



VT Trans Climate Change Action Plan

June 2008

Introduction

The State of Vermont recognizes the threat posed by climate change and the effects it will have on the states', the nation's, and the planet's economy, ecology and way of life. With a threat that is real and imminent, Vermont is poised to take action through policies and programs aimed at reducing green house gas emissions while ensuring energy security, creating opportunity and strengthening communities.

Vermont in concert with the other New England states and the Eastern Canadian provinces adopted aggressive green house gas (GHG) emission reduction goals as early as 1991. Governor James Douglas reaffirmed these ambitious goals when he established the Governor's Commission on Climate Change (GCCC) by Executive Order 07-05 on December 5, 2005, and they were put into statute by the General Assembly in the passage of Act No. 168 (S.259) in 2006.

Vermont's GHG Emission Reduction Goals: Reduce the state's GHG emissions by 25 percent from 1990 levels by 2012; 50 percent by 2028; and, if practical, 75 percent by 2050.

Transportation makes up 44 percent of Vermont's GHG emissions, thus making climate change an issue requiring action by the Vermont Agency of Transportation (VTrans) and other organizations and agencies that influence our transportation choices.

VTrans is working closely with other state agencies, including the Agency of Natural Resources (ANR) to review and implement the transportation-related recommendations from the 2007 GCCC final report. The report recognizes the complex nature of the problems facing the state but underscores the opportunity in building a green Vermont economy driven by developing and exporting technologies and programs related to energy efficiency and renewable energy sources.

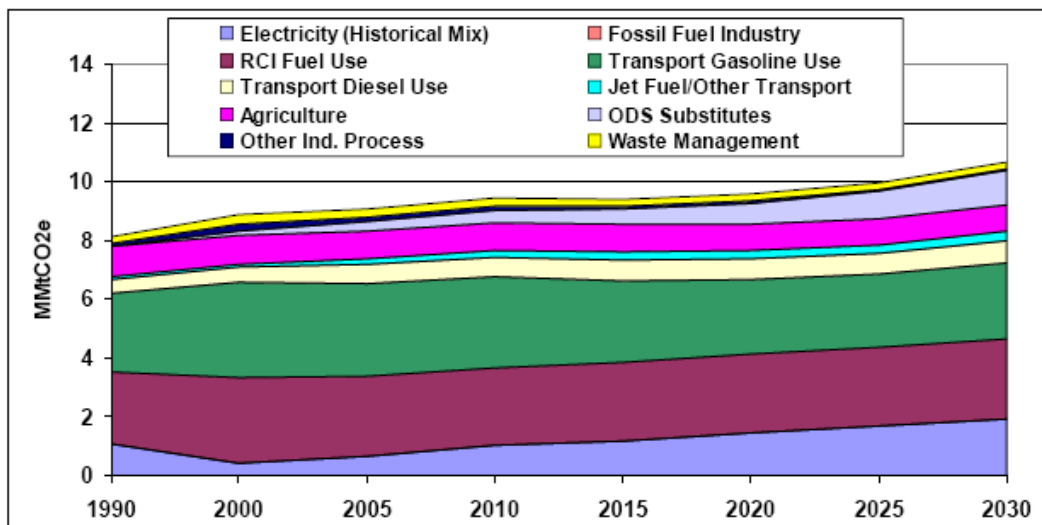
VTrans developed the actions described below based on a careful review of the transportation-related recommendations in the GCCC report, and consideration of agency programs and capacity to undertake the recommendations on a short and long term basis. The agency also recognizes that no one agency or entity can take on climate change alone. The required partners – state and federal government, business and energy interests - are many and varied, thus requiring that the agency be open and creatively work with others in addressing the problem of climate change.

The VTrans Climate Plan action plan has three major focus areas:

- 1. Reducing GHG Emissions from the Transportation Sector**
- 2. Protecting Vermont's Transportation Infra-structure from the Effects of Climate Change**
- 3. Reducing VTrans' Operational Impacts on Climate Change**

Background: Vermont Transportation Sector Emissions

Vermont gross GHG emissions by sector, 1990–2030: historic and projected (electricity supply low-emission scenario)



RCI – Residential, Commercial and Industrial
ODS – Ozone Depleting Substances (which are also powerful greenhouse gases)

From **The Final Report and Recommendations of the Governor’s Commission on Climate Change**, October 27, 2007, p.4-1

The transportation sector is the largest source of GHG emissions in Vermont—accounting for 44% of Vermont’s gross GHG emissions in 2000. Carbon dioxide (CO₂) accounted for about 96% of transportation GHG emissions. Most of the remaining GHG emissions from the transportation sector are due to nitrous oxide (N₂O) emissions from gasoline engines. GHG emissions from transportation fuel use have risen steadily since 1990 at an average rate of slightly over 1.1% annually.

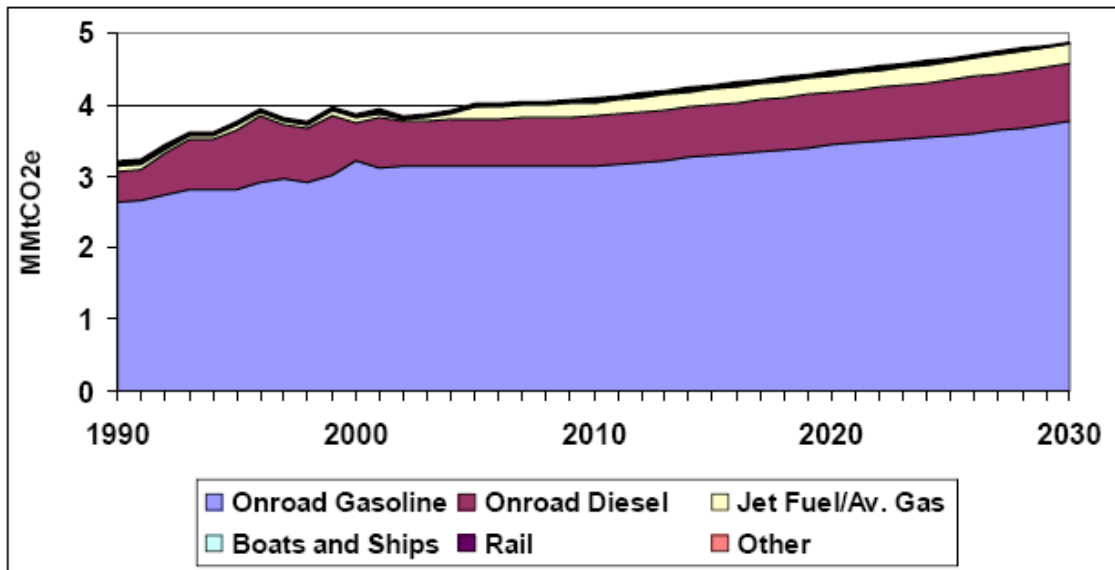
Transportation emissions are determined by technologies (types of engines and vehicles), fuels, and activity rates. Activity rates, in turn, are determined in part by population, economic growth, and land use choices that affect the demand for transportation services.

