

Final Report of the Climate Action Panel

Colorado Climate Project of
The Rocky Mountain Climate Organization

November 2007

Executive Summary

Creation of the Colorado Climate Project

The Rocky Mountain Climate Organization (RMCO) undertook the Colorado Climate Project to bring Coloradans together to reduce the state's contribution and vulnerability to climate change. The project was inspired by and patterned after similar efforts undertaken by state governments around the country. Like many of those efforts, the Colorado Climate Project was carried out in partnership with the Center for Climate Strategies (CCS), which helped design the process and provided technical analyses for and facilitation services for this project, as CCS has done for state government advisory panels in several states.

RMCO's Project Directors of the Colorado Climate Project appointed a blue-ribbon Climate Action Panel (CAP) and charged them to develop recommendations for actions that can be taken in Colorado by the state government, local governments, water providers, the private sector, and individuals to reduce the state's contribution and vulnerability to a changed climate. This report is the culmination of the work of 116 Coloradans who worked as members of and alternates to the CAP and the six Policy Work Groups (PWGs) that supported the CAP.

Greenhouse Gas Emissions Inventory and Projections

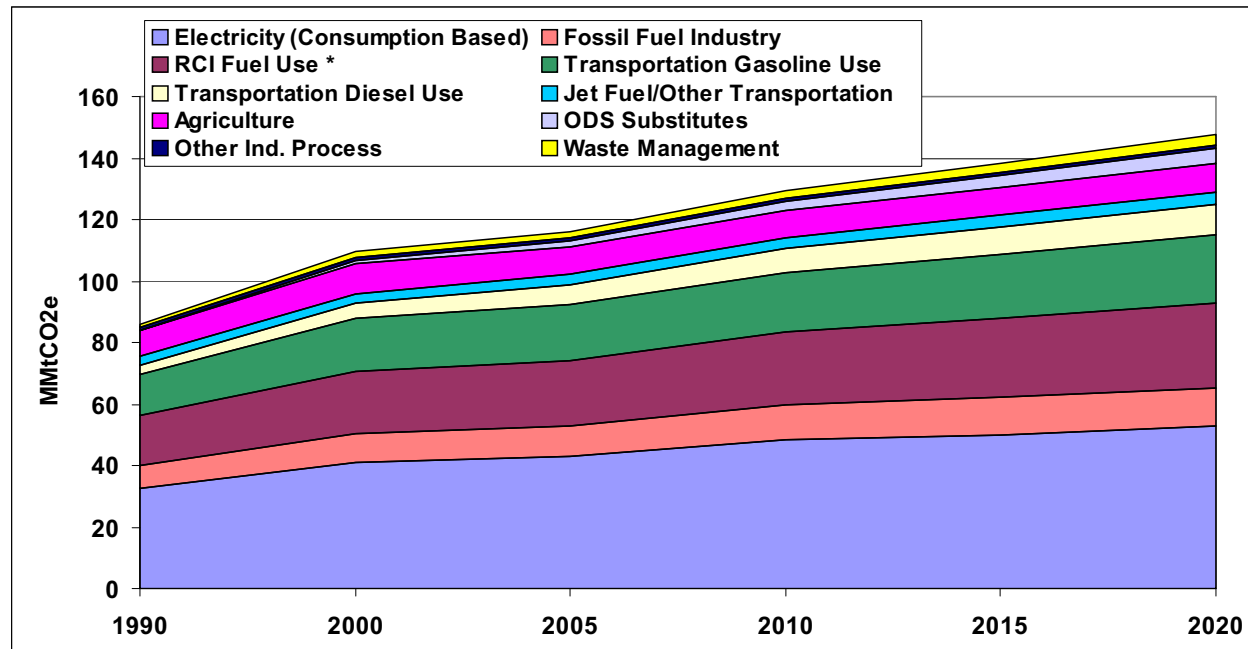
In January 2007, CCS prepared a preliminary draft greenhouse gas (GHG) emissions inventory and reference case projection for the Colorado Department of Public Health and Environment (CDPHE) that was separately provided to the CAP and its PWGs to assist them in understanding past, current, and possible future GHG emissions in Colorado, and thereby inform the policy development process. The preliminary draft *Inventory and Projections* was improved by incorporating comments provided by the CAP and PWGs. As shown in Figure ES-1, the *Inventory and Projections* revealed substantial emissions growth rates and related mitigation challenges. Colorado's gross emissions of GHGs grew by 35% between 1990 and 2005, slightly more than twice the national average of 16%. Colorado's emissions growth was driven largely by the growth of Colorado's population, as the state's emissions on a per-capita basis stayed essentially constant between 1990 and 2005. Under current law, Colorado's gross GHG emissions (not counting sequestration) are projected as rising fairly steeply to 147.5 million metric tons (MMt) of carbon dioxide equivalent (CO₂e) by 2020, or 71% over 1990 levels.

CAP Policy Recommendations

The CAP recommends 70 policy actions. Among those CAP members present and voting, sixty-one policy recommendations were approved unanimously; seven were approved by a super majority, with fewer than five votes against them; and two were approved by a simple majority. For each of 10 recommendations (four of which were among the recommendations not approved unanimously), at least one CAP member expressed qualifications but did not object to it. These expressions of qualifications, which CAP members called "yes but" votes, allowed members to express an objection or concern to some of the specific details of a policy recommendation or the supporting analysis considered by the CAP while supporting the overall concept of the policy. Explanations of both individual objections and qualifications are in the appendices to this report, in the detailed accounts of each CAP recommendation (except that the explanation for the one

objection to a water adaptation recommendation is in Chapter 8, where those recommendations are detailed).

Figure ES-1. Gross GHG emissions by sector, 1990–2020: historical and projected (consumption-based approach) business-as-usual base case

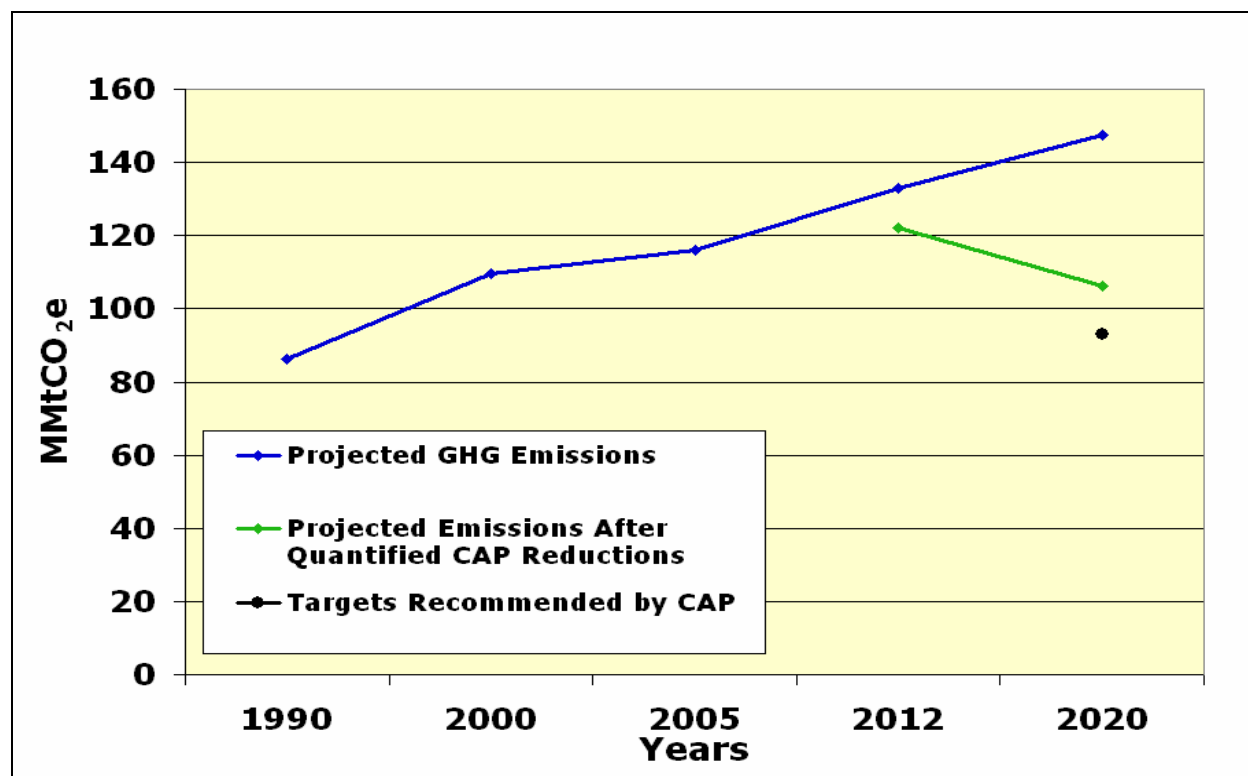


* RCI = direct fuel use in residential, commercial, and industrial sectors; ODS Substitutes = ozone depleting substances substitutes. Other Industrial Processes include process-related GHG emissions from cement, lime, and soda ash manufacturing; semiconductor manufacture; soda ash, limestone, and dolomite use; electricity transmission and distribution systems. Ozone Depleting Substance (ODS) substitutes (for hydrofluorocarbons, etc) are used in cooling and refrigeration equipment for industrial and commercial applications as well as for vehicle air conditioners.

Figure ES-2 and Table ES-1 present a summary of some of the recommendations. In Figure ES-2:

- Actual (for 1990, 2000, and 2005) and projected (for 2012 and 2020) levels of Colorado’s gross GHG emissions on a consumption basis are shown by the blue line. (The consumption-based approach accounts for emissions associated with the generation of electricity in-state and imported from out-of-state to meet Colorado’s demand for electricity.)
- Projected emissions if all of the CAP’s 33 recommendations that were analyzed quantitatively with respect to its GHG reduction potential are completely implemented and the estimated reductions are fully achieved are shown by the green line. (Note that other CAP recommendations would have the effects of reducing emissions, but those reductions were not analyzed quantitatively and they are not reflected in the green line.)
- Projected emissions associated with the CAP’s recommendation that Colorado set a target to reduce its GHG emissions economy-wide in the vicinity of 20% below 2005 levels by 2020 are shown by the black dot.

Figure ES-2. Annual GHG emissions: reference case projections and CAP recommendations (consumption-basis, gross emissions)



The CAP approved 55 recommendations to reduce emissions, of which 33 were analyzed quantitatively to estimate their effects on emissions. The analyzed measures were estimated to have a cumulative effect of reducing emissions by about 41.3 MMtCO₂e in 2020, enough by themselves to achieve over three quarters of the reductions necessary to meet the 2020 goal. The 26 measures analyzed in terms of their cost-effectiveness were estimated to have a total net savings of about \$2.6 billion between now and 2020. That is because the most effective way to reduce emissions often is to improve energy efficiency, which both cuts emissions and saves money.

Table ES-1. Annual emissions: reference case projections, and impact of CAP recommendations (consumption-basis, gross emissions)

Greenhouse Gas (GHG) Emissions (MMtCO ₂ e)					
	1990	2000	2005	2012	2020
Actual/projected GHG emissions	86.1	109.6	116.1	132.8	147.5
Projected emissions compared to 2005				+14%	+27%
Total GHG reductions from 33 analyzed CAP recommendations				-10.6	-41.3
Projected emissions after above reductions				122.2	106.2
2020 target recommended by CAP					92.9
2020 target compared to actual/forecast			-20%	-30%	-37%

The CAP chose to recommend goals for emission reductions to be achieved by 2020 and 2050, mindful of scientists' conclusions that global GHG emissions have to be reduced substantially by

2050, compared to 2000 levels, in order to stabilize global temperatures, and that emission reductions in the next two to three decades will have a large impact on opportunities to achieve that kind of stabilization. Accordingly, the CAP recommends that the Governor of Colorado set goals for reducing GHG emissions in Colorado in the vicinity of a 20% reduction in GHG emissions by 2020 and an 80% reduction by 2050, both compared to 2005 levels on a gross emissions/consumption basis. The CAP believes the goals should guide actions in the state, but should not be a firm cap.

