ Hazardous Materials
- ▶ Air Quality
- ▶ Historical/Cultural Resources
- ▶ Right-of-Way/Property Impacts, Including Impacts to Parks, Farmland and Neighborhoods
- ▶ Scenic Viewsheds
- ▶ Traffic and Train Noise
- ▶ Climate Change

Procedure and technical guidance on environmental matters relating to the planning, design, construction, operation, and maintenance of transportation facilities is detailed in the NYSDOT Environmental Procedures Manual.<sup>1</sup> In addition, Chapter 7 (“Overview of Environmental Process”) of the NYSDOT Procedures for Locally Administered Federal Aid Projects (PLAFAP) manual discusses the project

advancement and environmental procedures that must be followed to satisfy applicable environmental laws, including the NYS Smart Growth Public Infrastructure Policy Act.<sup>ii</sup> NEPA and SEQR, and many other State and federal environmental regulations, require that environmental considerations be addressed in transportation decision making, plans and programs. Most transportation capital and maintenance projects have the potential to affect natural and human-made resources in both positive and negative ways. Lead agencies and project sponsors in charge of transportation projects and MPOs must strive to ensure full and objective consideration of all reasonable alternatives that avoid adverse impacts to the environment and communities. Where adverse impacts are unavoidable, lead agencies and project sponsors must identify the impacts and incorporate measures to mitigate impacts to the maximum extent practicable.

Certain environmentally-sensitive areas are easily identified and mapped through well-established state and federal programs and their associated digital resources. These include state and federally-protected wetlands and floodplains. In addition, the locations of historical/cultural resources and threatened or endangered species can be accessed and evaluated on a location-specific basis through available mapping and databases as well as through consultation with state and federal agencies such as the NYS Department of Environmental Conservation, the State Office of Parks, Recreation and Historic Preservation, the US Army Corps of Engineers, and the Federal Fish and Wildlife Service, as well as other similar or supporting local, state and federal offices.

The Ulster County Planning Department and the Ulster County Department of the Environment have developed several geographic resources to help communities in Ulster County plan for the protection of sensitive areas and focus development in areas capable of supporting growth and having access to needed infrastructure. These “Activity Centers” are shown in the map on page 49. The UCTC, through Plan 2045, will utilize this geographic resource as a tool to assist in the development of plans and projects that will enable the transportation system in these areas to meet the challenges that come with growth.

All of these resources together provide the foundation for programmatic environmental mitigation. UCTC is committed to examining the potential for negative impacts from the overall program of projects, actions, and strategies that comprise Plan 2045, and to institute programmatic responses.

### CONSULTATION WITH RESOURCE AGENCIES

In an effort to coordinate the discussion of potential environmental mitigation activities, the UCTC contacted appropriate Federal, State, and tribal, wildlife, land management, regulatory and resource agencies regarding the 2045 Long Range Transportation Plan. Responses received can be found in Appendix C.



**Flooded Road.**

## SUSTAINABILITY, CLIMATE CHANGE AND TRANSPORTATION RESILIENCE

Sustainability is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”<sup>iii</sup> The concept known as the “triple bottom line” functions as the predominant theory addressing sustainability in practice. Triple bottom line (TBL) accounting expands the traditional reporting framework to consider not only financial performance, but also environmental and social performance. The theory and practice of sustainable transportation has evolved from these basic concepts. Today it is regarded by federal and state agencies as an important component of transportation planning and it is one that Ulster County Transportation Council strives to integrate into its daily operations.



Triple Bottom Line of Sustainability

At its core, sustainable transportation refers to the planning, design, construction, and operation of transportation facilities in a manner that will have minimal or zero net negative impact on the natural environment. This is achieved through a variety of mechanisms at programmatic and project levels. On a programmatic level, it includes adherence to federal aid procedures for projects – in particular, federal and state permitting and environmental review processes. It also includes serious evaluation of the need for new facilities in the first place, seeking to avoid unnecessary investments and their possible negative long-term impacts. On a project level, it involves the integration of innovative approaches that mitigate or diminish negative impacts on the environment into the design and construction process. Techniques are being developed that extend the life of transportation infrastructure and make maintenance activities more environmentally friendly. Of increasing importance in our understanding of transportation’s impacts on the environment is the recognition of the transportation-land use connection, which identifies cumulative impacts that transportation systems can have on communities and the environment over time, primarily through induced growth brought on by the presence of new or expanded transportation facilities. Finally, identifying and encouraging technologies that can reduce transportation’s contribution of green house gas emissions represent a central component to the implementation of sustainable transportation.

## CLIMATE CHANGE

### NYSDOT GreenLITES Program

**GreenLITES** (Green Leadership In Transportation Environmental Sustainability),” a transportation environmental sustainability rating program. NYSDOT developed the **GreenLITES** certification program to better integrate these principles by:

- ▶ Recognizing and increasing the awareness of the sustainable methods and practices we already incorporate into NYSDOT project designs and daily operations.
- ▶ Expanding the use of these and other innovative alternatives which will contribute to improving transportation sustainability.