Transportation sector emissions totaled about 3.2 million metric tons of carbon dioxide equivalents (MMtCO₂e) in 2000. As the result of Vermont’s increase in vehicle miles traveled (VMT) during the 1990s, gasoline use has grown at rate of 1.4% annually. Meanwhile, diesel use has risen 2.7% annually, suggesting an even more rapid growth in freight movement within or through the State. GHG emissions from transportation are forecast to grow considerably over the next 15 years.

Gasoline-powered vehicles accounted for about 82% of total transportation GHG emissions in 1990 and 78% in 2005; they are projected to decrease from 77% to about 70% of total transportation emissions between 2010 and 2030. This projected decrease in gasoline consumption between 2010 and 2020 is due to the adoption of California’s light-duty vehicle GHG standards. Accounting for the effects of the California (CA) light-duty vehicle GHG standards, average annual growth in gross GHG emissions for the on-road gasoline consumption sector is projected at about –0.7% from 2002 through 2030.

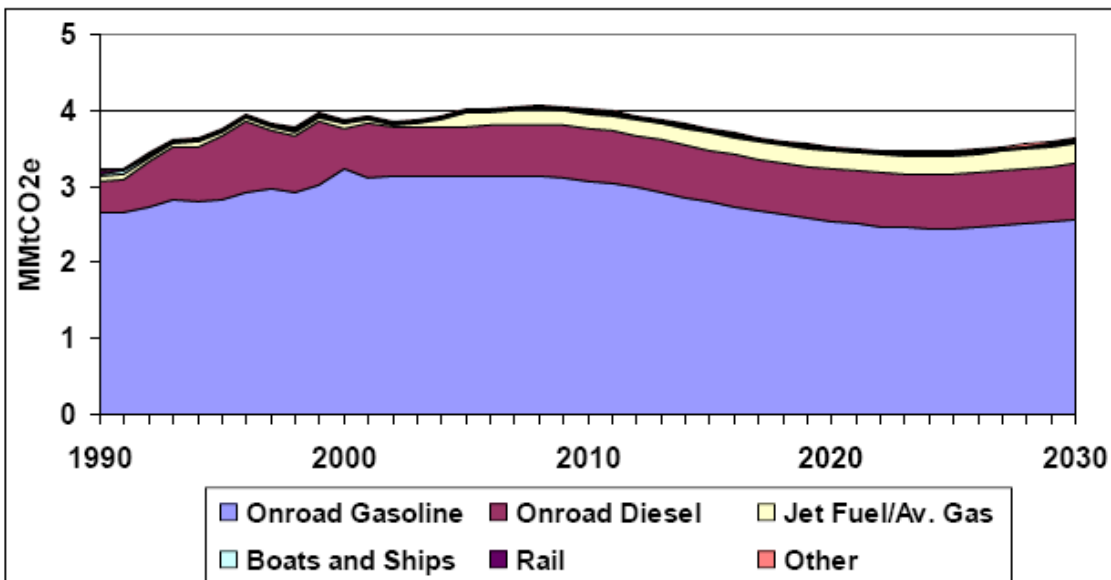
In order for the transportation sector to contribute to meeting Vermont's GHG reduction goals, other substantial actions will be necessary. The overall growth in transportation sector emissions, and particularly in VMT, suggests many opportunities and challenges for reducing Vermont's GHG emissions. The figures below show projected GHG emissions from the transportation sector without and with the adoption of the California (CA) standards for light duty vehicles.

Transportation GHG emissions by fuel, not including CA light-duty vehicle GHG standards, 1990–2030



MMtCO_{2e} = million metric tons of carbon dioxide equivalents.

Transportation GHG emissions by fuel, including CA light-duty vehicle GHG standards, 1990– 2030



MMtCO_{2e} = million metric tons of carbon dioxide equivalents.

Reducing Transportation Sector GHG Emissions

VTrans will take a three-pronged approach to reducing transportation sector GHG emissions:

- 1. Promoting the development, availability, and use of cleaner burning bio-fuels**
- 2. Increasing vehicle efficiency**
- 3. Increasing the efficiency of the transportation system**

1. Promoting the development, availability and use of cleaner burning bio-fuels

Growing Vermont's biofuels industry is part of the administration's green economic development strategy. VTrans will continue to work with the Department of Public Service (DPS), the Agency of Agriculture, ANR and the biofuels industry in the efforts outlined in the GCC report, the state's Comprehensive Energy Plan, and the 25/25 report. VTrans will support, as appropriate, research into a Vermont low carbon fuel standard, work to demonstrate use and increase demand of biofuels through use in the VTrans fleet, and support biofuels demonstration and education initiatives such as the Clean Cities program.

VTrans Bio-fuels Strategies:

- ❖ VTrans is currently demonstrating the viability of biodiesel in its on-going use of B-5 to fuel its fleet, which used 150,000 gallons in 2007 and is expected to burn 220,000 gallons in 2008. The use of higher biodiesel blends has been tested with encouraging results.
- ❖ Participation in S. 209 biodiesel study
- ❖ Biodiesel blends are being used in Chittenden County transit busses supported by VTrans. The short-range public transit plan currently underway will help inform future transit use of biodiesel.

2. Increasing vehicle efficiency

The Vermont Low Emission Vehicle Program

Vermont and more than a dozen other states have adopted California vehicle emissions standards. Not only are these standards more stringent than federal vehicle emissions standards with respect to traditionally regulated air pollutants, but they also include standards for GHG, while federal vehicle emissions standards *do not* regulate GHG. The CA vehicle emissions standards for GHG adopted by Vermont and other states will be phased in through 2016. When fully implemented, GHG emissions from the vehicle fleet subject to these standards will be reduced by 30 percent. These reductions will be achieved primarily through a combination of technologies to improve vehicle efficiency, use of lower carbon fuels, and improved air conditioning systems. Although Vermont and a number of other states have adopted CA standards, enforcement of the GHG standards is pending approval by the U.S. EPA. ANR is the state entity primarily responsible for implementing the CA emissions standards adopted by Vermont. VTrans has supported ANR with transportation planning dollars for this program.

Research

There is support at the UVM Transportation Research Center and other entities for the research and development of alternative vehicle technologies including hydrogen and plug-in hybrids. VTrans has in the past demonstrated the use of alternative technologies, including early hybrid technology in its passenger fleet.