If the 2020 goal were achieved, Colorado's emissions in 2020 would be reduced 37% to 92.9 million metric tons of GHGs, compared to 147.5 MMtCO_{2e} projected under current law. The Colorado target would fall within the range of statewide emission goals already set by other western states, including Arizona (45% below projected emissions in 2020), Oregon (44%), New Mexico (33%), California (28%), and Washington (28%).

If adopted, the 33 recommendations for emission reductions that were analyzed quantitatively could achieve 75% of the 2020 goal chosen by the CAP. While the CAP's 22 other GHG mitigation recommendations were not readily quantifiable, many of them would likely achieve additional reductions. In addition, the CAP believes other reasonable measures to reduce emissions beyond those recommended by the panel are available now, and emerging technologies hold the potential to substantially reduce emissions even more.

The CAP also adopted 15 recommendations for adaptation to future climate changes. They include 14 policies that, together, outline a road map for dealing with the projected effects of climate change on the state's water supplies, which may well amount to Colorado's greatest vulnerability to climate change. Another recommendation is that the state government assess Colorado's particular vulnerabilities to climate change and develop specific adaptation plans.

Table ES-2 provides a summary by sector of the estimated cumulative impacts of implementing all of the CAP's recommendations. The table shows the estimated GHG reductions; costs or savings from each policy recommendation and, its cost-effectiveness (cost or savings per ton of reduction) upon which the cumulative impacts in Table ES-3 are based. Note that the cumulative impacts shown in Table ES-3 account for overlaps between policies by eliminating potential double counting of emission reductions and costs or cost savings.

Table ES-2. Summary by sector of estimated impacts of implementing all of the CAP recommendations

Cumulative Reductions and Costs/Savings	2012 GHG Reductions (MMtCO ₂ e)	2020 GHG Reductions (MMtCO ₂ e)	2007–2020 GHG Reductions (MMtCO ₂ e)	2007–2020 Costs (Savings) (Net Present Value Million \$)	2007–2020 Cost-Effectiveness (\$/tCO ₂ e)
	<i>From 33 recommendations analyzed for GHG reductions</i>			<i>From 26 recommendations analyzed for costs and cost savings</i>	
Residential Commercial and Industrial (RCI) Sector Total Adjusted for Overlaps	3.7 ¹	15.1 ¹	86.0 ¹	–\$153 ²	–\$2/ton ²
Energy Supply (ES) Sector Total Adjusted for Overlaps	3.0 ³	9.1 ³	58.8 ³	\$526 ⁴	\$10/ton ⁴
<i>Adjustments for Overlaps Between RCI and ES Recommendations</i>	<i>[–0.3]</i>	<i>[–2.0]</i>	<i>[–8.6]</i>	<i>[–\$10.0]</i>	
Transportation and Land Use (TLU) Sector Total Adjusted for Overlaps	2.1 ⁵	7.8 ⁵	46.7 ⁵	–\$3,185 ⁶	–\$141/ton ⁶
Agriculture, Forestry, and Waste Management (AFW) Sector Total Adjusted for Overlaps	2.2	11.5	66.0	\$252	\$4/ton
<i>Adjustments for Overlaps Between AFW and ES Recommendations</i>	<i>[–0.04]</i>	<i>[–0.21]</i>	<i>[–1.40]</i>	<i>[–\$0]</i>	<i>[–\$0/ton]</i>
Cross-Cutting (CC) Sector Total	N/A	N/A	N/A	N/A	N/A
Water Adaptation (WA) Sector Total	N/A	N/A	N/A	N/A	N/A
Totals	<i>From 33 recommendations analyzed for GHG reduction</i>			<i>From 26 recommendations analyzed for costs and cost savings</i>	
	10.7	41.3	247.5	–\$2,570	Not estimated

Notes: Negative numbers indicate cost savings. N/A = not available.

Table ES-3. Summary of CAP’s 70 policy recommendations by sector

Notes: Negative numbers indicate cost savings. The cost (savings) shown are calculated in terms of net present value in constant 2005 dollars using a 5% annual real discount rate for the period 2008 through 2020. Capital investments are represented in terms of levelized or amortized costs through 2020.

¹ Totals from all 9 RCI recommendations with estimated GHG reductions.

² Totals from only those 7 RCI recommendations with estimated costs/cost savings.

³ Totals from all 6 ES recommendations with estimated GHG reductions.

⁴ Totals from only those 5 ES recommendations with estimated costs/cost savings.

⁵ Totals from all 8 TLU recommendations with estimated GHG reductions.

⁶ Totals from only those 4 TLU recommendations with estimated costs/cost savings.

Residential, Commercial, and Industrial Policy Recommendations

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
RCI-1	Expand demand side management programs of all electric and gas utilities, ramped up to reduce energy use by 1% per year by 2013.	0.6	5.2	24	–\$853	–\$32/ton	Unanimous Consent (Several qualified approvals)
RCI-2	Revolving loans to reduce energy use in state and local government buildings.	0.2	0.5	3.7	–\$67	–\$18/ton	Super Majority (1 objection)
RCI-3	Upgrade the state’s energy requirements for local building codes every 3 years, and improve enforcement of building codes.	0.3	2.7	13.0	N/A	N/A	Unanimous Consent
RCI-4 (total)	Targets and programs for beyond-code reductions in energy use in new government, residential, and commercial buildings.	1.0	2.4	20.4	\$1,550	\$76/ton	Unanimous Consent
	<i>Government subtotal:</i>	0.4	0.6	6.0	\$348	\$58/ton	
	<i>Commercial subtotal:</i>	0.5	1.4	11.2	\$1,219	\$109/ton	
	<i>Residential subtotal:</i>	0.2	0.4	3.2	–\$17	–\$5/ton	
RCI-5	Inverted electricity block rates for all residential and commercial consumers to fund utility energy efficiency programs.	1.6	6.7	38.2	–\$1,135	–\$30/ton	Majority (7 objections)
RCI-6	Low interest loans to fund energy efficiency retrofits for commercial and industrial buildings.	0.5	1.8	11.7	–\$334	–\$28/ton	Unanimous Consent (2 qualified approvals)
RCI-7	Electricity smart metering with time-of-use rates and in-home or in-office displays for all residential, commercial, and industrial consumers.	2.0	2.6	25.4	–\$844	–\$33/ton	Unanimous Consent
RCI-8	Tax credits for renewable energy systems in new and existing residential, commercial, and industrial buildings.	N/A	N/A	N/A	N/A	N/A	Unanimous Consent
RCI-9	Promote commercial and industrial combined heat and power (CHP) systems.	0.3	1.4	8.3	–\$25	–\$3/ton	Unanimous Consent
RCI-10	Statewide program for voluntary GHG reductions by businesses.	0.6	1.0	4.5	N/A	N/A	Unanimous Consent
RCI-11	Inverted electricity block rates for all residential and commercial consumers, recovering only cost of service.	N/A	N/A	N/A	N/A	N/A	Unanimous Consent
	RCI Sector GHG reduction total of 9 analyzed policies after adjusting for overlaps among policies	3.7	15	86	N/A	N/A	
	RCI Sector cost-effectiveness total of 7 analyzed policies with cost analysis after adjusting for overlaps among policies				–\$153	–\$2/ton	

Energy Supply Policy Recommendations

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
ES-1	Tax credits and incentives to finance renewable energy generation facilities.	Benefits are quantified in policy ES-2					Unanimous Consent
ES-2	Increase renewable portfolio standards to 30% for investor-owned electric utilities and 15% for municipal and co-op utilities, with no more than 85% of renewable energy from centralized wind power.	1.9	4.9	34	\$524	\$16/ton	Super Majority (3 objections) (1 qualified approval)
ES-3	Consider adoption of Xcel's clean energy portfolio standard on a state, regional, or national basis.	Non-specific policy was not quantified					Majority (9 objections)
ES-4	Require all electric utilities to plan cooperatively for electricity transmission infrastructure investments that support renewable resources.	Non-quantitative policy proposal analyzed					Unanimous Consent
ES-5	Consider applying a price to CO ₂ emissions (such as cap and trade or tax) on a state, regional, or national basis.	Non-specific policy not quantified					Super Majority (1 objection) (1 qualified approval)
ES-6	Assess a public benefit charge on all electric utility bills to fund renewable energy programs.	Policy not quantified					Super Majority (3 objections) (1 qualified approval)
ES-7	Adopt structural changes to facilitate large businesses and universities to invest in combined heat and power (CHP) and distributed generation (DG) systems.	0.4	1.1	7.3	\$110	\$15/ton	Unanimous Consent
ES-8	Work with neighboring states to form a regional CO ₂ transportation and sequestration collaborative.	Non-quantitative proposal not quantified					Unanimous Consent
ES-9	Low interest loans to Colorado companies and universities for research and development of carbon emissions reduction technology, funded at \$100M/yr through surcharge on all electricity bills.	R&D benefits not quantified					Unanimous Consent
ES-10	Evaluate and, if appropriate, seek funding for advanced fossil fuel generation with carbon capture demonstration project.	Non-specific policy not quantified					Unanimous Consent
ES-11	Statewide mapping and development of small hydro-power, geothermal, and biomass renewable power sources.	0.0	0.8	3.1	\$123	\$40/ton	Unanimous Consent
ES-12	Review costs and emission reduction potential of nuclear power.	Non-specific policy not quantified					Unanimous Consent
ES-13	Adopt policies to promote a 2% increase in efficiency of existing power generators by 2020.	Costs not quantified—savings ca. 1 MMtCO ₂ /yr by 2020					Unanimous Consent
ES-14	Reduce GHG emissions from oil and gas operations 35% by 2020.	0.8	2.6	16	\$12	\$0.8/ton	Unanimous Consent
ES-15	Establish a CO ₂ emissions performance standard of no more than 1,100 lbsCO ₂ /MWh for new non-peaking power plants and those older than 60 years.	0.5	2.3	13	–\$14	–\$1/ton	Super Majority (5 objections)

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
	Energy Supply Sector totals of 6 analyzed policies (including ES-13) after adjusting for overlaps among policies	3	9	59	N/A	N/A	
	Energy Supply Sector totals of 5 policies with cost estimates (not including ES-13) after adjusting for overlaps				\$526	\$10/ton	

Transportation and Land Use Policy Recommendations

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
TLU-1	Reduce light-duty vehicle miles traveled 2% by 2020 by promoting “smart growth” land use planning and development. Require that GHG emissions be considered in long-range transportation plans by 2010.	0.08	0.47	2.43	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-2	Incentives for the purchase of low-GHG vehicles. [An alternative if the TLU-6 clean car standards are not implemented.]	Quantified as part of TLU-6					Unanimous Consent
TLU-3	Reduce light-duty vehicle miles traveled 6% by 2020 by improving transit service quality and funding expansion of transit infrastructure.	0.17	0.97	5.09	N/A	N/A	Unanimous Consent
TLU-4	Reduce heavy-duty vehicle idling.	0.07	0.11	0.91	–\$123	–\$134/ton	Unanimous Consent
TLU-5	Adopt a low carbon fuels standard that will reduce carbon intensity of passenger vehicle fuels by 10% by 2020.	0.38	2.21	16.1	N/A	N/A	Unanimous Consent
TLU-6	Adopt California GHG emission standards for cars and trucks.	0.70	3.40	18.8	–\$1,880	–\$100/ton	Unanimous Consent
TLU-7	Expand transit use marketing and employer-sponsored transit fare programs.	Quantified as part of TLU–3					Unanimous Consent
TLU-8	Move toward basing motor vehicle insurance on the distances vehicles are driven.	0.32	0.94	7.19	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-9	Local parking management programs to encourage alternative travel choices and transit-oriented development.	0.03	0.03	0.34	–\$37	–\$110	Unanimous Consent
TLU-10	Require employers with more than 100 employees to offer commuter benefits programs.	0.42	0.45	4.77	–\$1,145	–\$240/ton	Unanimous Consent
TLU-11	Incorporate vehicle maintenance, operation, and transportation choice GHG reduction information in driver training and education.	Not quantified					Unanimous Consent
	TLU Sector GHG reduction total of 8 analyzed policies after adjusting for overlaps among policies	2.14	7.84	46.7	N/A	N/A	
	TLU Sector cost-effectiveness total of 4 analyzed policies with cost estimates after adjusting for overlaps among policies				–\$3,185	–\$141/ton	