**GreenLITES** is a **self-certification program** that distinguishes transportation projects and operations based on the extent to which they incorporate sustainable choices. This is primarily an internal management program for NYSDOT to measure our performance, recognize good practices, and identify where we need to improve.

UCTC’s approach to climate change and transportation resilience is based on multi-layered guidance established through local, state, regional, and federal precedent and action. In 2010, New York State along with 10 other U.S. states and the District of Columbia signed a Declaration of Intent to create the Transportation and Climate Initiative of the Northeast and Mid-Atlantic States (TCI) – a regional transportation approach intended to help states build the clean energy economy of the future. The group, which includes the New York State Department of Transportation, New York State Department of Environmental Conservation, and New York State Energy Research and Development Authority, has agreed to work together with other member agencies to reduce greenhouse gas emissions, minimize the transportation system’s reliance on high-carbon fuels, promote sustainable growth and address the challenges of vehicle-miles traveled.

## COMMUNITY TRANSPORTATION PLANNING ASSISTANCE

The UCTC sets aside annual funding to allow MPO and Planning Department staff to provide planning and design assistance as well as educational training for communities in developing their comprehensive plans, establishing design parameters for major projects, establishing access management and pedestrian/ bicycle provisions in land use controls, and assisting in decision-making for capital investments and designs that become part of or impact the transportation system. A primary goal is to ensure that communities understand the fundamental link between transportation and land use.



Today, the TCI is directed by state and district agencies located within the 13 TCI jurisdictions of New York, Vermont, New Hampshire, Maine, Massachusetts, Connecticut, Rhode Island, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, and the District of Columbia.

In June of 2019, New York State lawmakers agreed to the NYS Climate Leadership and Community Protection Act (6 NYCRR Part 496) – the most ambitious climate legislation enacted in the United States to date. The Act will require the state to achieve a carbon free electricity system by 2040 and reduce greenhouse gas emissions 85% below 1990 levels by 2050. Efforts over the past decade to reduce emissions in New York State have focused on the power sector, making New York’s electricity some of the cleanest in the nation. Given that transportation is now the largest and growing share of GHG emissions in New York State and the region, **emissions from fuel consumption have been identified through the Act as a primary target for reduction.**



Recognizing that more than one third of all carbon emissions come from the transportation sector, participating states started taking action through working groups focused on regional priorities, such as clean vehicles and fuels. Several TCI states are also now working together to explore potential regional policies to improve transportation systems and reduce pollution.

<https://www.transportationandclimate.org/content/about-us>

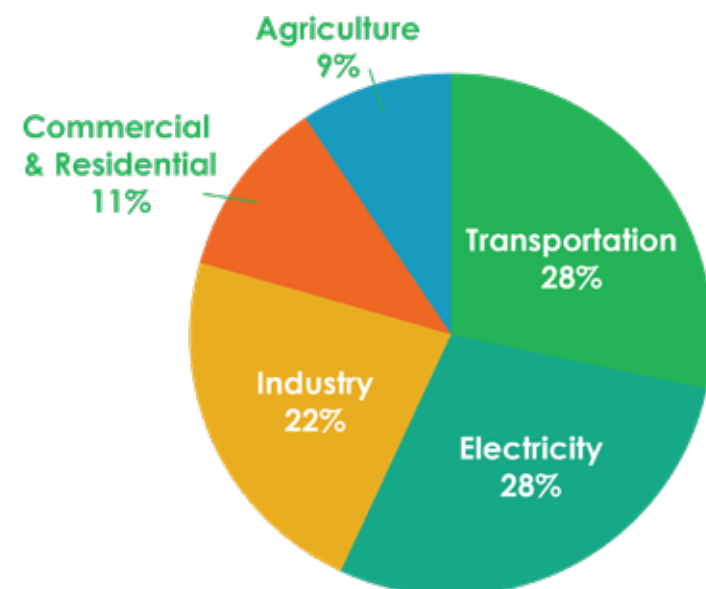
## A CLOSER LOOK: TRANSPORTATION AND GREEN HOUSE GAS EMISSIONS IN NEW YORK AND ULSTER COUNTY

According to the US EPA, transportation generates the largest share of greenhouse gas emissions (GHGE) in the United States, accounting for 28% of total GHGE. Greenhouse gas emissions from transportation primarily come from burning fossil fuel for our cars, trucks, ships, trains, and planes. Over 90 percent of the fuel used for transportation is petroleum based, which includes primarily gasoline and diesel.<sup>iv</sup>