Vehicle Purchase Incentives

Incentives such as so called “feebates” (see definition below) are noted in the draft **Vermont Comprehensive Energy Plan** as having the potential to increase the market share of high efficiency vehicles and technologies available to the general public. The effectiveness of feebates should be carefully considered within their economic context. The rising price of fuel may cause the market to shift to more efficient vehicle purchases without the intervention of a feebate. Feebates have the potential to require significant DMV program implications.

*From the draft **Vermont Comprehensive Energy Plan**, April 2008: **Feebates** are structured so that purchasers of the least efficient vehicles would pay a fee at the time of purchase and purchasers of the most efficient vehicles, including hybrids, would receive an incentive, or rebate. The program can be structured to operate within each vehicle class, so businesses and families for whom a larger vehicle is a necessity would not be adversely affected, as an SUV or a large truck would still be eligible for an incentive - the purchaser would simply be encouraged to buy the most efficient vehicle in that particular class. This is important in Vermont, as 31% of vehicles purchased fall into either the “large” or “largest” vehicle categories, and 41% are designated “medium.” Analyses have indicated that benefits associated with this type of program arise from changes made by manufacturers when they recognize shifts in market demand toward vehicles with greater fuel efficiency. As stated earlier, Vermont has limited power to influence manufacturer decisions because of the small size of its auto market. Although it isn’t currently being discussed, a regional approach to a feebate system could prove beneficial. However, this raises issues about administration and coordination of the program, and how funds would be distributed. In any feebate program, readily available information for the purchaser is essential.*

Consumer Education

Vehicle technology choices through labeling and other programs

Vehicle maintenance, such as appropriate tire pressure, to ensure that vehicles perform at optimum efficiency levels as well as after market technologies such as low rolling resistance tires and low viscosity oil

Unnecessary Vehicle Idling

Promote the dissemination of information and appropriate policy-making and regulation of unnecessary vehicle idling.

VTrans Vehicle Efficiency Strategies:

- ❖ Continue using SPR dollars for the LEV program
- ❖ Actively participate in the Vermont Clean Cities program
- ❖ Model fleet management energy efficiency strategies such as the VTrans vehicle idling policy
- ❖ From the draft Comprehensive Energy Plan:
 1. Tax Dept, DMV, NEG-ECP, and AOT, large employers: Evaluate a purchase and use tax reduction incentive; consider increasing the mileage limit and exempting purchasers of efficient vehicles from the purchase and use tax.
 2. Tax Dept, AOT, ANR, and DPS evaluate the benefits and costs to implementing a feebate program within Vermont; consider a regional feebate in the context of the New England Governor’s conference planning.
 3. Tax Dept, AOT work with business community to evaluate various incentives and possible “best-in-class” requirements for encouragement of efficient company fleets.

- ❖ From the draft Comprehensive Energy Plan:
 1. *Tax Dept, AOT, auto-industry retailers and mechanics, VT General Assembly evaluate aftermarket tire efficiency labeling requirement, and/or tire efficiency requirements*
 2. *Conduct education and information outreach, led by the AOT and DPS, to inform consumers of the choices available concerning replacement tires, low viscosity oil and tire inflation*

3 Increasing the efficiency of the transportation system

The transportation system can be made more efficient in several ways: by increasing the use of public transit options such as vans, trains or buses and zero polluting modes such as biking and walking; by increasing the number of passengers in cars and thus decreasing the number of vehicles on the roads through ridesharing; and by relieving congestion and thus less efficient engine speeds and roadway idling through techniques such as signal timing and intersection improvements. The latter - dubbed transportation system management or TSM - while having important local traffic and energy conservation benefits also has the potential to increase overall highway capacity and thus increased numbers of vehicles and emissions.

The number of cars and trucks on Vermont roadways has been growing in the long term. While improved technologies, especially in the light duty fleet, hold promise to substantially reduce per-mile GHG pollution, continuing growth in Vehicle Mile Traveled (VMT)¹ can eventually erode any gains made from the use of new vehicle technologies mandated by adoption of the California emissions standards.

Strategies to reduce the numbers of cars and trucks on Vermont's roadways fall into several categories

Growing local economies and encouraging land use planning and community design such as "transit-oriented design" aimed at compact development patterns and a mix of uses in order to encourage shorter trips and the viability of alternative modes

Improving the state's telecommunications network to encourage telecommuting and thus reduce commute miles

Expanding access to and the quality of alternative transportation modes: transit, rail (passenger and freight), bike/ped. Inter-modal connections are integral to this

Increased vehicle occupancy rates (through rideshare programs and other mechanisms) Park and ride facilities are integral to this

Employee commuter programs and other programs aimed at reducing trips from certain sectors, such as tourism or higher education

Road, parking, and energy pricing to affect behavior

There are additional benefits of addressing the rise in vehicle numbers on Vermont roadways. Increases in traffic is often perceived to be a sign of booming times, but traffic

¹ VMT refers to the total number of miles of vehicular travel per year on a highway system.

and traffic congestion has negative consequences for air and water quality, communities and the economy. Addressing traffic congestion by increasing roadway capacity is costly and ultimately encourages even more driving.

The Final Report and Recommendations of the Governor's Commission on Climate Change, October 27, 2007p. G-2 includes the following:

Ensure that vehicle miles traveled (VMT) in Vermont are equal to the amount driven in aggregate in the year 2000 by the year 2012 and are equal to the 1990 level by 2025.

VMT was 5,838,000,000 in 1990 and 6,811,000,000 in 2000. Forecasts are in 5-year increments, so the Center for Climate Strategies (CCS) 2012 baseline is an interpolation: 8,858,000,000. 2025 baseline forecast is 10,300,000,000. Thus, these goals imply reductions from the baseline of 2,047,000,000 VMT in 2012 and 4,463,000,000 VMT in 2025. Thus, these goals imply reductions from the baseline of 2,047,000,000 VMT in 2012 and 4,463,000,000 VMT in 2025.

A VMT reduction goal must be carefully considered. Vermont's VMT numbers are greatly influenced by external factors. Significant traffic passes through the state such as trucks serving New England markets, Canadians passing through to the eastern US and Americans visiting the metropolitan areas of Quebec. This portion of VMT is outside the state's control.

Vermont is a rural state and due to a myriad of economic and cultural reasons has grown in such a way that people are required to drive often long distances to access important functions such as work, school, medical care, and shopping. This document and others propose to change this trend overtime by building local economies and compact settlement patterns and providing transportation alternatives both within and between communities. However, reducing VMT today in a rural state such as Vermont is extremely challenging even with unprecedented increases in fuel prices as have been recently occurring.