Agriculture, Forestry, and Waste Management Policy Recommendations

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
AFW-1	Achieve no-till operation of half of croplands by 2020 and increase nitrogen fertilizer efficiency by 20%.	0.57	0.78	7.7	–\$57	–\$7/ton	Unanimous Consent
AFW-2	Implement methane capture and energy recovery on manure management projects on 80% of animal feeding operations by 2020.	0.01	0.32	1.8	\$66	\$36/ton	Unanimous Consent (1 qualified approval)
AFW-3	Reduce on-farm petro-diesel use 20% by 2020, and reduce electricity use from fossil fuels 40% through energy efficiency and on-site renewable sources generation.	0.14	0.64	3.8	–\$150	–\$40/ton	Unanimous Consent
AFW-4	Incentives for the production of biodiesel fuel from oilseed crops, waste vegetable oil, or other sources to offset 40% of fossil diesel fuel use by 2020.	0.02	0.22	1.1	\$13	\$12/ton	Unanimous Consent (3 qualified approvals)
AFW-5	Increase in-state ethanol production, using GHG-superior feedstocks and production methods, to 400 million gallons per year above BAU by 2020.	0.39	3.1	15	\$58	\$3/ton	Unanimous Consent (3 qualified approvals)
AFW-6	Preserve forest lands (line 1) and grasslands (line 2) to reduce the rate of conversion to developed uses by 25% by 2020.	0.10 0.05	0.24 0.14	1.7 1.0	\$44 \$31	\$26/ton \$32/ton	Unanimous Consent
AFW-7	Increase the use of biomass from forest health and fire risk treatment for energy production, using 20% of harvested wood by 2020.	0.08	0.20	1.4	–\$104	–\$75/ton	Unanimous Consent
AFW-8	Divert 75% of wastes from landfills by 2020 through source reduction, enhanced recycling, and composting programs.	0.48	4.6	24	\$311	\$13/ton	Unanimous Consent
AFW-9	Control or capture landfill methane to achieve 50% reduction from BAU by 2020.	0.33	1.2	7.5	–\$0.1	–\$0.02/ton	Unanimous Consent
AFW-10	Plant 3.4 million new trees statewide by 2020 through expanded urban forestry programs.	0.03	0.08	0.59	\$40	\$79/ton	Unanimous Consent (1 qualified approval)
	AFW Sector Total of Analyzed Policies After Adjusting for Overlaps	2.2	11.5	66	\$252	\$4 /ton	

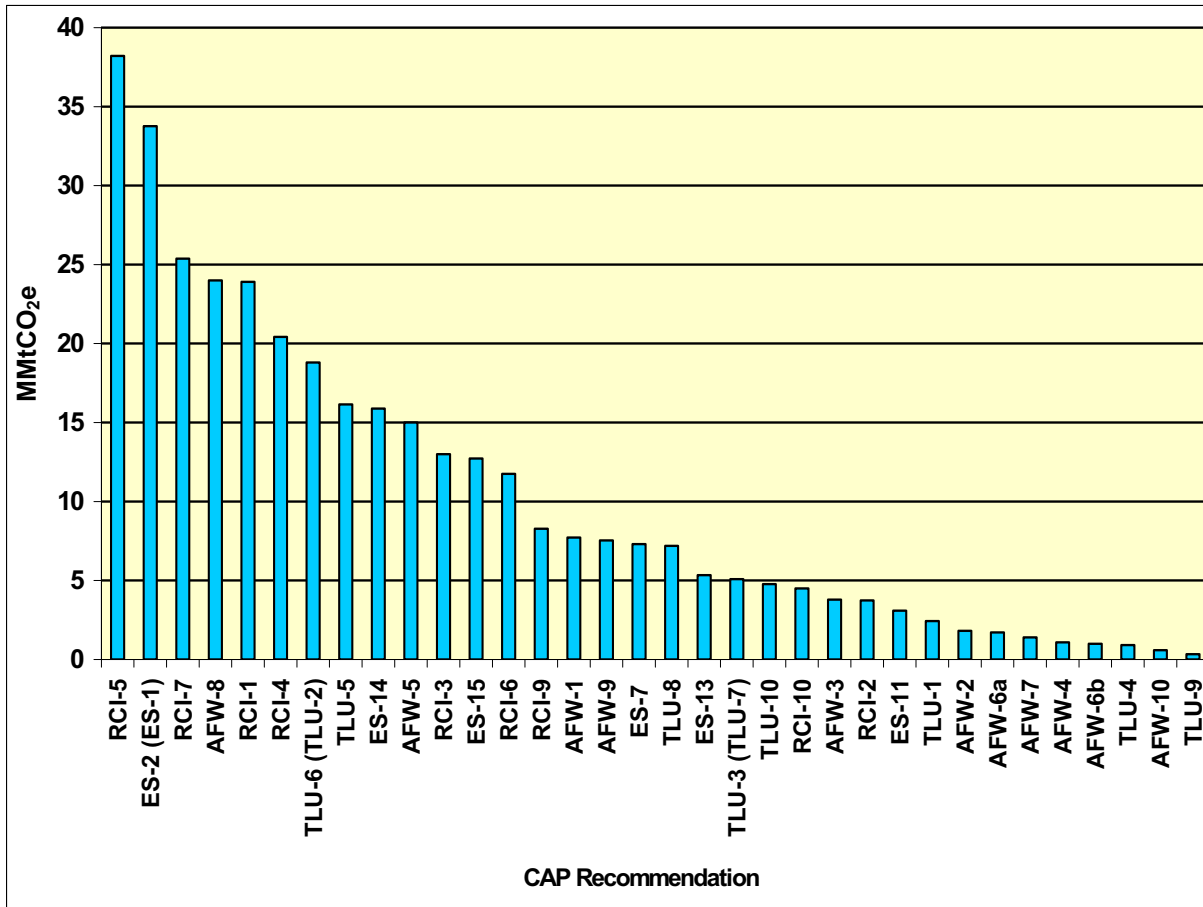
Cross-Cutting Issues Policy Recommendations

	Policy Recommendation	Analysis	Climate Action Panel Action
CC-1	Periodically update GHG inventories and forecasts.	<i>Not Quantified</i>	Unanimous Consent
CC-2	State development of annual GHG reporting protocols for all sources, including mandatory reporting for significant sources.	<i>Not Quantified</i>	Unanimous Consent
CC-3	State development of capacity to participate in the national <i>Climate Registry</i> to measure, track, and record emissions reductions.	<i>Not Quantified</i>	Unanimous Consent
CC-4	The governor should set statewide GHG reduction goals and targets to achieve in the vicinity of a 20% reduction by 2020 and 80% by 2050, both compared to 2005 levels.	<i>Not Quantified</i>	Super Majority (1 objection) (5 qualified approvals)
CC-5	Set state and local government reduction targets for their own GHG emissions; the state target should be at least an amount consistent with CC-4 levels.	<i>Not Quantified</i>	Unanimous Consent
CC-6	Promote adoption of comprehensive local government climate action plans.	<i>Not Quantified</i>	Unanimous Consent
CC-7	State and local government public education and outreach efforts to support GHG reduction programs, policies, and goals.	<i>Not Quantified</i>	Unanimous Consent
CC-8	A public-private partnership to seek funding for GHG reduction measures and development of a new energy economy in Colorado.	<i>Not Quantified</i>	Unanimous Consent
CC-9	State government assessment of vulnerabilities to climate change and development of adaptation plans.	<i>Not Quantified</i>	Unanimous Consent

Water Adaptation Policy Recommendations

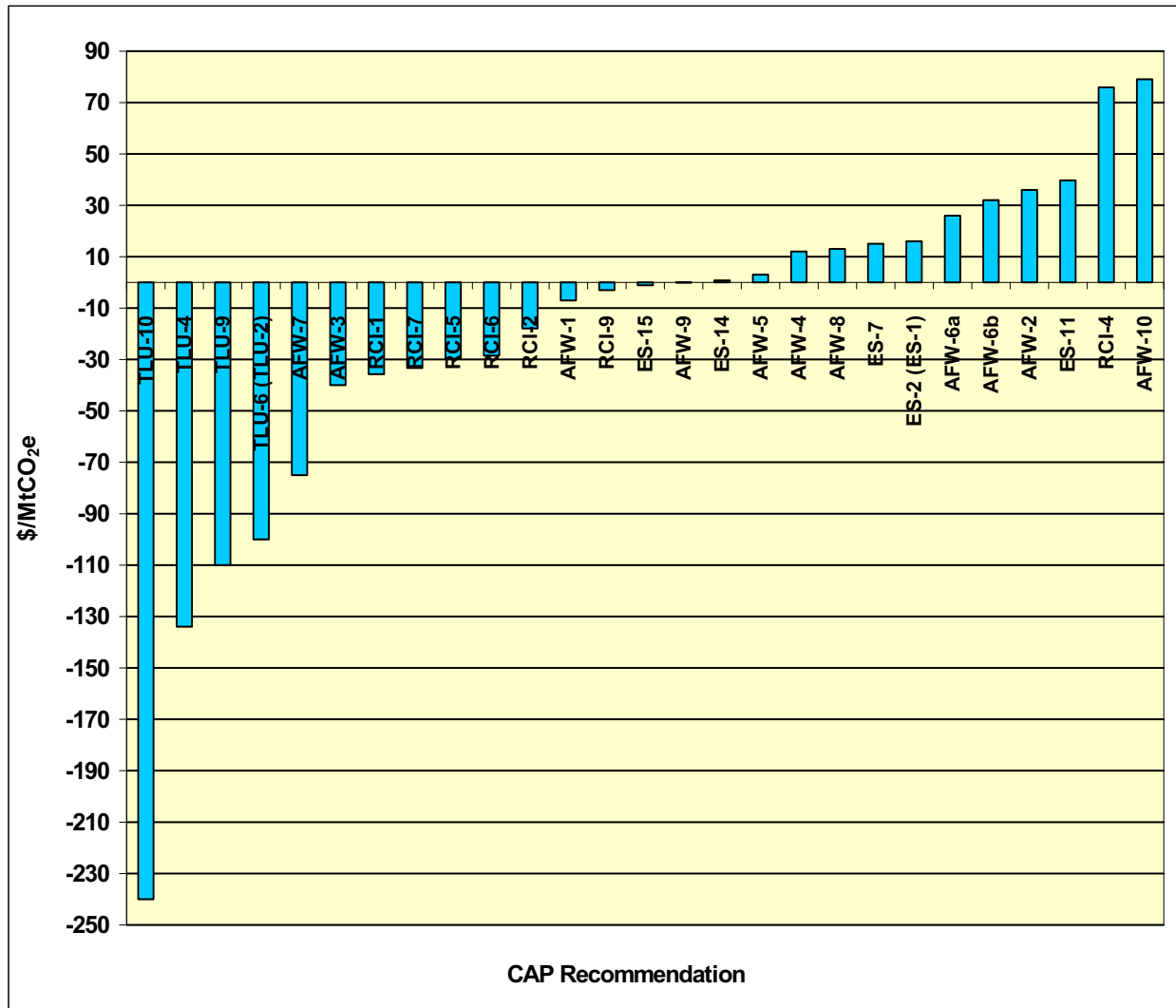
	Policy Recommendation	Analysis	Climate Action Panel Action
WA-1	Public officials exercise leadership in addressing climate change effects on water supplies.	<i>Not Quantified</i>	Unanimous Consent
WA-2	Water managers consider climate change in all water supply decisions.	<i>Not Quantified</i>	Unanimous Consent
WA-3	Climate change effects considered in the new Colorado Water Conservation Board study of Colorado River water availability.	<i>Not Quantified</i>	Unanimous Consent
WA-4	State government develop mechanisms for compact calls for each major river basin.	<i>Not Quantified</i>	Unanimous Consent
WA-5	Assessment of knowledge about climate change effects on Colorado's water resources. An assessment of data and data systems for understanding climate change.	<i>Not Quantified</i>	Unanimous Consent
WA-6	Cooperative development of information on climate change effects in each major river basin.	<i>Not Quantified</i>	Unanimous Consent
WA-7	Municipal water providers evaluate water conservation savings, best demand management practices, and the best uses of conserved water in their systems.	<i>Not Quantified</i>	Unanimous Consent
WA-8	Minimize effects of water-rights transfers on agricultural economies.	<i>Not Quantified</i>	Unanimous Consent
WA-9	Consider relationships between energy and water use.	<i>Not Quantified</i>	Unanimous Consent
WA-10	Information exchanges on effects of climate change on water resources.	<i>Not Quantified</i>	Unanimous Consent
WA-11	State government consider ways to reduce climate change effects on water-related recreation and tourism.	<i>Not Quantified</i>	Unanimous Consent
WA-12	State government consider ways to reduce climate change effects on the environment.	<i>Not Quantified</i>	Unanimous Consent
WA-13	Reduce use of groundwater for irrigation until recharges match discharges.	<i>Not Quantified</i>	Unanimous Consent
WA-14	Establish new Colorado Water Institute.	<i>Not Quantified</i>	Super Majority (1 objection)