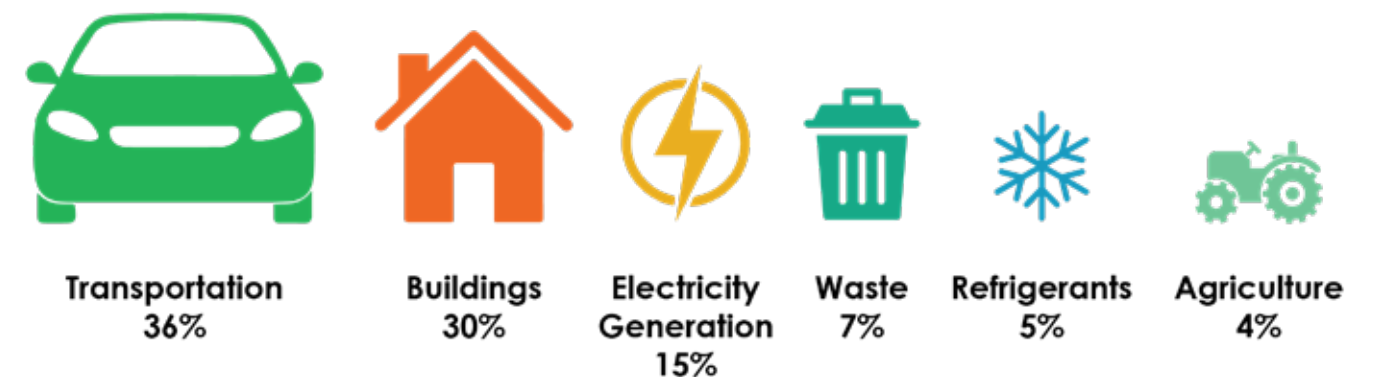
In New York State, the share of transportation as a source of total GHGE is even greater, with transportation accounting for 36% of the state’s GHGE footprint. According to the NYS Greenhouse Gas Inventory, carbon dioxide (CO2) largely accounts for transportation GHG emissions from fuel use at 98%; methane and nitrous oxide (N2O) account for the remaining mix of GHGE from on-road, gasoline-fueled vehicles.<sup>v</sup> In addition, note that in this analysis vehicles not primarily used for transportation (e.g., construction cranes and bulldozers, farming vehicles, and warehouse tractors and forklifts) are classified in the sector of primary use, be it commercial or industrial.<sup>vi</sup>

Developing a greenhouse gas (GHG) emissions inventory is one of the first steps toward setting emission savings goals and measuring progress toward achieving those goals. While a variety of sophisticated methods exist to calculate GHGE at the local level, data is often limited and becomes obscured when attempting to scale down to more detailed levels of analysis. A simple method that communities can use to estimate GHGE is to use local vehicle-miles-traveled (VMT) and average fuel economies to calculate total fuel consumption and GHG emissions.

**Figure 5.1: Total Greenhouse Gas Emissions by Economic Sector, Entire US.**  
Source: US EPA (2018) Inventory of US Greenhouse Gas Emissions, 1990-2016.