Another large portion of Vermont's VMT is tourist traffic coming into the state from all directions. While the state can work to increase tourists visiting the state via passenger rail, inter-city bus and air service and provide inter-modal connections and transit service so that cars are not needed when visitors arrive at their destinations such as ski areas, these alternatives can not in the near term come close to addressing the state's current tourism transportation demand. The state's rural nature and dispersed attractions, the prevailing car culture, and the state's economy relying so heavily on tourism make reducing VMT in this sector a challenge. In order for the state to remain an important tourist destination into the future, it will be prudent to have the rail and transit infrastructure and walkable and bikeable destinations served by transit, vans and other services in places and ready to expand as the cost and availability of fuel increases and the importance of reducing SOV trips is more widely accepted by the general public.

Any VMT reduction goals must be broken down into that portion of VMT that can be influenced by state actions such as commuter home to work trips. Also reducing *the rate* of growth may be a more realistic approach. It must be acknowledged that there is a portion of the VMT that simply can't be controlled or don't want to at this point in time due to economic considerations. The VMT goals in the GCCC report require further analyses.

VTrans helps provide transportation choices through:

1. Dollars for physical assets, rail, bus, bike/ped facilities.
2. Dollars for transit, rail programs – planning and operational costs.

3. Dollars for planning the transportation system, modal planning and inter-modal connections, both state and regional (northeast) level. MPO and TPI address regional level planning
4. Dollars for public education and marketing – rail, transit, rideshare, walking and bicycling

VTrans Strategies to Gain Transportation System Efficiencies:

1. Expand access to and the quality of alternative transportation modes: transit, rail (passenger and freight), bike/pedestrian, inter-city bus, and including inter-modal connections. Also, increase vehicle occupancy rates through rideshare and vanpool programs and encourage related mechanisms such as park and ride facilities.

Discussion by Mode or Program:

Inter-modal Connections and Coordination

Alternative modes require inter-modal connections unless the mode provides origin to destination service. For example, when passengers disembark from an the inter-city bus or train at a stop or station, options such as transit service, taxis or a walkable community need to be present in order to get travelers to their final destination. These options need to be as “seamless” as possible for the alternative to be viable, in other words with minimum delay and inconvenience. Inter-modal facilities are also critical for rail freight in order to connect maritime shipping with rail and rail with truck if the final destination is not serviced by rail.

Goals: From the GCCC report: *Provide adequate inter-modal (e.g., transit, bike, pedestrian, and shuttle bus) connections at all railroad stations, airports, and bus stops; target improved railroad station and airport inter-modal connections for large institutions, companies, and the Vermont travel industry; provide parking facilities at railroad and bus stations and airports.*

Strategies: Implement the 2007 H.527 Section 45 Study examining the “Regional Connectivity of Vermont’s Public Transportation System” and establish regional transit connections so that there is seamless service throughout the state; coordinate state, regional and municipal level planning and investment; coordinate online service (see Go-VT description below under commuter programs); and coordinate marketing strategies for all modes (also see Go-VT)

From the 2007 Public Transit Policy Plan, p. 12:

VTrans will support a vital intercity bus network in Vermont, serving both intra-state travel and travel to other metropolitan areas in New York, New England, and Quebec by providing attractive and accessible facilities (park-and-rides with bus shelters) at convenient locations along major travel corridors.

VTrans will work to improve connectivity between public transit provider services and private-sector operations that serve markets outside Vermont, and to provide easy access to information about those services at inter-modal facilities and via the Internet.

Transit

Goals: The VTrans 2007 Public Transit Policy Plan states that *VTrans’ overall goal is to preserve and enhance the level of public transportation services in Vermont, and VTrans will work with providers to enhance and expand public transportation services. Adding new services and improving the efficiency and convenience of existing ones could help attract and retain additional public transportation ridership. It is in Vermont’s interest to reduce vehicle miles traveled per capita and increase public transportation ridership. Reducing auto*

dependency ensures that the state can reduce vehicle emissions and meet greenhouse gas targets.

The GCCC report includes the following transit goal: *Create a system that is easy to use, affordable and serves downtowns, growth centers and major highway corridors. Long term goal - 15 minute headways in these areas and 30 minutes elsewhere.*

Strategies:

Vermont's transit system's historic mission of providing mobility to all Vermonters will be maintained while addressing the challenges of keeping commuting to work affordable and reducing the transportation sector's GHG emissions.

VTrans will aggressively explore opportunities to maximize the efficient delivery and utilization of public transit services including: an examination of the transit delivery system, coordinated transit provider services, new software and technology capable of facilitating more efficient operations, and examining the extent to which our investments are both strategic and accountable through performance measures.

Park and Ride

Successful vanpool, rideshare and transit programs require a network of state, municipal and neighborhood park-and-ride facilities.

Goals: Continue and expand the state park and ride program and encourage park and ride use and facilities at the regional, municipal and neighborhood levels. VTrans will double the number of Vermont's park-and-ride spaces over the next decade.

Strategies: Vermont currently has 27 state-owned and maintained facilities totaling over 1,000 parking spaces. Fifteen additional projects are in the development stages: nine new facilities and six expansions or upgrades to existing facilities. Projects in Randolph, Weathersfield and Waterbury are slated for construction funding in FY09.

Park-and-ride facilities are also supported through the VTrans Municipal Park-and-Ride Grant Program. Grants through this program are issued to municipalities to build their own facilities. \$100,000 was available in SFY 2004 and 2005, the first two years of the program. This was increased to \$200,000 in '06 and '07 and this year \$250,000 will fund municipal park- and-ride projects. There have been 27 grants awarded. Of those 18 lots are now open for use and provide over 270 parking spaces for commuters. The program is very competitive with more applications for grants than funding allows.

Rideshare/Vanpool:

Goals: Increase participation in the state carpool and vanpool programs Including: doubling the number of people actively signed-up in the Statewide rideshare database (from 1,600 to 3,200); improving ride-match systems to include automated and immediate matching information; and accommodating "single trip" travel plans. For the vanpool program: support third-party vanpool providers by promoting and coordinating these services.

Strategies: Go-Vermont - reconfiguring the state rideshare and vanpool programs under a statewide coordinated inter-regional program as described below under commuter programs. Launch statewide marketing and outreach campaign.

Biking and Walking

Biking and walking are the best option from an emissions perspective. They have zero emissions *and* health and wellness benefits.

Goals: Increase the number of trips made by bicycling and walking, especially for short trips. Improve the safety of pedestrian and bicycle travel through education and increasing the quality and availability of facilities.

Strategies (from the 2007 VTrans Bicycle and Pedestrian Plan):

Incorporate bike and pedestrian accommodations in VTrans projects, programs and actions

Sustain current state, regional, and municipal programs to encourage walking and bicycling as a means of transportation.