Figure ES-3. CAP policy recommendations ranked by cumulative GHG reductions, 2007–2020



Note: Emission reductions for TLU-2 are included in the reductions for TLU-6, reductions for TLU-7 are included in the reductions for TLU-3, and reductions for ES-1 are included in the reductions for ES-2. For the purpose of counting the number of options for which emission reductions were quantified, each of the following are counted as one option: TLU-6 and TLU-2, TLU-3 and TLU-7, ES-2 and ES-1, and AFW-6a and AFW-6b.

Figure ES-4. CAP policy recommendations ranked by dollars per metric ton



Note: Negative values represent net cost savings and positive values represent net costs associated with the policy recommendation. Cost savings for TLU-2 are included in the cost savings for TLU-6, and costs for ES-1 are included with the costs for ES-2. For the purpose of counting the number of options for which costs or cost savings were quantified, each of the following are counted as one option: TLU-6 and TLU-2, ES-2 and ES-1, and AFW-6a and AFW-6b.

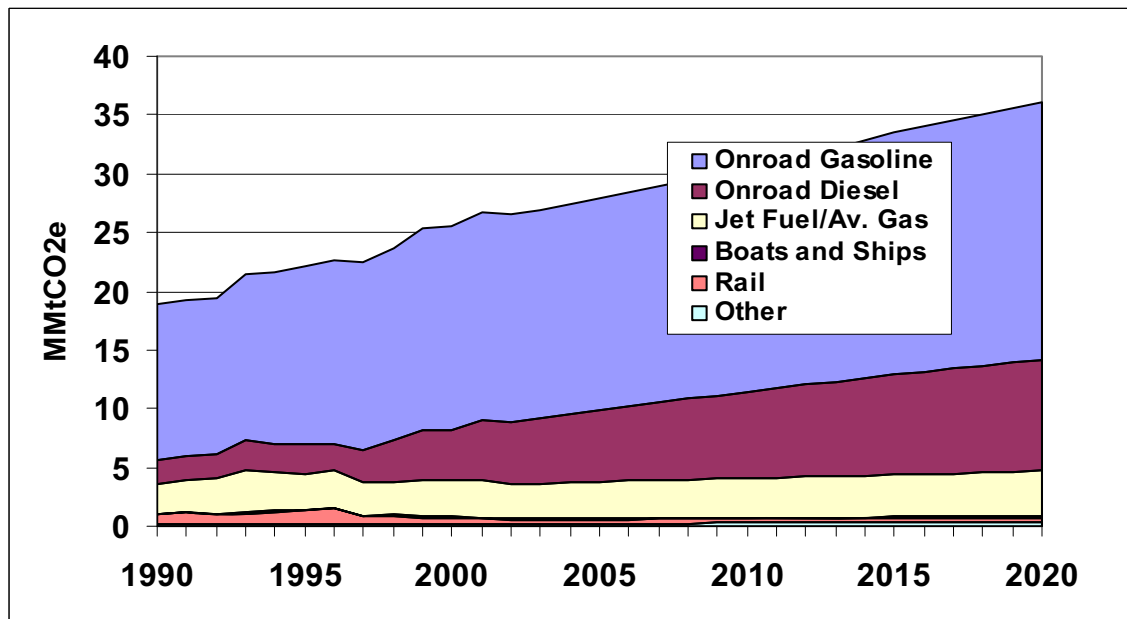
Chapter 5 Transportation and Land Use

Overview of GHG Emissions

The Transportation and Land Use (TLU) sector is a major source of greenhouse gas (GHG) emissions in Colorado, currently accounting for about 24% of the State’s gross GHG emissions in 2005. The transportation technologies and fuels used are key determinants of those emissions, along with population, economic growth, and various land use policies that all affect the demand for transportation services. Colorado GHG emissions from the TLU sector totaled 28 million metric tons of carbon dioxide equivalent (MMtCO₂e) in 2005.

Figure 5-1 shows historical and projected transportation sector GHG emissions by fuel and source, illustrating rapid growth. Total transportation emissions are expected to nearly double between 1990 and 2020, reaching 36.2 MMtCO₂e in 2020 under the reference case projection. Growth in vehicle miles traveled (VMT) will account for most of the increase. VMT from gasoline-fired vehicles is projected to grow by 34% between 2005 and 2020, while VMT from diesel vehicles is projected to grow 68%, largely due to growth in freight movement.

Figure 5-1. Historical and projected GHG emissions from the transportation sector, Colorado, 1990 to 2020



Key Challenges and Opportunities

The principal means to reduce transportation emissions include improving vehicle fuel efficiency, substituting gasoline and diesel with lower-carbon fuels, reducing vehicle travel, and improving the efficiency of transportation system operations. The first three approaches are particularly important areas for policy development at present.

In Colorado and in the nation as a whole, vehicle fuel efficiency has improved little since the late 1980s, yet many studies have documented the potential for substantial increases in efficiency while maintaining vehicle size and performance. Opinions differ on the extent to which vehicle fuel efficiency can be increased in the near term and the impacts of mandated efficiency standards on automakers. Increases in federal fuel economy standards are likely in the near future, but the scale of increase is unknown.

The use of alternative fuels with lower per-mile GHG emissions is growing in Colorado, and larger market penetration is possible. Conventional gasoline- and diesel-fired vehicles can use low level blends of biofuels. Alternative technology vehicles can also use higher level biofuel blends, as well as other types of alternative fuels such as natural gas, electricity, and hydrogen. The type of fuel and its origin are crucial determinants of impacts on GHG emissions, as some alternative fuels have relatively little life-cycle GHG benefit. Currently, the most prevalent biofuel in Colorado is corn-based ethanol, which has minimal GHG benefit from a life-cycle perspective. Ethanol from cellulosic feedstocks can achieve much larger GHG reductions, but the production of such fuels is not yet commercially viable. Fuel distribution infrastructure is also a constraining factor for wide distribution of many alternative fuels.

The reduction of per capita VMT is a critical component of mitigating GHG emissions from the transportation sector. Expanded use of smart growth land use patterns can contribute substantially to this goal by reducing trip length and encourage the use of transit, ridesharing, bicycling, and walking. A variety of pricing policies and incentive packages can also help to reduce VMT. Some localities in Colorado have taken steps to increase transit options and encourage smart growth. The development of better planning methods and regulations and the increase of funding in support of alternative modes of transportation will be key mechanisms to achieve these goals.

Overview of Policy Recommendations and Estimated Impacts

The CAP recommends a set of 11 policy recommendations for the TLU sector that offer the potential for major economic benefits and emissions savings. All 11 recommendations were adopted by unanimous consent of the CAP members present and voting. These policy recommendations could lead to emissions reductions of

- 7.8 MMtCO₂e per year by 2020,
- 47 MMtCO₂e cumulative savings from 2007 through 2020, and
- \$3.2 billion net cost savings to the Colorado economy through the year 2020 on a net present value (NPV) basis.¹

The weighted average cost of the policy recommendations for which quantitative estimates of both costs and savings were prepared is -\$141 per ton of CO₂e.

¹ The net cost savings are based on fuel expenditures, operations, maintenance, and administrative costs, and amortized, incremental equipment costs. All NPV analyses here use a 5% real discount rate.

The estimated impacts of the individual policies are shown in Table 5-1. The CAP policy recommendations are described briefly here and in more detail in Appendix G of this report. The recommendations not only result in significant emissions and costs savings, but offer a host of additional benefits as well.

Table 5-1. CAP-recommended policies and results for the transportation and land use sector

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007–2020			
TLU-1	Reduce light-duty vehicle miles traveled 2% by 2020 by promoting “smart growth” land use planning and development. Require that GHG emissions be considered in long-range transportation plans by 2010.	0.08	0.47	2.43	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-2	Incentives for the purchase of low-GHG vehicles. [An alternative if the TLU-6 clean car standards are not implemented.]	Quantified as part of TLU-6					Unanimous Consent
TLU-3	Reduce light-duty vehicle miles traveled 6% by 2020 by improving transit service quality and funding expansion of transit infrastructure.	0.17	0.97	5.09	N/A	N/A	Unanimous Consent
TLU-4	Reduce heavy-duty vehicle idling.	0.07	0.11	0.91	–\$123	–\$134/ton	Unanimous Consent
TLU-5	Adopt a low carbon fuels standard that will reduce carbon intensity of passenger vehicle fuels by 10% by 2020.	0.38	2.21	16.1	N/A	N/A	Unanimous Consent
TLU-6	Adopt California GHG emission standards for cars and trucks.	0.70	3.40	18.8	–\$1,880	–\$100/ton	Unanimous Consent
TLU-7	Expand transit use marketing and employer-sponsored transit fare programs.	Quantified as part of TLU-3					Unanimous Consent
TLU-8	Move toward basing motor vehicle insurance on the distances vehicles are driven.	0.32	0.94	7.19	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-9	Local parking management programs to encourage alternative travel choices and transit-oriented development.	0.03	0.03	0.34	–\$37	–\$110	Unanimous Consent
TLU-10	Require employers with more than 100 employees to offer commuter benefits programs.	0.42	0.45	4.77	–\$1,145	–\$240/ton	Unanimous Consent
TLU-11	Incorporate vehicle maintenance, operation, and transportation choice GHG reduction information in driver training and education.	Not quantified					Unanimous Consent
	Sector GHG reduction total of 8 analyzed policies after adjusting for overlaps among policies	2.14	7.84	46.7	N/A	N/A	
	Sector cost-effectiveness total of 4 analyzed policies with cost estimates after adjusting for overlaps among policies				–\$3,185	–\$141/ton	

GHG = greenhouse gas; N/A = not applicable.

* Cumulative Net Present Value and Cost-Effectiveness values reflect options 4, 6, 9, and 10 only. Cumulative Net Present Value and Cost-effectiveness values for all options cannot be quantified.

Negative cost numbers indicate cost *savings*. The cost (savings) shown are calculated as in terms of net present value in constant 2005 dollars using a 5% annual real discount rate for the period 2008 through 2020. Capital investments are represented in terms of levelized or amortized costs through 2020.

These benefits include reduced local air pollution, more livable, healthy communities, and economic development and job growth. In order for the TLU policies recommended by the CAP to yield the levels of savings described here, the policies should be implemented in a timely, aggressive, and thorough manner.

Technology is an important component of the recommended policies. The State Clean Car program (TLU-6) would result in the largest GHG reduction of any single TLU policy recommendations. However, before Colorado or any other state can adopt it, U.S. EPA must grant a waiver approving the original California GHG standards for new vehicles. If for any reason Colorado is not able to implement the Clean Car Program, other technology-based policies could play a larger role. For example, the policies to be studied under the Incentives for Purchase and Operation of Low-GHG Vehicles (TLU-2) could improve fuel efficiency through a multi-state “feebate” program. Such a program would be revenue-neutral, assessing a fee on relatively high emissions/low fuel economy vehicles and offering a rebate or tax credit on low emissions/high fuel economy vehicles. A multi-state approach to feebates is recommended because of the drawbacks of Colorado, or any other state, acting alone in this area.