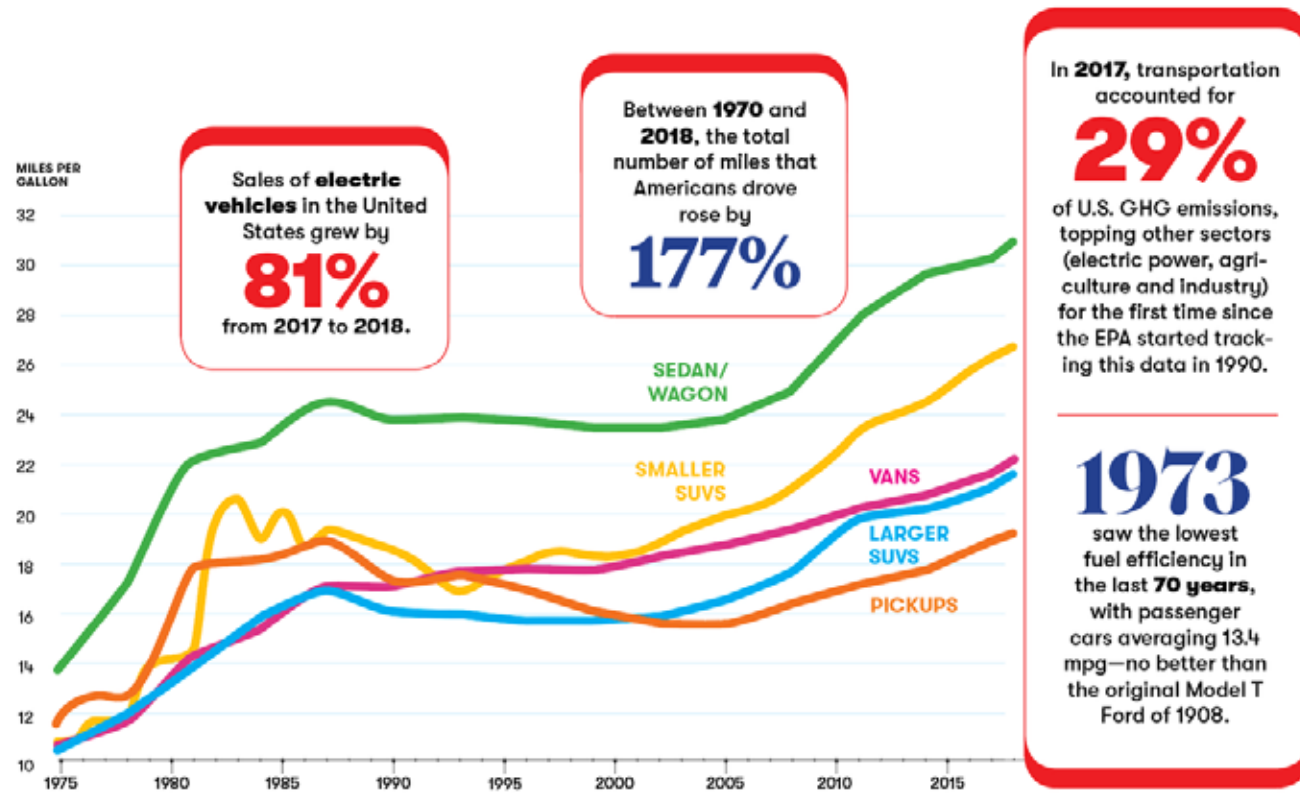


**Figure 5.2: Main Sources of Greenhouse Gases in NYS**



Source: NYSDEC

Figure 5.3: Share of Vehicles on the Road, Entire US<sup>vii</sup>

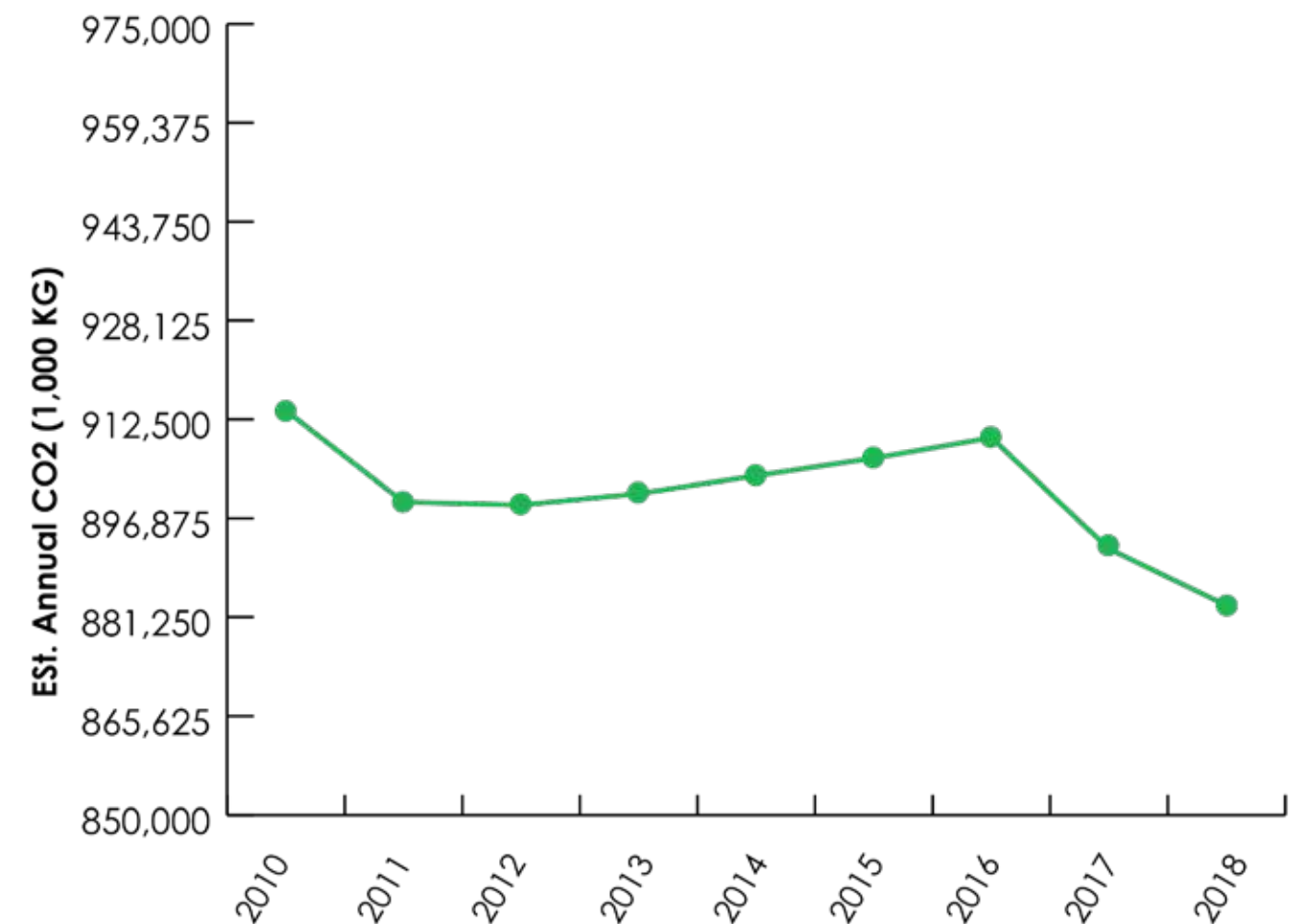


Even though tail pipe emissions continue to improve, more vehicles on the road means a steady increase in GHGE over time.



Climate change is directly linked to more frequent and intense precipitation events, which can increase the risks of flooding and extreme events and impact transportation infrastructure.