Promote the incorporation of pedestrian and bicycle considerations into municipal town plans and expand and/or implement regional bicycle and pedestrian plans

Passenger Rail

Goals: Increase passenger rail use by 200% by 2028 (from the VTrans Rail Plan and GCCC report)

Strategies (from the VTrans Rail Plan and GCCC report):

- Replace Amtrak engines with more efficient DMUs
- Improve the frequency of service and travel time of Vermont's current Amtrak routes
- Increase the marketing of the state's current Amtrak routes
- Expand passenger rail service to Vermont's western corridor
- Improve passenger rail connections to Montreal and Boston
- Determine the demand necessary to justify commuter rail service in certain corridors and work to provide the service, including piggybacking commuter and intercity rail services

Rail Freight

Goals: From the GCCC report and VTrans Rail Plan: *Increase rail freight in Vermont by 100% by 2028. Background: From 1992 to 2002, freight rail traffic that originated and terminated in Vermont declined by 21 percent. Freight that originated in Vermont, however, increased from 430,000 tons in 1992 to 764,360 tons in 2002, which is primarily attributable to the increase in shipments from Omya, Inc. in Florence. It is projected that freight rail tonnage will increase between 44% and 55% between now and 2020 or approximately 2.4% annually during the next 5 years. State rail plan calls for a 2% annual increase; the baseline calls for a 29% increase by 2020.*

Strategies: From the GCCC report: *Improve rail infrastructure to serve all freight needs (e.g., double-stack on the western corridor); identify and provide necessary freight modal transfer stations within Vermont and the region; work with municipalities to plan and regulate land use to accommodate rail and bus infrastructure and service.*

Inter-city Bus

Vermont's Inter-city bus service is provided by the private sector. Vermont Transit, part of the Greyhound network, connects the state with out-of-state destinations such as Montreal, Boston and New York City as well as connecting cities and towns within Vermont that are not efficiently connected by transit service. Inter-city bus service has declined in recent years including service to the western corridor (Rt. 7) and the Northeast Kingdom.

Goals: From the GCCC report: *Improve intercity bus service throughout the northeast region; improve intercity bus service in the Rt. 7 corridor through public-private partnerships.* The 2007 H.527 Section 45 Study examining the “Regional Connectivity of Vermont’s Public Transportation System identifies the need to improve inter-city service and the hurdles associated with a publicly-funded service.

Strategies: Continue to examine the feasibility of local transit service providing the in-state inter-city service previously provided by Vermont Transit including the expansion of commuter service.

2. Employee commuter programs and other programs aimed at reducing trips from certain sectors, such as tourism or higher education

Commuting: Twenty-three percent of the vehicle miles traveled on the state roadway system are from Vermonters going from home to work and back. The average commute trip in Vermont takes 22 minutes and state workers, as an example, drive an average of 33 miles round trip. Reducing these numbers will help the state reach its GHG reduction goals.

Many Vermonters and Vermont employers are keenly interested in doing their part to limit the state’s GHG emissions. Supporting alternative commuting options is one way to accomplish this. Important added benefits include employees saving money on transportation expenses, and companies gaining access to employees who without better commuting options might not be able to get to their facilities.

Goals: *GCCC goals: All Vermont employers with more than 50 employees offer commuter benefits, all colleges and universities offer CB, all government units, especially the state, offers CB, state adopts employee parking management and incentive programs, and parking priority is provided for low-GHG vehicles (carpools, vanpools, and low-GHG SOVs).*

Strategies:

Continue VTrans support of Way to Go week and outreach in coordination with the CCMPO

Continue agency participation and provide technical assistance to inter-agency efforts related energy conservation and GHG reduction associated with state employee commuting.

Go Vermont: VTrans will partner with employers and be a catalyst in helping them and all working Vermonters find commuting alternatives that make real reductions in their carbon footprint by undertaking the following:

1. Ridesharing – As part of GoVermont, the state will shift its focus away from broad-based “ride matching” and vanpooling that relies upon the efforts of individuals and move toward a public-private approach of working directly with employers to reduce commuter miles traveled. New efforts also will make the current rideshare matching program a more efficient, state-level program that seamlessly connects with other states.

The Vermont RideShare Program has in the past supported staff, an Internet website, a database and the associated marketing efforts necessary for Vermonters seeking carpool ride matches. The existing program also provides funding and support for the development of vanpools. After conducting investigations into carpool and vanpool programs throughout the US as well as improvements in software and services provided

by public entities, VTrans is redirecting \$250,000 in FY09 to implement significant changes to the VT RideShare Program and its services.

VTrans will implement a new sophisticated, self-serve software application with a single database that is shared across Vermont, New Hampshire and Maine. Instead of the intensive administrative overheads required to perform the manual database matching process, this new cooperative venture will greatly expand service, reduce labor and support needs, and reduce capital investment. The new service will have the potential to serve as a comprehensive database for all alternative transportation modes available to Vermonters including public transit routes, rail, and carpool, vanpool, and bike/ped options.

2. Vanpools – Go Vermont will remake the state’s vanpool program to be more user-friendly by eliminating some of its more complex requirements. Currently, a potential vanpool group through an employer or a volunteer group of individuals must form a 501(c) 3 organization, become insured, maintain the vehicle, and provide an upfront 10 percent payment of the van’s purchase price. Successful programs in other states are geared instead toward professional, turnkey vanpool operations. These vanpool services are quickly available, efficient, and cost-effective to businesses and employment centers across the state. VTrans has prepared an RFP designed to solicit proposals for such professional services, and will consider partially subsidizing the per-seat costs.

3. Go-Vermont Marketing Program – Operating the rideshare and vanpool programs through professional, turnkey operations will lower costs and allow the savings to be re-directed toward a statewide marketing campaign (multi-media messaging, staffing targeted events, business presentations, etc.) that will generate broader interest in the overall benefits of Go-Vermont. These increased marketing efforts likely will include radio and print media buys, participating in targeted events, and partnering with businesses to augment overall outreach efforts.

4. Public Private Partnership Investments – Private employers and job centers are looking to invest in public transit routes as well as car and vanpool options. In some instances, successful and growing businesses have a need to reach out to labor markets beyond their immediate location. The cost of commuting can be prohibitive to some potential employees, but investment in alternative transportation can bridge that gap. In other instances, employers have discovered the financial value that alternative transportation provides their employees in regard to significant savings. Alternative transportation can also be financially beneficial to businesses that find the cost of providing expanded parking prohibitive. The bottom line on both sides of the employer-employee relationship is improved with better transportation options.

5. Go-Vermont Advisory Committee – The advisory committee currently working to help VTrans remake the RideShare program to better meet employer needs will advise the Agency on all aspects of the Go-Vermont Program. The committee includes companies who are creating or expanding employee commute alternatives and putting meaningful green business practices in place.