Other policies can promote technological improvements in the heavy-duty diesel fleet. TLU-4, Heavy-Duty Vehicle Idle Reduction, would limit unnecessary idling by heavy-duty trucks and buses and would promote technological alternatives to extended idling. Less idling means less fuel consumed and fewer GHG emissions.

Colorado can achieve greater alternative fuel use through a combination of voluntary and mandatory measures. A Low Carbon Fuel Standard (TLU-5) can increase the use of alternative transportation fuels that result in lower GHG emissions. The policies recommended in Chapter 6 (AFW-4 and AFW-5) can promote in-state production of these fuels through methods with lower lifecycle GHG emissions. The Low Carbon Fuel Standard would also promote the use of vehicles powered by electricity or hydrogen. When produced from renewable sources, these fuels can dramatically reduce GHG emissions.

A number of policies would work together to reduce VMT by increasing the viability of alternative modes of travel and providing incentives to use alternative modes. These policies will require increased coordination between state government, local government, and businesses in many cases. Smart Growth and Related Planning (TLU-1) presents the greatest institutional challenge. The promotion of more compact and mixed-use development patterns requires significant reform in local planning practices. Yet implementation of this policy is essential to make travel by walking, bicycling, and transit more feasible. In fact, transit use is on the rise nationwide and can be increased in many areas. TLU-3 (Improve and Expand Transit Service) and TLU-7 (Transit Marketing, Promotion, and Pricing Incentives) involve a policy package for the improvement, expansion, and promotion of public transit in Colorado. Commuter Benefits Programs (TLU-10), offered by employers to their employees, also promote use of transit as well as other alternatives to driving to work.

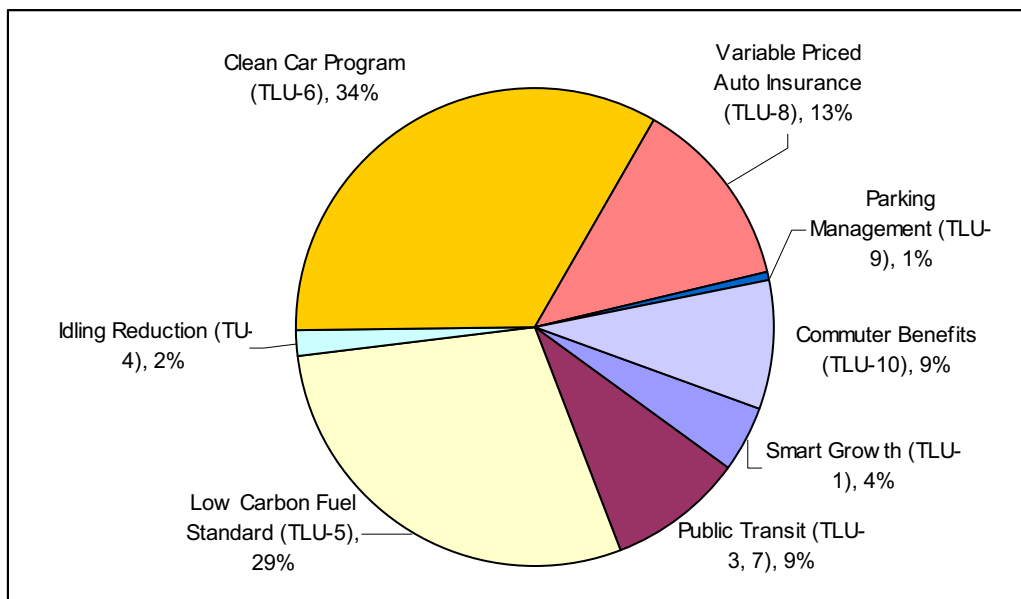
Other policies would change the price or perceived convenience of driving. Variable Priced Automobile Insurance (TLU-8) and Parking Management (TLU-9) increase the attractiveness of alternative modes relative to driving. Together these policies address the built environment, transportation infrastructure, and the behavior of individuals to reduce per capita VMT.

Finally, driver and consumer education provides users of the transportation system with the information they need to make choices that results in lower GHG emissions. TLU-11 would develop a curriculum to be incorporated into all driver training programs to promote voluntary reductions of fuel use and GHG emissions.

There is overlap in the expected emissions reductions among some of the policies within the TLU sector, so the GHG reductions resulting from individual stand-alone policies are not purely additive. In particular, policies that reduce VMT will erode the GHG benefits of policies that improve vehicle fuel economy or reduce fuel carbon intensity (TLU 5 and 6). It was assumed that there is no overlap among the policies that affect VMT (TLU-1, 3/7, 8, 9, and 10), so the VMT effects of these policies were summed to arrive at an adjusted statewide VMT (by vehicle class and urban/rural designation). Using the adjusted VMT, statewide fuel use and GHG emissions were calculated, and this result was reduced by the impacts of TLU-5 and TLU-6. TLU-4 affects only heavy-duty vehicles and therefore has no overlap with other policies. There is no overlap between TLU policies and those from the other sectors. More detail on the calculation of net cumulative impacts is included in Appendices D and G.

Figure 5-2 illustrates the distribution of total (2007-2020) emission reductions by policy recommendation. The Clean Car program (TLU-6) and Low Carbon Fuel Standard (TLU-5) account for the largest shares of emission reduction, together making up 63% of the total reductions from the recommended TLU policies. Variable priced auto insurance (TLU-8), commuter benefits programs (TLU-10), and public transit improvement and expansion (TLU 3/7) each contribute approximately 10% to the total TLU reductions. The other policy recommendations contribute smaller shares.

Figure 5-2. Percent of avoided greenhouse gas emissions by policy



Transportation and Land Use Sector Policy Recommendations

The TLU sector includes emissions and mitigation opportunities related to vehicle technologies, fuel choices, public transit options, and demand for transportation services.

TLU-1 Smart Growth and Related Planning

The CAP recommends, by unanimous vote of those members present and voting, that Colorado implement land use planning, development, and analysis that supports protection of natural and cultural resources, strengthens communities, creates more compact development, and reduces growth in driving and emissions. Specific policies and strategies to be considered and undertaken include the following:

- Provide incentives to developers for density and mixed use.
- Improve techniques for estimating reductions in vehicle trip generation for land uses with mixed use developments.
- Include reductions in estimated traffic generation as a result of intelligently located development.
- Implement a concurrency management system or adequate public facilities requirement.
- Encourage the use of intergovernmental agreements to implement urban growth boundaries.
- Provide a means for local governments to share local sales tax proceeds.
- Implement inter-jurisdictional planning and/or regional review of local plans.
- Program infrastructure investments so as to encourage and reward compact development.
- Undertake local planning for local street patterns prior to development.
- Increase property owners' awareness of conservation easements in Colorado.
- Promote brownfield development through rebates of property taxes to offset cleanup costs.
- Increase funding for a Conservation/ Land Protection Fund.

Together, these Smart Growth policies reduce GHG emissions by giving municipalities the tools needed to shift development patterns and reduce vehicle trips and total vehicle miles traveled.

In addition, the CAP recommends that the Colorado Department of Transportation (CDOT) and metropolitan planning organizations (MPOs) quantify and report GHG emissions from long-range transportation plans by 2010, provided that financial and technical assistance is provided as needed.

TLU-2 Incentives for Purchase and Operation of Low-GHG Vehicles

The CAP recommends, by unanimous vote of those members present and voting, that Colorado further study, develop and/or maintain policies and programs that encourage the purchase of low GHG emission vehicles. These policies include

- Performing a multi-state study of the feasibility and effectiveness of a regional feebate system;
- Continuing the current income tax credit program for hybrid, alternative fuel, and low-emission vehicles so that it continues in its present form beyond 2010; and
- Maintaining current preferential state-controlled infrastructure (high-occupancy vehicle (HOV) lanes) access for alternative fuel vehicles (natural gas, propane, 100% electric) with possible provision of “green license plates” to designate alternative fuel vehicles.

Additionally, the CAP recommends, by unanimous vote of those members present and voting, that tax-funded, non-tax paying entities (state and local governments) be required to purchase the lowest GHG vehicle suitable for their usage. Together, these incentives could change the vehicle fleet technology mix through a combination of demand- and supply-side changes.

TLU-3 Improve and Expand Transit Service

The CAP recommends, by unanimous vote of those members present and voting, that Colorado make improvements to existing transit service and expand current transit routes to reach more of the state’s population. The provision of better and more extensive transit service can shift passenger transportation from single-occupant vehicles to public transit, thereby reducing emissions. This recommendation involves a number of actions to be undertaken by state government, local government, and transit agencies. Transit investments that encourage greater use of public transportation may include

- Improving service frequency on selected existing transit routes,
- Supporting and encouraging improvements in intercity bus service,
- Reducing travel times on selected existing transit routes (e.g., signal prioritization, exclusive lanes),
- Improving service quality on selected existing transit routes (safety, cleanliness, and improvements to shelters/stations), and
- Expanding transit service and infrastructure (commuter rail, light rail, bus, bus rapid transit [BRT]).

TLU-3 also works in conjunction with TLU-7 (Transit Marketing, Promotion, and Pricing Incentives) to reduce VMT growth. TLU-3 is the service and infrastructure component of an overall strategy to increase the mode share of public transit.

TLU-4 Heavy-Duty Vehicle Idle Reduction

The CAP recommends, by unanimous vote of those members present and voting, that Colorado develop and implement a statewide regulation banning extended idling by heavy-duty vehicles. This regulation would reduce idling from diesel and gasoline heavy-duty vehicles, buses, and other vehicles. In addition to the regulation, the policy would promote and expand the use of technologies that reduce heavy-duty vehicle idling. These technologies include truck stop electrification stations as well as vehicle equipment modifications such as auxiliary power units, direct fired heaters, and automatic engine shut down/startup system controls.

The CAP also recommends, by unanimous vote of those members present and voting, that Colorado create programs aimed at increasing voluntary adoption of idling reduction technologies. Components of such programs would include:

- Collaborative outreach and education timed with the implementation and enforcement of a statewide anti-idling regulation
- Conducting pilot projects and demonstrations to evaluate the effectiveness of various idle reduction technologies
- Seeking funding from federal and other sources for such programs.

TLU-5 Low Carbon Fuels Standard

The CAP recommends, by unanimous vote of those members present and voting, that Colorado promote greater use of low-carbon transportation fuels by adopting a “Low Carbon Fuels Standard.” The Low Carbon Fuel Standard would require all transportation fuel providers in Colorado to ensure the mix of fuel they sell into the Colorado market meets, on average, a declining standard for GHG emissions measured in CO₂ equivalent gram per unit of fuel energy sold. Low carbon fuels could include biodiesel, ethanol from cellulosic feedstocks, hydrogen, compressed natural gas, liquefied petroleum gas, and electricity. The program does not mandate that any particular fuel be used to meet the performance standard.

Related elements of this strategy include:

- Fuel Quality Standards
- State Government Fleet ‘Leadership’ Programs for adoption of Low Carbon Fuels
- Low Carbon Fuel Infrastructure Development

The CAP recommends that the Low Carbon Fuel Standard require a reduction in the carbon intensity of passenger vehicle fuels sold in-state by at least 10% by 2020. The standard would be measured in CO₂e grams per unit of fuel energy sold, calculated on a lifecycle basis in order to include emissions from fuel production. Fuel providers (defined as refiners, importers, and blenders of passenger vehicle fuels) would need to demonstrate compliance with the standard.