Figure 5.4: Estimated Annual Green House Gas Emissions from On-Road Transportation Sources, Ulster County, 2010 - 2018



The chart above illustrates the estimated carbon dioxide emissions on an annual basis in Ulster County using annual VMT estimates applied to all on-road vehicle classes. The rapid decline in estimated emissions between 2016 and 2018 is likely attributable to decreases in both annual VMT and overall fuel consumption.

Light duty vehicles that burn regular gasoline – passenger cars, light trucks, vans and sport utility vehicles – accounted for nearly 64% of GHGE from transportation in 2018. While many of the brands of vehicles on the road may be relatively fuel efficient with decent emissions standards, their disproportionately large share of the transportation system explains their collective impact on total emissions. This is further illustrated by travel to work data for Ulster County.

According to the US Census Bureau, 77.2% of people employed in Ulster County travel to work alone; private vehicle commuter travel accounts for a total of 85% of trips to work, further underscoring the impacts that the share of light duty vehicles on the road has on GHGE in Ulster County.

Figure 5.5: Share of Vehicles on the Road, Ulster County, 2018

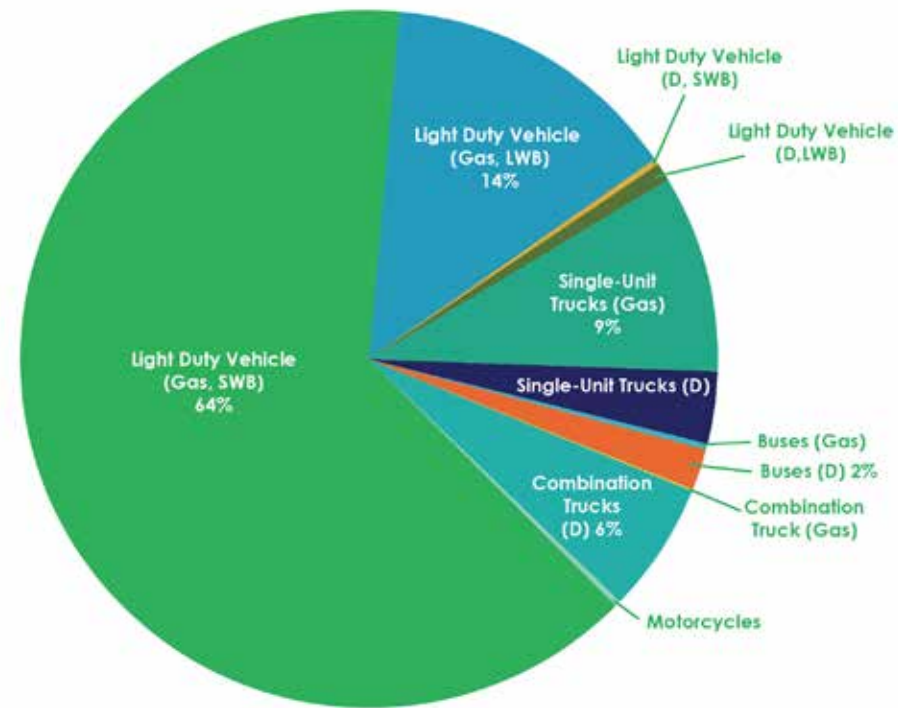
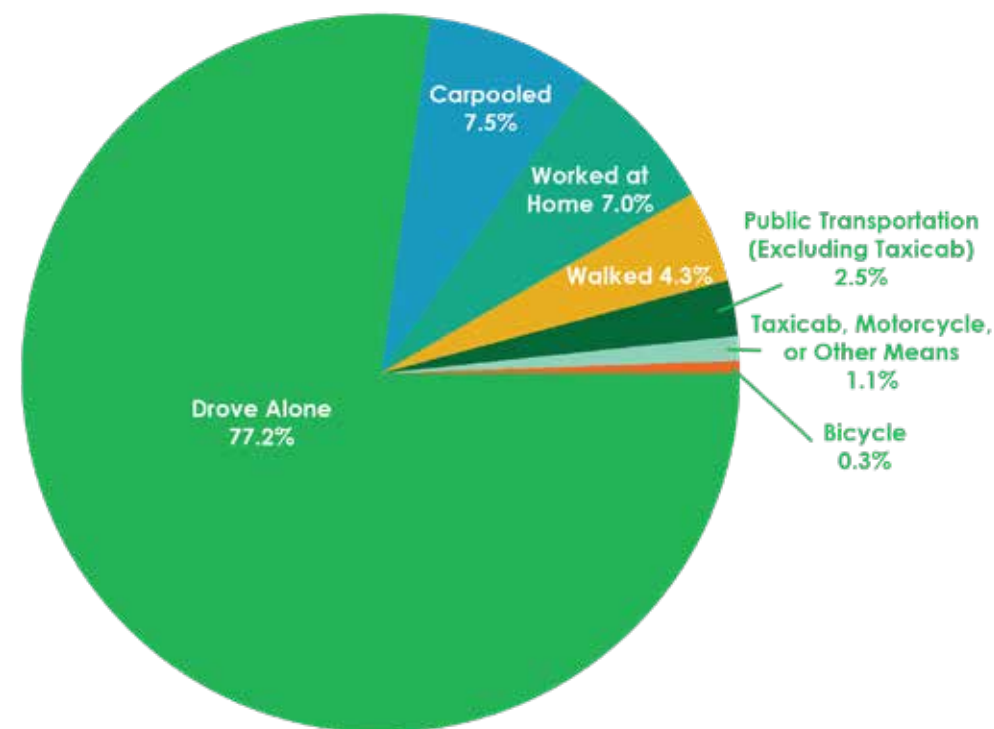