4. Growing local economies and encouraging land use planning and community design such as “transit-oriented development” aimed at compact development patterns and a mix of uses in order to encourage shorter trips and the viability of alternative modes

Dispersed land use or “sprawl” requires increased vehicle use thus increasing traffic congestion, which then requires state investment to address. In addition walking and bicycling are difficult and public transit service inefficient in areas of dispersed land use. These modes are more viable in compact, mixed use areas where jobs and residences, businesses and services are in close proximity.

Many of Vermont’s urban centers, small cities and towns, even village areas, have the existing density to be conducive to walking, biking and transit service. The state has programs in place to encourage new development and revitalized downtowns with sufficient density, mix of uses, connections to pedestrian and biking facilities, and access to public transit services.

The 2007 Vermont Public Transportation Policy Plan (pp. 37- 39) describes the concept of Transit Oriented Development (TOD), a form of “smart growth”, necessary for transit, walking and biking to be viable transportation alternatives:

To retain the unique rural character of Vermont, it is essential that development occurs in a “smart” way that preserves historic New England settlement patterns of compact village and urban centers separated by rural countryside. Among other principles, Smart Growth encourages Transit Oriented Developments (TODs) which are mixed-use developments with interconnecting pedestrian and bicycle facilities as well as access to public transit services. TODs promote choice in the modes of transportation available to the public, play an important role towards creating healthy, walkable communities and support the needs of diverse socioeconomic groups, including transit-dependent populations.

TOD offers location efficiency in the form of increased choices for transportation to accomplish daily tasks, “value recapture” (savings on transportation for both the individual and the community), livability, choice, and efficient regional land-use patterns. TOD has the following major characteristics:

- *Land use density supportive of transit services;*
- *Mixed land uses and pedestrian-oriented designs that encourage walking;*
- *Less automobile ownership accompanied by less vehicle miles traveled (VMT);*
- *Proximity of retail, employment and residential areas to transit stations.*

In addition, transit oriented developments address issues such as mobility for an increasing senior population and energy conservation. Mobility for seniors can be most efficiently maintained by offering them affordable places to live in village centers where they can accomplish many of their trips on foot and by fixed route and demand response public transportation. Compact, mixed-use development also conserves energy and resources by reducing the distances, and hence energy consumed, people have to travel for necessary trips. It also reduces public expenditure on extending municipal services, such as water and sewage, to areas outside the village and urban centers.

A common thread in all of the literature dealing with smart growth and TOD policy is that it cannot be implemented as a stand-alone policy and be expected to curb sprawl, reduce congestion, increase availability and use of transit service, and increase affordable housing. TOD works best when implemented as part of a program or policies aimed at improving the quality of life and reducing auto-dependency.

Goals: From the 2007 Transit Policy Plan, p. 11: *VTrans will continue to support Smart Growth and transit oriented development as it strives to improve mobility, maintain the rural character, and avoid sprawl in Vermont. It will be the policy of VTrans to meet this objective through its own program management, through coordinated planning and cooperation with*

other agencies and through its role as a “statutory party” in the Act 250 development review proceedings.

Strategies:

TOD research as appropriate through the MPO and TPI programs

Direct Enhancement dollars to downtown areas and growth centers

Corridor planning that addresses all modes ongoing through the MPO and TPI programs

Target downtown areas, growth centers and commuter routes as transit priority areas

VTrans participates in Downtown/Growth Center Programs directed by ACCD

From the 2007 Transit Policy Plan, p. 13:

- ❖ *VTrans will work with the Governor, the Legislature and all other state agencies, toward creation of a coordinated and guiding implementation plan or strategy designed to meet the smart growth and environmental goals established by existing statutes.*
- ❖ *VTrans will support and assist, as necessary, all appropriate boards, commissions and state offices that have been working to implement smart growth and TOD strategies at the state, regional and local levels of government.*
- ❖ *VTrans will work with other state agencies and Regional Planning Commissions (RPCs) to develop a method to encourage developers and municipalities to contact the transit agency in their area prior to the start of the development review process of a project – especially for developments that could serve transit-dependent populations.*
- ❖ *Revise the Traffic Impact Evaluation Guide (VTrans, 2003) to include public transportation solutions where appropriate.*
- ❖ *VTrans should review Act 250 applications and traffic impact studies in a comprehensive manner that takes into account all relevant modes of transportation.*
- ❖ *VTrans will continue coordination with the RPCs on Act 250 applications for small to medium scale developments.*
- ❖ *VTrans will continue working with other state and regional agencies to educate local communities on the benefits of TOD and encourage municipalities to adopt more smart growth-friendly zoning ordinances*
- ❖ *Develop a coordinated team approach utilizing staff from VTrans, ANR, ACCD, DPS and the Governor’s office to plan for and respond to new development projects of statewide importance.*
- ❖ *VTrans will revise criteria for new public transportation routes (New Starts) to reflect the benefit of services that promote or enhance TOD.*

Protecting Vermont's Transportation Infra-structure from the Effects of Climate Change

Climate and Weather Background

How will Vermont's climate change with global warming and thus the environmental conditions change that affect transportation infrastructure?

The information provided below is based on global trends and regional models. It is general to the northeast region and not Vermont specific. Much more research is needed to better understand regional and state level trends. There is agreement among scientists that historical trends related to factors such as snow depth and the frequency and character of flood events are expected to change in the decades ahead. We can no longer expect past weather patterns to tell us what lies ahead.

Climate change science has focused on *global* effects with models indicating average temperatures rising from 3 to 10 degrees F. by the end of this century. Tropical storms and hurricanes are likely to become more intense, produce stronger peak winds and produce increased rainfall over some areas due to warming sea surface temperatures (which can energize these storms) International Panel on Climate Change IPCC. In addition there is consensus among scientists that the frequency and intensity of precipitation events generally will increase. Wet areas will become wetter with more precipitation falling during single events and traditionally dry areas, such as the US southwest will face drought conditions.

The effects for North America are summarized in the following excerpt from **Regional Climate Projections: Assessment of Projected Climate Change for North America**, Hesselbjerg and Hewitson, et al. p. 887: *All of North America is very likely to warm during this century, and the annual mean warming is likely to exceed the global mean warming in most areas. In northern regions, warming is likely to be largest in winter, and in the southwest USA largest in summer. The lowest winter temperatures are likely to increase more than the average winter temperature in northern North America, and the highest summer temperatures are likely to increase more than the average summer temperature in the southwest USA. Annual mean precipitation is very likely to increase in Canada and the northeast USA, and likely to decrease in the southwest USA. In southern Canada, precipitation is likely to increase in winter and spring, but decrease in summer. Snow season length and snow depth are very likely to decrease in most of North America, except in the northernmost part of Canada where maximum snow depth is likely to increase.*

What do scientists tell us this will mean for Vermont?