TLU-6 Clean Car Program for Autos and other Light-Duty Vehicles

The CAP recommends, by unanimous vote of those members present and voting, that Colorado adopt the State Clean Car Program in order to reduce GHG emissions from new light-duty vehicles. Under the current federal law, states have the option of choosing between the federal standard for air pollution emissions and the California standard. This policy assumed the California standards, which must still be approved by US EPA, would take effect in Colorado beginning with Model Year 2011 (calendar year 2010). Other Clean Car Program elements can include standards requiring reductions in smog- and soot-forming pollutants and promoting introduction of very low-emitting technologies into new vehicles.

In 2005, California finalized a set of GHG standards for new light-duty vehicles, to be phased in from 2009 to 2016. The regulations are estimated to result in an average reduction of GHGs from new cars and light trucks of about 22% in 2012 and about 30% in 2016, compared to today's vehicles. States that already have adopted or stated an intention to adopt the Clean Car Program standards include, at least, Arizona, California, Connecticut, Florida, Maine, Massachusetts, Montana, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, and Washington.

TLU-7 Transit Marketing, Promotion, and Pricing Incentives

The CAP recommends, by unanimous vote of those members present and voting, that Colorado promote greater use of public transit and a reduction in automobile travel through various forms of marketing and pricing incentives. Travel patterns are affected by public knowledge and attitudes; therefore marketing becomes an important tool in order to increase transit usage. Instead of merely advertising its availability, transit marketing could be an ongoing dialogue between community partners and transit agencies to develop programs in metropolitan areas.

Complementing policy recommendations TLU-3 and TLU-10, TLU-7 would increase the use of transit service by expanding employer-provided transit benefit programs that encourage commuting by transit. Public transit can be made more affordable by offering other price incentives, such as group discounts or discounted pricing for multi-modal purchases. The state would also work with transit agencies to develop and implement new transit marketing programs in metropolitan areas.

TLU-8 Variable Priced Automobile Insurance

The CAP recommends, by unanimous vote of those members present and voting, that Colorado take steps to promote provision of a variable priced automobile insurance. Variable priced insurance transfers some of the fixed cost of annual auto insurance premiums to a variable basis, thereby providing an incentive for vehicle owners to drive less. One form of this concept is "pay-at-the-pump insurance," whereby insurance premiums are paid as a fuel tax surcharge. Another form is Pay-As-You-Drive (PAYD) insurance, whereby a portion of vehicle insurance payments is assessed on a per-mile basis. Benefits of variable priced insurance include emissions

reductions, increased safety (through decreased driving) and fairer distribution of costs (by tracking the portion of individuals' risk associated with miles driven).

The CAP recommends that Colorado change insurance regulations to allow private companies to offer a variable priced insurance option. Additionally, the CAP recommends that Colorado initiate and promote a pilot program of PAYD. Assuming a pilot program is successful, market penetration could increase to 50% by 2020. This could happen either through competitive market pressure (increasing numbers of companies offer it in order to stay competitive) or through a change in state policy mandating insurance companies to offer PAYD at some point after it has been proven to work.

TLU-9 Parking Management

The CAP recommends, by unanimous vote of those members present and voting, that Colorado encourage innovative parking management by local governments as a way to reduce automobile use and encourage infill and transit-oriented development. The location, supply, and pricing of parking can have a major impact on travel decisions, including choice of mode. Parking management refers to policies and programs that result in more efficient use of parking resources. Managing parking by restricting parking availability or encouraging market rate pricing can encourage more transit usage, ridesharing, bicycling, and walking. Reducing requirements for parking supply can also encourage infill and transit-oriented development by lowering the cost of such projects.

TLU-10 Commuter Benefits Programs

The CAP recommends, by unanimous vote of those members present and voting, that Colorado promote commuter benefits programs by employers. Employers can significantly reduce automobile travel by their employees by offering amenities such as free or low cost transit passes, strong telework programs, carpool matching and vanpool subsidies, guaranteed ride home services, parking cash-out, and facilities for bicyclists.

State and local government agencies can offer these programs to their employees and can encourage private employers to offer such programs. Commuter benefits programs could also be part of a larger Colorado corporate climate challenge. The CAP recommends that Colorado adopt an employee trip reduction act and require large employers to participate in an employee trip reduction program. The goal of this policy recommendation is that, by 2010, all employers in Colorado served by a transportation authority or district with more than 100 employees will offer a commuter benefits program.

TLU-11 Driver and Consumer Education

The CAP recommends, by unanimous vote of those members present and voting, that Colorado develop and implement a driver and consumer education curriculum on energy efficient driving behaviors. Drivers will voluntarily reduce fuel use and GHG emissions from their activities when they have the information necessary to make proper decisions.

A driver and consumer education curriculum would address improved vehicle maintenance, improved vehicle operation and improved transportation choice. This curriculum would be a requirement for all driver training programs with questions pertinent to training included on the written/driving portion of private and commercial driver licensing tests. Currently, driver training programs in Utah and Arizona incorporate this type of curriculum in classroom settings.

This policy would also involve a state marketing program for fuel efficient replacement tires and energy efficient driving practices and devices, and training for state and municipal fleet operators.

Appendix G

Transportation and Land Use Policy Recommendations

Summary List of Policy Recommendations

	Policy Recommendation	GHG Reductions (MMtCO ₂ e)			Costs (Savings) 2007–2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Climate Action Panel Action
		2012	2020	Total 2007-2020			
TLU-1	Reduce light-duty vehicle miles traveled 2% by 2020 by promoting “smart growth” land use planning and development. Require that GHG emissions be considered in long-range transportation plans by 2010.	0.08	0.47	2.43	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-2	Incentives for the purchase of low-GHG vehicles. [An alternative if the TLU-6 clean car standards are not implemented.]	Quantified as part of TLU-6					Unanimous Consent
TLU-3	Reduce light-duty vehicle miles traveled 6% by 2020 by improving transit service quality and funding expansion of transit infrastructure.	0.17	0.97	5.09	N/A	N/A	Unanimous Consent
TLU-4	Reduce heavy-duty vehicle idling.	0.07	0.11	0.91	–\$123	–\$134/ton	Unanimous Consent
TLU-5	Adopt a low carbon fuels standard that will reduce carbon intensity of passenger vehicle fuels by 10% by 2020.	0.38	2.21	16.1	N/A	N/A	Unanimous Consent
TLU-6	Adopt California GHG emission standards for cars and trucks.	0.70	3.40	18.8	–\$1,880	–\$100/ton	Unanimous Consent
TLU-7	Expand transit use marketing and employer-sponsored transit fare programs.	Quantified as part of TLU-3					Unanimous Consent
TLU-8	Move toward basing motor vehicle insurance on the distances vehicles are driven.	0.32	0.94	7.19	Less than \$0	Less than \$0/ton	Unanimous Consent
TLU-9	Local parking management programs to encourage alternative travel choices and transit-oriented development.	0.03	0.03	0.34	–\$37	–\$110	Unanimous Consent
TLU-10	Require employers with more than 100 employees to offer commuter benefits programs.	0.42	0.45	4.77	–\$1,145	–\$240/ton	Unanimous Consent
TLU-11	Incorporate vehicle maintenance, operation, and transportation choice GHG reduction information in driver training and education.	Not quantified					Unanimous Consent
	Sector GHG reduction total of 8 analyzed policies after adjusting for overlaps among policies	2.14	7.84	46.7	N/A	N/A	
	Sector cost-effectiveness total of 4 analyzed policies with cost estimates after adjusting for overlaps among policies				–\$3,185*	–\$141/ton*	

GHG = greenhouse gas; N/A = not applicable.

* Cumulative Net Present Value and Cost-Effectiveness values reflect policies 4, 6, 9, and 10 only. Cumulative Net Present Value and Cost-effectiveness values for all policies cannot be quantified.

Negative cost numbers indicate cost *savings*.

The cost (savings) shown are calculated as in terms of net present value in constant 2005 dollars using a 5% annual real discount rate for the period 2008 through 2020. Capital investments are represented in terms of levelized or amortized costs through 2020.

TLU-1. Smart Growth and Related Planning

Policy Description

Implement land use planning, development, and analysis that supports protection of natural and cultural resources, strengthens communities, creates more compact development, and reduces growth in driving and emissions.

Policy Design

Goals:

- Support and promote public and private planning and development practices, including smart growth planning and infrastructure provision that reduce the number and length of trips and expand travel modes in Colorado.
- Reduce light-duty vehicle miles traveled (VMT) by 2% statewide by 2020.¹
- Require that Colorado Department of Transportation (CDOT) and metropolitan planning organizations (MPOs) quantify and report greenhouse gas (GHG) emissions from long-range transportation plans by 2010, provided that financial and technical assistance is provided as needed.

Timing: See above.

Parties Involved: Municipal elected officials; local and regional planning commissions and staffs; CDOT and other state agencies which have programs/projects that have land use impacts; private developers and contractors; planning, land use, and engineering professionals; public and private organizations with land use, transportation, and environmental interests.

Implementation Mechanisms

- Provide incentives to developers for density and mixed use.
 - To help balance any reluctance the market may display toward acceptance of higher density or mixed use, relax some design requirements (such as parking minimums) or provide fee credits (e.g., against road impact fees).
- Improve techniques for estimating reductions in vehicle trip generation for land uses with mixed use developments. (internal capture)
 - Mixed use developments have shown to have reduced VMT and VT due to increased access to goods and services. Traditional traffic generation estimates are based upon suburban models and require mixed use developers to pay for impact fees that may be unnecessary and may render these projects infeasible. Inaccurate traffic generation estimates may also overemphasize the need to increase vehicle capacity on the surrounding roadway network to the detriment of the pedestrian environment.

¹ VMT reduction goal of 2% is based on DRCOG modeling of “compact urban footprint” scenario.

- Include reductions in estimated traffic generation as a result of intelligently located development. (infill)
 - New development located in established urban areas results in reduced VMT and VT due to shorter average trip distances and higher potential for alternative mode use. Traffic generations forecasts should take location of development into account when estimating vehicle trip generation.
- Implement a concurrency management system or adequate public facilities requirement.
 - Concurrency standards or requirements affect the timing of development and the provision of transportation infrastructure. If implemented using multimodal strategies and district or area-based measurement, they can support infill, compact development and transit use.
- Encourage the use of intergovernmental agreements to implement urban growth boundaries.
 - Urban growth boundaries are difficult to implement unilaterally and may be meaningless in effect if other nearby cities annex the land outside the adopting city's boundary. Intergovernmental agreements are an appropriate means of resolving where in a given county urban growth will be allowed to occur.
- Providing a means for local governments to share local sales tax proceeds.
 - Eliminating competition between local governments of commercial development would reduce existing pressures that discourage growth management.
- Implement interjurisdictional planning and/or regional review of local plans.
 - Because local governments face fiscal and other challenges, and because the land use decisions of one local government will affect other jurisdictions around it, local efforts to manage growth responsibly could be bolstered by requiring interjurisdictional planning or regional oversight over some aspects of local planning.
- Program infrastructure investments so as to encourage and reward compact development.
 - Compact urban development patterns require supportive infrastructure investments- especially high capacity transit systems. If state transportation funds were targeted to encourage and reward compact growth and infill development, that could reinforce improved growth management efforts by local governments.
- Undertake local planning for local street patterns prior to development.
 - Discussion: True street grid systems will require a street network that goes beyond the bounds of any one development. Frequently, much of the connectivity problem is caused by poor connections between subdivision projects. Cities in Colorado currently identify a network of arterial and collector streets which are formalized through a "master streets plan." To facilitate the development of a more connected street system, cities could also extend the concept to include local streets and a local street grid layout.
- Increase property owners' awareness of conservation easements in Colorado.
 - Conservation easements give land owners tax breaks for agreeing to restrict development on their land. Efforts to increase the extent of conservation easements on private lands could help focus development to urbanized areas.
- Promote Brownfield development through rebates of property taxes to offset cleanup costs.

- Tax rebates for Brownfield development often pay for themselves after a few years with increased property tax revenue.
- Increase funding for a Conservation/Land Protection Fund
 - Often parcels of land are put on the market and sold before conservation organizations have an opportunity to collect enough funds to buy the parcel. The Conservation/ Land Protection Fund, already active in Colorado, is a revolving load fund that will provide conservation organizations with access to immediate financial resources so desirable land can be purchased once available. (<http://www.cclt.org/>)
- By executive order or legislative direction, require that CDOT and MPOs quantify and report GHG emissions from long-range transportation plans by 2010, provided that financial and technical assistance is provided as needed.