Figure 5.6: Journey to Work Modal Distribution, Ulster County, 2018

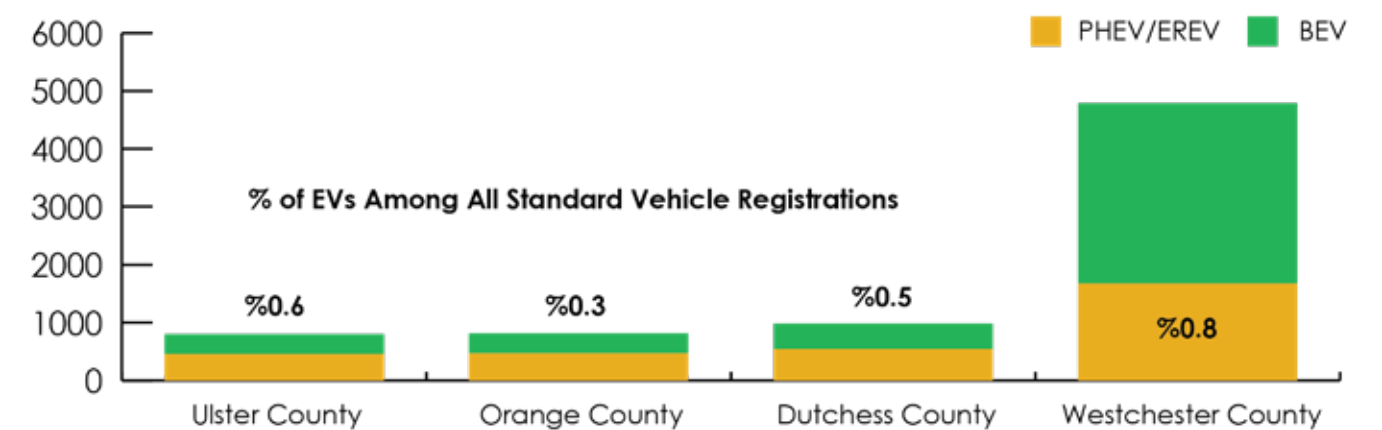


Firetruck being rescued by tow truck from culvert that has collapsed due to severe flooding.

In addition to policies that encourage drivers to leave their cars at home and seek alternatives to single-occupancy motor vehicle travel, solutions that make those vehicles cleaner to use must be developed if tangible reductions in GHGEs are to be achieved. Electric vehicles are very likely the best answer to that problem at this time.

EVs represent a very small share of the vehicle fleet among the universe of registered vehicles in the region and across the state, typically accounting for less than one percent of all standard registrations depending on location. Dense metropolitan areas are likely to see the largest share of EVs at this time due to a variety of factors, such as shorter average trip distances, higher concentration of charging stations, and larger household incomes. A snapshot of EV ownership trends across the Mid-Hudson and NY Metropolitan regions supports these assumptions.

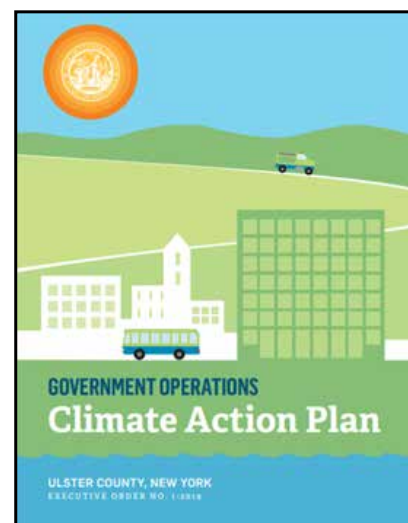
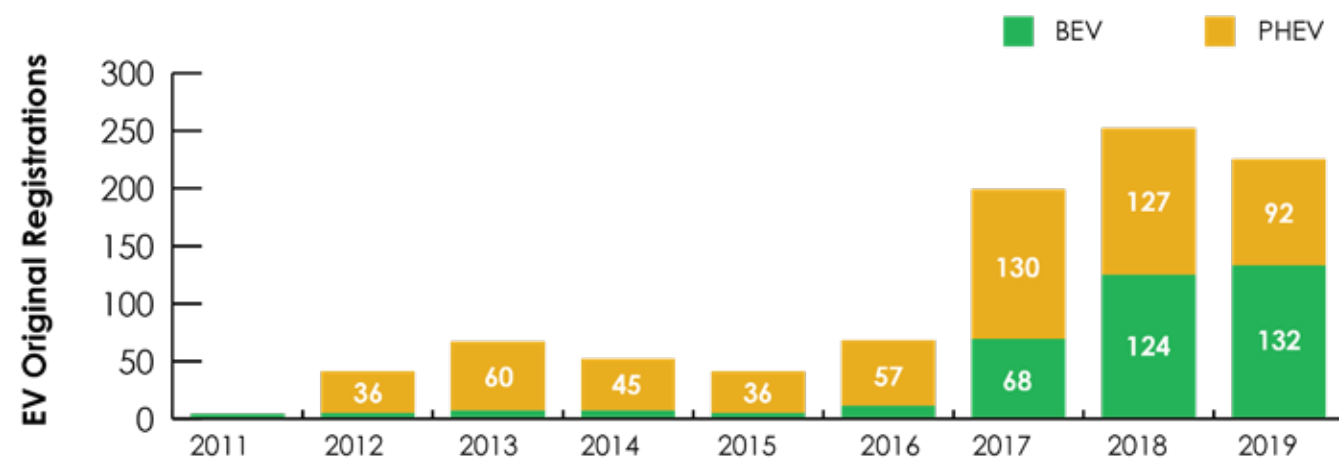
Figure 5.7: EV Registrations for Selected Counties, 2020