The report *Confronting Climate Change in the Northeast* by the Northeast Climate Impacts Assessment Synthesis Team, 2007, Union of Concerned Scientists reports: *Since 1970 the Northeast has been warming at a rate of nearly 0.5 degrees Fahrenheit (°F) per decade. Winter temperatures have risen even faster, at a rate of 1.3°F per decade from 1970 to 2000. This warming has been correlated with many other climate-related changes across the region, including:*

- ❖ *More frequent days with temperatures above 90°F*
- ❖ *A longer growing season*
- ❖ *Less winter precipitation falling as snow and more as rain*
- ❖ *Reduced snowpack and increased snow density*
- ❖ *Earlier breakup of winter ice on lakes and rivers*
- ❖ *Earlier spring snowmelt resulting in earlier peak river flows*

❖ *Rising sea-surface temperatures and sea levels*

The October 2006 report, **Climate Change in the US Northeast**, also by the Northeast Climate Impacts Assessment Synthesis Team, details the following for our region:

We are already experiencing an increase in the rate of climate change in the Northeast. Annual average temperatures are rising, with the greatest increases occurring in winter temperatures. These changes have been accompanied by a reduction in snow cover, earlier snowmelt, earlier arrival of spring, an extension of the summer season, and an increased risk of extreme heat. These changes are expected to grow in the future, with the amount of change depending on whether we follow a pathway of lower or higher greenhouse gas emissions.p. 10

Precipitation p. 15:

❖ *Winter precipitation (in the form of both snow and rain falling in winter months) has been increasing over the past few decades, and is projected to continue increasing, with slightly larger changes under the higher-emissions scenario than the lower-emissions scenario.*

❖ *Little change is expected in summer rainfall, although projections are highly variable.*

Extreme Precipitation and Storms p. 16:

❖ *The frequency of heavy rainfall events is increasing across the Northeast.*

❖ *Under both emissions scenarios, rainfall is expected to become more intense. In addition, periods of heavy rainfall are expected to become more frequent.*

❖ *Some East Coast winter storms are projected to shift from earlier to later in the winter season as temperatures rise, and more storms are expected to travel further up the coast and affect the Northeast.*

Heat Waves and Temperature Extremes p. 13:

❖ *The number of very hot days is increasing across the Northeast.*

❖ *By the end of the century, many northeastern cities can expect 30 or more days over 90oF under the lower-emissions scenario, and 60 or more days per year under the higher emissions scenario.*

❖ *Currently, northeastern cities experience one or two days per summer over 100oF. This number could increase by late century to between three and nine days under lower emissions and between 14 and 28 days under higher emissions.*

Streamflow and Water Supply p. 20:

❖ *Warmer winter and spring temperatures in the Northeast are melting the snow earlier and causing earlier high spring flows.*

❖ *As temperatures continue to rise, snow and ice will melt even earlier, advancing spring streamflow 10 days earlier under the lower emissions scenario and more than two weeks earlier under the higher emissions scenario.*

❖ *Warming temperatures will also cause more water to evaporate in the summer months, extending the summer low-flow period by nearly a month under the higher-emissions scenario and increasing the risk of water shortages and drought.*

❖ *Global warming is also expected to increase the likelihood of high flow events in the winter, particularly under the higher-emissions scenario, which implies a greater risk of flooding.*

Winter Snow p. 22:

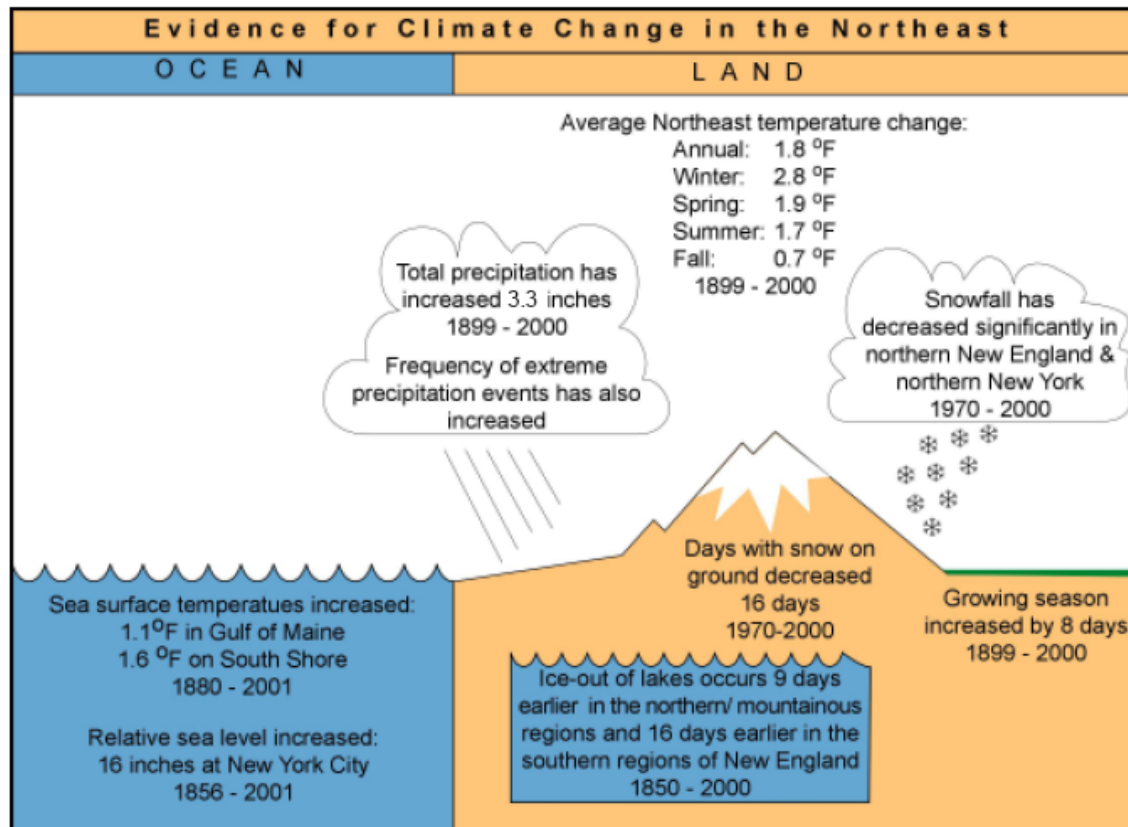
❖ *The number of snow-covered days across the Northeast has already decreased, as less precipitation falls as snow and more as rain, and as warmer temperatures melt the snow more quickly.*

❖ *Snow density has increased as the snow has become wetter and heavier (i.e., more "slushy").*

❖ *By the end of the century, the northern part of the Northeast, currently snow-covered for almost the entire winter season, could lose up to one-quarter of its snow-covered days under the lower-emissions scenario and more than half of its snow-covered days under the higher emissions scenario.*