Related Policies/Programs in Place

A variety of local policies and programs are in place throughout Colorado to promote smart growth.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG Emission Savings	0.08	0.47	MMtCO ₂ e
Net Present Value (2007–2020)		<\$0	\$ Million
Cumulative Emissions Reductions (2007–2020)		2.43	MMtCO ₂ e
Cost-Effectiveness		<\$0	\$/MtCO ₂ e

Data Sources: DRCOG Metro Vision 2035 land use scenarios.

For cost information, a variety of literature finds that integrated transportation and land use planning produces net savings on the total costs of buildings + land + infrastructure + transportation. However, some components may be higher even though total costs are reduced. The preponderance of literature suggests net savings overall (see U.S. Environmental Protection Agency, *Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality*, 2001). A National Academy of Sciences/Transportation Research Board review found substantial regional and state-level infrastructure cost savings from more compact development (see Robert Burchell, et al., *The Costs of Sprawl—Revisited (TCRP Report 39)*, Transportation Research Board, Washington, DC, 1998). An analysis of the New Jersey State Plan found that municipalities, counties, and school districts would save an estimated \$160 million from 2000 to 2020 by pursuing smart growth patterns (see Robert Burchell, et al., *The Costs and Benefits of Alternative Growth Patterns: The Impact Assessment of the New Jersey State Plan*, Center for Urban Policy Research, Rutgers University, 2000).

Quantification Methods: Assume 2% reduction in light-duty vehicle VMT with full implementation, consistent with Compact Urban Footprint and Compact Urban Footprint Plus Transit scenarios (Denver Regional Council of Government (DRCOG) Metro Vision 2035 land use scenarios).

Costs cannot be quantified due to the broad scope of this policy recommendation and the uncertainty in how it would be implemented by local governments. Research suggests that the policy will result in net cost savings. (See Data Sources above).

Key Assumptions:

- 2% reduction projected for the Denver area is achievable on average across Colorado's urban and rural areas.
- Implementation: 10% in 2010, 50% in 2015, 100% in 2020.

Key Uncertainties

Achieving the target reduction in VMT depends on implementation of the policy initiatives at all levels of government. It is possible that required planning could be done in a way that does not change development patterns, and thus does not reduce VMT and emissions. That is, the policy language does not require these outcomes.

External forces can have a significant effect on VMT and land development patterns, which creates additional uncertainty regarding the impacts of this policy recommendation. For example, fuel prices affect vehicle use. A major increase in fuel prices would help to encourage use of alternative travel modes, and might increase the benefits of this policy. Conversely, a reduction in fuel prices would make it more difficult to reduce VMT through smart growth and multimodal transportation planning efforts. Land development patterns are strongly influenced by regional and state macroeconomic forces. The ability of governments to influence land use patterns depends to some extent on developer demand.

Additional Benefits and Costs

Land use policies such as the densification of developed land, mixing of compatible land uses and other urban design measures have beneficial spin-offs for other strategies. Land use based policies further mode switching policies because these policies help create an environment that is easier served by transit, biking and walking.

Benefits include reduced infrastructure costs noted above, avoided health care costs from reduced air pollution and increased walking/biking, and other quality-of-life aspects.

There will be front-end costs of program development and implementation, and a successful program requires dedicated resources.

Feasibility Issues

Land use changes will not have a large impact on transportation systems and GHG emissions over the short term. However, over longer time spans, land use changes aimed at creating denser,

mixed-use settlements may offer important opportunities to reduce vehicle use and GHG emissions.

Smart growth strategies targeting densification and land use mix will affect primarily urban areas, since they have the characteristics to address densification. The effectiveness of these policies also depends upon the willingness of local governments—largely in urbanized areas—to implement land use policies and regulations. In addition, policies that affect land use and transportation take a long time not only to implement, but also a long time to accrue their effects. Typically, transit oriented-development strategies take more than 20 years to implement.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-2. Incentives for Purchase and Operation of Low-GHG Vehicles

Policy Description

This policy includes several policies and programs to encourage purchase of low GHG emission vehicles through monetary and convenience rewards and incentives throughout the state.

- **Feebates**—This is a study policy rather than an implementation policy. The state would participate in a multi-state study of the feasibility and effectiveness of a regional feebate system with other western states. The feebate study would be conducted through a multi-state cooperative agreement for greater impact and could be implemented through the recently formed Western Regional Climate Action Initiative.
- **Tax Credits for Low-GHG Vehicles**—Amend the current income tax credit program for hybrid, alternative fuel, and low-emission vehicles so that it continues in its present form beyond 2010.
- **Operating Incentives for Low-GHG Vehicles**—Maintain current preferential state-controlled infrastructure (high-occupancy vehicle [HOV] lanes) access for alternative fuel vehicles (natural gas, propane, 100% electric). Possible provision of “green license plates” to designate alternative fuel vehicles.

Tax-funded, non-tax paying entities (state and municipalities) shall be required to purchase the lowest GHG vehicle suitable for their usage.

Policy Design

Goals:

- **Feebate program** would be developed as part of multi-state study of regional feasibility and effectiveness. This policy would be considered as a contingency in the circumstance where the clean car standards (TLU-6) were not to be implemented.
- **Income tax credits** as defined in state statute but would continue at present levels beyond 2010.
- **Access to HOV lanes** for alternative fuel vehicles would continue as current policy.

Timing: The feebate program and extension of tax credits would require legislative approval. Goal of implementation before 2010.

Parties Involved: State legislature, state and municipal fleet managers, Governor (and administration), tax-paying Colorado motor vehicle owners, residents and business, especially if subject to Colorado’s tax payer bill of rights (TABOR) voter approval requirement.

Implementation Mechanisms

The proposed policies and programs in this policy will need to be passed through the legislative process and will be subject to TABOR if revenue growth is anticipated through the Feebate segment. Implementation of the Feebate will be channeled through the Colorado Department of

Motor Vehicles. The other policies, tax credits and incentives are already in place to some degree and will simply need to be modified from time to time to meet the new criteria as technology changes.

Related Policies/Programs in Place

While feebates are set as a new proposal, they are not completely unlike the application of existing taxes such as vehicle sales tax and gas guzzler tax. The difference is the method of calculation. In the case of feebates, the calculation will be on vehicle ‘green rating’ and can adopt the green house gas scores for vehicles as determined by the U.S. Environmental Protection Agency (<http://www.epa.gov/greenvehicle/>)

Currently there are tax credits in place for alternative fuel vehicles (including hybrids) and alternative fuel refueling facility installations. These credits are outlined by the Colorado Department of Revenue, Taxpayer Service Division (<http://www.revenue.state.co.us/fyi/html/income09.html>).

Currently, an incentive for access to HOV lanes is in place for vehicles that meet the EPA inherently low emission vehicle (ILEV) classification and have a gross vehicle weight rating of 26,000 pounds or less. These vehicles may be operated in HOV lanes regardless of the number of occupants and without payment of a special toll or fee. A special sticker must be obtained from the state Department of Transportation. At this time, hybrid electric vehicles do not qualify as ILEVs because they use conventional gasoline fuel and cannot receive the HOV exemption decal. (Reference [Colorado Revised Statutes](#) 42-4-1012).

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	Quantified as part of TLU-6		MMtCO ₂ e
Net present value (2006–2020)	Quantified as part of TLU-6		\$ Million
Cumulative emissions reductions (2006–2020)	Quantified as part of TLU-6		MMtCO ₂ e
Cost-effectiveness	Quantified as part of TLU-6		\$/MtCO ₂ e

Data Sources: See TLU-6

Quantification Methods: See TLU-6

Key Assumptions: See TLU-6

Key Uncertainties

Both the United States Department of Energy (US DOE) and the Canadian Transport Ministry have studied the potential impacts of national level feebate programs in recent years. While these studies have informed the debate about the advantages and disadvantages of national feebate programs, there remains considerable uncertainty about the potential benefits and costs of state- or multistate-level feebate programs. There is an important need for a greater understanding of

the potential effects of single state or multistate feebate programs on the types of vehicles that manufacturers put into the marketplace and on the purchasing decisions that consumers make.

Additional Benefits and Costs

None identified.

Feasibility Issues

Requires multistate cooperation for regionally consistent feebate program.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-3. Improve and Expand Transit Service

Policy Description

Improvements to existing transit service and expansion of transit routes can shift passenger transportation from single-occupant vehicles to public transit, thereby reducing emissions. This mitigation policy involves a number of actions to be undertaken by state government, local government, and transit agencies.

Policy Design

Goals: Implement transit investments that encourage greater use of public transportation, such as the following:

- Improve service frequency on selected existing transit routes.
- Support and encourage improvements in intercity bus service.
- Reduce travel times on selected existing transit routes (signal prioritization, exclusive lanes, etc.).
- Improve service quality on selected existing transit routes (safety, cleanliness, improvements to shelters/stations).
- Expand transit service and infrastructure (commuter rail, light rail, bus, bus rapid transit [BRT]).

In conjunction with TLU-7, this policy will reduce light-duty vehicle urban VMT by 6% compared with 2020 VMT under a baseline scenario.² As a result, between 2007 and 2020, light-duty urban VMT would grow by 22% instead of by 28%.

Timing:

- Many programs are in place and are therefore can be immediately expanded and implemented. Enhancement and continuation can begin short-term.
- Infrastructure improvements will take 3–5 years at a minimum.

Parties Involved: CDOT, transit agencies, metropolitan planning organizations, municipalities, counties

Implementation Mechanisms

- Create a reliable statewide funding source for transit systems. The Colorado Transportation Finance and Implementation Panel (“blue ribbon panel”) is currently exploring funding options for Colorado’s transportation system. Encourage the panel to include transit funding set-asides in any funding mechanism that is recommended by the panel.

² VMT reduction goal of 6% based on recent modeling by Professor Robert Johnston of University of California, Davis.

- CDOT and state MPOs should maximize use of federal discretionary transportation funds that can be use for public transit capital projects and/or operating assistance.
- All new large residential developments should include a resident travel plan that will achieve a 20% transit mode share, with developments that are unable to achieve this goal making a cash-in-lieu payment. If the State has the authority to implement this provision, it should require the use of travel plans by developers. If not, the State should incentivize local governments to make use of such plans.
- Create a statewide transit plan.
- Monitor and support the activities of the Rocky Mountain Rail Authority and Colorado Rail Association.
- I-70 Corridor: Support the mediation facilitated by the Keystone Center to resolve issues and build trust for stakeholders along the I-70 corridor.

Related Policies/Programs in Place

In Boulder, travel plans to encourage alternative mode share are a standard part of proposals for large new residential and commercial developments.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.17	0.97	MMtCO ₂ e
Net present value (2006–2020)		N/A	\$ Million
Cumulative emissions reductions (2006–2020)		5.09	MMtCO ₂ e
Cost-effectiveness		N/A	\$/MtCO ₂ e

Data Sources:

- I-70 corridor: CDOT Traffic Data by Route

Quantification Methods: Reduce light-duty urban VMT by 6% compared to baseline scenario.

Further reduce light-duty VMT by 8–10 million VMT annually to reflect bus service between Denver and ski resorts on I-70. (Calculated as a 1% reduction in non-truck VMT along the route).³

Key Assumptions:

- Implementation: 10% in 2010, 50% in 2015, 100% in 2020.

³ Source: I-70 Mountain Corridor Draft PEIS, Appendix B, B.1.5.1

Key Uncertainties

Achieving the VMT reduction goals for this policy recommendation will require supporting land use policies. Higher density and pedestrian-oriented development patterns encourage use of public transit. Thus, the success of this policy recommendation depends in part on the success of policy TLU-1.