PHEV = Plug In Hybrid Vehicle BEV = Battery Electric Vehicle EREV = Extended Range Elec. Vehicle

While the total number of registered EVs is relatively small compared to all vehicles, the share has been growing. As shown below, the number of EVs registered in Ulster County **TRIPLED** between 2016 and 2018. Over time, the rate of change and share of EVs will depend largely on economic conditions, state and federal financial incentives for purchase, fuel costs, and EV range per charge.

**Figure 5.8: EV Registrations in Ulster County Over Time**



*Local action by communities will be a key factor in the success of GHGE reduction*

## ASSESSING VULNERABILITIES

The transportation sector consists of an interconnected system of assets and derived services, but a changing climate undermines the system's ability to perform reliably, safely, and efficiently. Many federal, state and municipal agencies have developed frameworks and tools to assess climate change transportation resilience. In response to the major flooding events of Super Storm Sandy and Hurricane Irene and Lee, NYSDOT developed the Scour Critical/Flood Prone Bridge Program, an initiative developed to strengthen New York State's at-risk bridges to withstand the increasing frequency of severe weather events and storms. To date, NYSDOT has replaced at least 5 bridges in Ulster County on critical corridors that will be more resilient to future flooding, including the Mt. Tremper bridge on Rte 28 shown here, which is being built higher and longer to avoid Esopus Creek floodwaters.



## TRANSPORTATION RESILIENCE

*Transportation Resilience refers to the ability of the transportation system to withstand, respond to, and recover rapidly from natural and man-made disruptions.*

While developing plans and policies to reduce GHGEs, states and communities are simultaneously trying to effectively manage, operate, and maintain a safe, reliable transportation system that is under increasing threats posed by a changing climate. Extreme weather events are becoming more frequent and intense due to climate change, and long-term climatological trends are slowly but inexorably changing how transportation systems need to be planned, designed, operated, and maintained. A "new normal" is evolving and State departments of transportation (DOTs) are turning their focus toward building resilience.<sup>viii</sup> Recognizing these challenges, in 2015 the Federal Highway Administration published its Climate Change Adaptation Guide.<sup>ix</sup> The Guide outlines methods to incorporate climate change considerations into how agencies plan and execute their transportation system management and operations (TSMO) and maintenance programs



**Example of severe flooding and resulting infrastructure and property impacts.**

to help the agency become more resilient to unanticipated shocks to the system.

Adaptation seeks to address anticipated potential future changes resulting from a changing climate, such as higher sea level, more frequent and intense weather events, and increased temperatures. Each of these has an impact on transportation infrastructure and operations and is of particular concern in the Ulster County Metropolitan Planning Area. There are over 40 miles of tidal coastal area in the Hudson River Valley that is subject to impacts from rising seas. There are also numerous rivers and streams that are prone to flooding. Severe flooding and storm

surge damage from Hurricane Irene in August of 2011 and Tropical Storm Sandy in October 2012 illustrate the seriousness of extreme weather events. Given the long life span of transportation assets, planning for system preservation and safe operation under current and future conditions constitutes responsible risk management, a concept addressed through transportation resiliency planning. Resiliency, requires a system-wide approach to providing transportation services before, during, and after an event. It is critical to ensure that evacuation, emergency response, and short and long-term recovery are not impeded by loss of facilities. This is done through assessing vulnerability and applying adaptation strategies to selected infrastructure.

Sustainable transportation is an element of creating sustainable communities, addressing issues associated with quality of life, livability, and social equity. A key component of creating livable communities is having transportation choices available to everyone. A multimodal system that integrates walking, bicycling, transit, and automobile access is one that provides residents with more choices of where to live, work, and play. Integrating land use planning with transportation improves livability by fostering a balance of more compact mixed-use neighborhoods that recognizes the importance of proximity, layout, and design to help keep people close to home, work, services, and recreation. Recognition of the importance of neighborhood character, community, and social justice in the planning and execution of transportation investments has therefore been integrated into the process itself when it is done well.