❖ *By the end of the century, the southern and western parts of the Northeast could experience as few as 5 to 10 snow-covered days in winter, compared with 10 to 15 days historically.*

From **Indicators of Climate Change in the Northeast** 2005, Cameron P. Wake, UNH Climate Change Center



Potential threats to Vermont’s transportation infra-structure from climate change:

1. Flooding and erosion of low lying road, railroads and other infrastructure
2. Changes in the intensity and frequency of storm events and the need for culverts, bridges, and stormwater systems that are designed to adequately handle the associated increased flow and erosion.
3. With Increased stream flow and erosion, increases in bridge scour
4. The effects on pavement from an increase in freeze thaw cycles.
5. Increased emergency preparedness and evacuation demands
6. Changing winter maintenance demands due to more or less snow or an increase in freeze events
7. Compromised availability and the need to stockpile diesel fuel, salt, and sand

VTrans Climate Change Adaptation Strategies

Recent research by TRB available at: <http://onlinepubs.trb.org/onlinepubs/sr/sr290summary.pdf> summarizes the climate change adaptation challenges facing DOTs nationally. The report says transportation officials should acknowledge the challenges posed by climate change and incorporate current scientific knowledge into the planning, design, construction, operation, and maintenance of transportation systems.

Bridging the Gap between Climate Science and Adaptation Action

It is widely acknowledged that the state has experienced more frequent flood events and the associated damage and costs in recent years. Scientists are unable to explain why these events are more frequent or if the pattern will continue in Vermont in the future. Indications are they may be associated with unstable weather patterns associated with global warming.

Climate information for the northeast needs to be continuously updated and made more specific to the extent possible. Most importantly this climate information needs to be interpreted by scientists and engineers so that transportation officials can understand the effects of changing weather patterns on stream levels, flooding, erosion and other factors affecting the transportation system. The agency can then take a risk based approach to planning the Vermont's future transportation system and develop appropriate decision support tools to help the agency invest wisely.

One of the TRB report authors, Henry G. Schwartz, notes that most climate change data historically have focused on a global scale, but for transportation planning, smaller-scale analyses are necessary. "It is now possible to project climate changes for large sub-continental regions, such as the Eastern United States, a scale better suited for considering regional and local transportation infrastructure," he added. Transportation planners and climate scientists need to work together more closely to develop regional scenarios for likely climate-related changes and to compile the data needed to analyze their impacts, the report found.

Climate Change and Transportation Decision-making

The TRB report warns that climate predictions historically used by transportation planners and engineers to plan and develop infrastructure may no longer be reliable in the face of new weather and climate extremes. What was once considered a "one-in-100-year" storm event may need to be adjusted to a one-in-50-year event. In addition, federal planning requirements that look 20 years to 30 years ahead may need to look forward 50 years to 100 years. While the report did not determine the financial implications of the climate change impacts to transportation infrastructure, the authors stressed the need for early planning. "Focusing on the challenges now could help avoid costly transportation investments and disruptions to operations in the future," the report said.

The report recommends the following decision framework for transportation professionals to use in addressing impacts of climate change on U.S. transportation infrastructure.

1. Assess how climate changes are likely to impact various regions of the country and modes of transportation.
2. Inventory transportation infrastructure essential to maintaining network performance in light of climate change projections to determine whether, when, and where the impacts could be consequential.
3. Analyze adaptation options to assess the trade-offs between making the infrastructure more robust and the costs involved. Consider monitoring as an option.
4. Determine investment priorities, taking into consideration the criticality of infrastructure components, as well as opportunities for multiple benefits (e.g., congestion relief, removal of evacuation route bottlenecks).
5. Develop and implement a program of adaptation strategies for the near and long terms.
6. Periodically assess the effectiveness of adaptation strategies and repeat steps 1–5.

In response to this framework the following makes sense for Vermont:

Federal and state agencies and universities at the federal and state levels – perhaps through the VT Climate Change Collaborative - should work together to institute a process for better communication among transportation professionals, climate scientists, and those in other relevant scientific disciplines, and establish a clearinghouse for transportation-relevant climate change information. This might include a task force with ANR, appropriate federal agencies, and UVM to look at the best available science on changes anticipated in stream flow and flooding and how this may or may not affect bridge/culvert design, stormwater design, roadway location and maintenance

Weather projections for Vermont and the associated environmental effects and infrastructure management responses should be based on an order of magnitude basis rather than a static projection, effect and response.

Safety on the entire system must be maintained. Given greater stream flows and erosion the Agency may need to prioritize efforts to inspect and protect critical structures from stream scour.

Identify Vermont's transportation infrastructure essential to maintaining network performance that is vulnerable to climate change. Adaptation priorities should be focused on *critical corridors* and places where impacts are significant and consequential. Planning for these corridors must include land use planning and alternative mode and telecommunications infrastructure – all factors that influence traffic levels and road way function.

Reducing VTrans' Operational Impacts on Climate Change

Background

State agencies are mandated to meet GHG emissions reduction targets for state operations set by Executive Order and reaffirmed in planning documents including the NEGC/ECP Climate Change Action plan. The agencies' work to date has focused on reducing emissions and thus energy use in areas such as agency controlled building heating and cooling, purchase and use of equipment, the efficiency of the state passenger fleet and its use and the use of the diesel fleet, and employee commuting. The Climate Neutral Working Group (CNWG) is an inter-agency committee assigned to prepare and implement a plan to meet the reduction targets. The CNWG, staffed by ANR has written two reports outlining the targets, the agencies' work to date and the challenges. Overall emissions from state government continue to rise, especially those related to transportation and employee commuting. There have been recent efforts to re-energize the CNWG through BGS. In addition each agency is mandated by statute to prepare an energy plan (State Agency Implementation Plan - SAIP) in coordination with the overall State Agency Energy Plan prepared by BGS. The energy plans have energy reduction targets and are thus another mechanism to address GHG emissions from state operations.

VTrans Operations GHG Reduction Strategies:

- ❖ Continuously update and assess the success of the VTrans SAIP work plan including improvements to monitoring energy use and undertaking activities and improvements to reduce energy use at VTrans controlled facilities and in all operations.
- ❖ Work to inform staff on their roles and responsibilities in reducing energy in the workplace as described in the SAIP.
- ❖ Participate fully in the CNWG process and contribute transportation related expertise as needed.
- ❖ Continue biofuels use in the agency fleet and participate in the legislatively mandated biofuels study
- ❖ Continue support of Way to Go and actively market WTG within the agency
- ❖ Increase agency participation in the state rideshare program
- ❖ Establish an agency transportation on-line bulletin board to facilitate commute and on the job ridesharing and participation in the state rideshare program.
- ❖ Reduce/eliminate paper use through electronic processes, thereby reducing/eliminating storage space needs.
- ❖ Investigate telecommuting and reduced work week options