Sustainable transportation in practice can also be a mechanism by which federal, state and local agencies can conserve limited fiscal resources. By focusing on the right investments, in the right place at the right time, these agencies can accomplish the goal of establishing a sustainable transportation system that reduces unnecessary growth and new facilities, lowers the costs associated with maintenance, and avoids repeated risks to investments.

This notion forms the basis of the NYS Department of Transportation’s “Forward Four” Principles, developed in 2012 in an effort to guide transportation investment decisions in an era of limited financial resources.<sup>x</sup> The Principles place a priority on transportation investment decisions that preserve the existing system through a focus on preventive, corrective and demand work. Its system perspective elevates the discussion from the project level to a consideration of the most effective methods for managing financial and operational risk. It emphasizes return on investment and investing in a transportation system that “considers the relative and cumulative value of transportation assets as they benefit the public, economy and environment.”



NYSDOT’s “Forward Four” Guiding Principles of Sustainable Transportation

Based on the above data and discussion, the following mitigation measures should be considered when developing UCTC transportation policy.

Figure 5.9: Possible Measures to Reduce Emissions and Improve the Transportation System for All Users<sup>xi</sup>

Electrification (Buses & Freight)	Electrification (Personal Vehicles)	Sustainability Planning	Regulatory Incentives	Affordability	Driver Pricing Reforms/Cost Incentives	Infrastructure Improvements	Public/ Alternative Transportation Options
Port Equipment Electrification	Rebates & Tax Incentives ✓	Transit-Oriented Development and In-fill Development	Real Estate Level of Service Review	Income-Based Transit Fares; Discounts for kids, seniors ✓	Dynamic Parking Prices	State-of-Good-Repair improvements for Roads ✓	Expansion of transit service to underserved areas ✓
Electrify Local Delivery Vehicles	EV Charging Infrastructure Incentives ✓	Non-road Equipment (Farms, Construction, Lawn equipment)	Transit Oriented Zoning	Direct Rebates/ Dividend ✓	Congestion Pricing	State-of-Good-Repair improvements for Transit ✓	Rural Public Transportation ✓
Electrify Transit Bus Fleets ✓	Electrifying Carshares/ Rideshares	Adjusting Routes to Avoid Traffic	Transportation Demand Management	Financing Programs for EVs ✓	Weight Distance Fees	Complete Streets ✓	Caresharing and Bikes sharing ✓
Electrify School Buses (V2G Potential)	Carpool Lane Access for ZEV's	Resilient Transportation Infrastructure ✓	Road Safety Liability	Telework ✓	Parking Pricing and Parking Cash Out	Bond Measures	Rideshare and Vanpools ✓
Zero-emission Fleet Commitment ✓	Public Awareness Programs ✓	Active Transportation and Community Planning ✓		Tax Credits ✓	Occupancy and High Traffic Pricing	Bike Accommodations ✓	Employer-sponsored Transportation
Heavy-duty EV Utility Rate Design Reform	Vehicle Retirement Incentive Programs ✓				Pay as You Drive	Traffic Calming ✓	Bus rapid Transit & Express Bus Routes

Future iterations of the Long Range Transportation Plan will seek to establish focused metrics such as those shown above that can be analyzed over time to measure progress.

Measures with a '✓' indicate those that have been advanced within Ulster County through Federal, state or local initiatives.



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- <sup>i</sup> NYSDOT Environmental Procedures Manual. Available online at <https://www.dot.ny.gov/divisions/engineering/environmental-analysis/manuals-and-guidance/epm>
- <sup>ii</sup> NYSDOT PFLAP Application. Available online at <https://www.dot.ny.gov/divisions/operating/opdm/local-programs-bureau/locally-administered-federal-aid-projects>
- <sup>iii</sup> World Commission on Environment and Development (1987). *Our Common Future*. Oxford: Oxford University Press. p. 27.
- <sup>iv</sup> <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#t1fn2>
- <sup>v</sup> Page 29 [https://www.dec.ny.gov/docs/administration\\_pdf/ghgguide.pdf](https://www.dec.ny.gov/docs/administration_pdf/ghgguide.pdf)
- <sup>vi</sup> [https://www.dec.ny.gov/docs/administration\\_pdf/ghginv2019.pdf](https://www.dec.ny.gov/docs/administration_pdf/ghginv2019.pdf)
- <sup>vii</sup> Source: "The Road More Travelled" *Smithsonian Magazine*. <https://www.smithsonianmag.com/history/when-michigan-students-put-car-trial-180974374/>
- <sup>viii</sup> <https://ops.fhwa.dot.gov/publications/fhwahop15025/fhwahop15025.pdf>
- <sup>ix</sup> <https://ops.fhwa.dot.gov/publications/fhwahop15026/fhwahop15026.pdf>
- <sup>x</sup> NYSDOT. <http://www.cdcmpo.org/policy/jun12/forward.pdf>
- <sup>xi</sup> [https://www.dec.ny.gov/docs/administration\\_pdf/climtranslides081519.pdf](https://www.dec.ny.gov/docs/administration_pdf/climtranslides081519.pdf)