Additional Benefits and Costs

There is a broad literature on the role of transit as a part of a modern economy and as a key contributor to creating and maintaining certain aspects of quality of life and a healthy, efficient economy. Overarching reviews of that literature are done only periodically; one of the most comprehensive is *Public Transportation and the Nation's Economy: A Quantitative Analysis of Public Transportation's Economic Impact*, Cambridge Systematics, Inc., 1999. This report lists the following additional types of benefits from transit investments. This list is not intended to imply that Colorado would necessarily see all these impacts, but to support the conclusion that transit investments can have significant ancillary benefits.

- “Transit capital investment is a significant source of job creation. This analysis indicates that in the year following the investment 314 jobs are created for each \$10 million invested in transit capital funding.
- “Transit operations spending provides a direct infusion to the local economy. More than 570 jobs are created for each \$10 million invested in the short run.
- “Businesses would realize a gain in sales three times the public sector investment in transit capital; a \$10 million investment results in a \$30 million gain in sales.
- “Businesses benefit as well from transit operations spending, with a \$32 million increase in business sales for each \$10 million in transit operations spending.
- “Business output and personal income are positively impacted by transit investment, growing rapidly over time. These transportation user impacts create savings to business operations, and increase the overall efficiency of the economy, positively affecting business sales and household incomes. A sustained program of transit capital investment will generate an increase of \$2 million in business output and \$0.8 million in personal income for each \$10 million in the short run (during Year 1). In the long term (during Year 20), these benefits increase to \$31 million and \$18 million for business output and personal income respectively.
- “Transit capital and operating investment generates personal income and business profits that produce positive fiscal impacts. On average, a typical state/local government could realize a 4% to 16% gain in revenues due to the increases in income and employment generated by investments in transit.
- “Additional economic benefits which would improve the assessment of transit’s economic impact are difficult to quantify and require a different analytical methodology from that employed in this report. They include “quality of life” benefits, changes in land use, social welfare benefits and reductions in the cost of other public sector functions.

- “The findings of this report complement studies of local economic impacts, which carry a positive message that builds upon the body of evidence that shows transit is a sound public investment. Local studies have shown benefit/cost ratios as high as 9 to 1.”

Feasibility Issues

Like any class of investment, the fact that empirically and on average the investment produces net returns does not guarantee that a given investment will do so. Transit investment and operation, and transit promotion, need to be tailored to the communities they serve, and be well planned, implemented, and run to produce the maximum return on investment (ROI).

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-4. Heavy-Duty Vehicle Idle Reduction

Policy Description

This policy focuses on reducing idling from diesel and gasoline heavy-duty vehicles, buses, and other vehicles through a combination of statewide anti-idling regulations and by promoting and expanding the use of technologies that reduce heavy-duty vehicle idling. These technologies include truck stop electrification as well as vehicle equipment modifications such as auxiliary power units, direct fired heaters, and automatic engine shut down/startup system controls.

Policy Design

Colorado would develop and implement a statewide regulation banning extended idling by heavy-duty vehicles in most situations. The anti-idling regulation should be designed to be easily enforceable by state and local agencies and supported with dedicated state funding for enforcement for this measure to be successful in reducing vehicle idling and GHG emissions. The regulation should limit exemptions as much as possible for easy enforcement. However, idling that occurs for public health and safety reasons (such as emergency vehicles) should be exempted from these requirements.

Colorado would encourage and support the establishment of truck stop electrification stations at key truck stops and rest areas throughout the state. Such efforts would include working with the US EPA, US DOE, truck stop owners, and equipment vendors to securing funding for truck stop electrification.

Colorado would also promote reduced idling through programs aimed at increasing voluntary adoption of idling reduction technologies. Components of such an effort should include collaborative outreach and education timed with the implementation and enforcement of a statewide anti-idling regulation and seeking funding for pilot projects and demonstrations as well as funds available through any federal or other programs to evaluate the effectiveness of various idle reduction technologies.

Goals:

- Adopt statewide regulation on extended heavy-duty vehicle idling by 2009.
- Development of truck stop electrification at 2 locations by 2012 and all major Colorado truck stops by 2020.
- Implement state incentives for purchase of heavy-duty vehicle auxiliary power units (APUs) by 2012.
- Reduce fuel consumption from extended (overnight) idling of heavy-duty vehicles 50% by year 2012 and 95% 2020.⁴

⁴ Goals assume that alternatives to extended engine idling (like truck stop electrification and APUs) are not widely available in 2012 but are widely available by 2020.)

Timing: See above.

Parties Involved: Trucking industry, Colorado Motor Carriers Association, CDOT, truck stop owners/operators, school districts, municipalities, and counties

Implementation Mechanisms

Information and education—Provide information to fleet carriers, shippers, retailers, bus companies, school districts, local governments and others involved in the diesel fleet industry indicating the economic benefits, as well as the environmental benefits, of reducing or eliminating idling. Emphasize the fuel savings benefits, reductions in toxic emissions, and reduced engine wear associated with reducing idling. Also, identifying best practices within the industry and recognizing companies with these best practices in place within Colorado should be used to encourage companies to select these carriers for their shipments. Develop outreach materials with cost benefits information and toxic diesel health impacts. Outreach materials should also be geared toward making the general public aware of the GHG, toxics and fuel-saving benefits of eliminating idling on personal vehicles, as well as on trucks and buses.

Technical assistance—Coordinate with anti-idling product manufacturers to organize workshops/outreach programs to regulated community to let them know of technological options that provide alternatives to the need for idling including products for cabin comfort, power for other functions (e.g., refrigerated trucks), and engine warm-up.

Funding Mechanism and/or incentives—Identify funding source to partially fund idling technology loan and/or grants for innovative truck stop electrification and other idling reduction technologies in the State focusing in high idling areas. Explore any available tax credits or other funding that may be available for idle reduction programs. Dedicated funding stream also needs to be identified to support enforcement of anti-idling laws that may be adopted as well as education and outreach. New transportation revenue sources (currently being explored by Governor Ritter’s blue ribbon commission) could provide funding.

Voluntary and or negotiated agreements— Work with regulated entities to promote voluntary compliance through distribution of materials, staff training, etc. Encourage participation in EPA’s SmartWay Transport partnership (or similar programs).

Codes and standards—Develop a statewide regulation banning idling by heavy-duty diesel commercial trucks, buses and other vehicles. It may make sense to model Colorado regulation on adjacent states regulations so some uniformity of regulations occurs on a regional basis.

Pilots and demos—Investigate availability of funding for pilot projects on idling reduction technologies from the U.S. Environmental Protection Agency, Department of Energy, and Department of Transportation, particularly in the areas of truck stop electrification. Evaluate the effectiveness of the pilot program before implementing on a broader scale.

Enforcement and reporting—Phased enforcement program to initially conduct outreach (phase I), warnings for a limited period of time (phase II), then issuance of tickets (phase III) coupled with enforcement should be system for tracking violation so the state can determine compliance rates and benefits achieved from the regulation.

Related Policies/Programs in Place

There are currently no known laws in place in Colorado related to this proposal. The neighboring states of Arizona and New Mexico have either put in place or are in the process of adopting anti-idling laws which could serve as a model for Colorado regulations. In addition, Maricopa County, Arizona has idling restrictions in place. Arizona also has a school bus idling pilot project that can be referenced. A check should also be made to see if any Colorado shippers/carriers/retailers are participating in the EPA's SmartWay Transport Program and using best practices for idling reduction.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.066	0.112	MMtCO ₂ e
Net present value (2006–2020)		–\$123	\$ Million
Cumulative emissions reductions (2006–2020)		0.912	MMtCO ₂ e
Cost-effectiveness		–\$134	\$/MtCO ₂ e

Data Sources:

Truck Stop Electrification

- Number of truck stop parking places in state: www.truckstopinfoplus.com
- Number of truck stops with truck stop electrification (TSE): www.epa.gov/smartway
- Idling hours per truck per night: Literature finds that sleeper trucks idle an average of 5.9 hours per night.⁵

Truck Idling Regulation

- Staff Report: Initial Statement of Reasons for Proposed Rulemaking. Airborne Toxic Control Measure to Limit Diesel-fueled Commercial Motor Vehicle Idling. California Air Resources Board, July 2004.

Quantification Methods:

Truck Stop Electrification

- Idling hours reduced = No. of affected spaces × estimated occupancy × 5.9 hours/night × 365 nights/year

Truck Idling Regulation

- California Air Resources Board (CARB) report provides average hours of idling reduced per vehicle per day by the regulation.

⁵ Nicholas Lutsey, Christie-Joy Broderick, Daniel Sperling, Carolyn Oglesby, "Heavy-Duty Truck Idling Characteristics—Results from a Nationwide Truck Survey," paper submitted for the 2004 Annual Meeting of the Transportation Research Board, 2004.

- CARB report provides heavy duty vehicle population figures for California. Figures for Colorado are scaled based on the relative size of economy-wide employment in Colorado.

Cost is calculated as the sum of equipment costs, savings on fuel, and cost to government for outreach and enforcement of the regulations.

Table G-1. NPV of program costs to 2020

Component	\$ Millions
Equipment	38.2
Fuel savings	-162.8
Government outreach and enforcement	2.0
Total	-122.6

Key Assumptions:

Truck Stop Electrification

- Overnight idling is eliminated at truck stops with TSE.
- 2 truck stops have TSE by 2012.
- All truck stops with 5 or more spaces have TSE by 2020.

Truck Idling Regulation

- Regulation prohibits idling for more than 5 consecutive minutes by commercial diesel-fueled heavy duty vehicles. Compliance is primarily achieved by drivers manually switching off engines.
- 100% implementation is achieved by 2010.

Key Uncertainties

- Number of overnight truck parking spaces in Colorado.
- Utilization of overnight truck parking spaces.
- Effectiveness of policy at reducing idling.

Additional Benefits and Costs

Reducing idling by heavy-duty vehicles and locomotives would reduce particulate matter emissions. Many scientific studies have linked breathing particulate matter (PM) to a series of significant health problems, including aggravated asthma, difficult breathing, chronic bronchitis, heart attacks, and premature death. Diesel PM is of specific concern because it is likely to be carcinogenic to humans when inhaled.

Feasibility Issues

No major feasibility issues identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-5. Low Carbon Fuels Standard

Policy Description

This policy seeks to utilize a broader fuel-neutral strategy to reduce GHG emissions by decreasing the carbon intensity of all passenger vehicle fuels sold in Colorado. This fuel-neutral, market-based and performance-based strategy would culminate in a low carbon fuels standard (LCFS). Low carbon fuels could include biodiesel, cellulosic ethanol, hydrogen, compressed natural gas, liquefied petroleum gas, electricity, and low carbon blends such as E10 or E85, but the program does not mandate that any particular fuel be used to meet the performance standard.

The elements of a strategy to reduce carbon intensity in motor fuels would include

- Fuel quality standards,
- Reduced carbon intensity fuel standards,
- State government fleet ‘leadership’ programs for adoption of low carbon fuels,
- Low carbon fuel infrastructure development, and
- Options for compliance.

The LCFS will require all fuel providers in Colorado to ensure the mix of fuel they sell into the Colorado market meet, on average, a reduced standard of carbon intensity compared with the present time for GHG emissions, as measured in CO₂e grams per unit of fuel energy sold. The standard will also be measured on a life cycle basis in order to include all emissions from fuel production to consumption.

Fuel providers (defined as refiners, importers, and blenders of passenger vehicle fuels) will need to demonstrate on an annual basis that their fuel mixtures provided to the market meet the goals and timetables for the LCFS. Options for compliance may include blending or selling increasing amounts of lower carbon fuels, using previously banked credits, and purchasing credits from fuel providers who earned credits by exceeding the standard. Penalties for noncompliance will be determined during the implementation process.

Policy Design

Goal levels: Create an LCFS for transportation fuels sold in Colorado that would reduce carbon intensity of Colorado’s passenger vehicle fuels by at least 10% by 2020. Wildlife values and sustainability criteria should be taken into account regarding sources of fuels used to meet the LCFS.

Timing: Following design period, program would be implemented prior to 2020. Fuel providers would be required to meet 10% reduction standard no later than 2020. Program design would include a ramp-up period that is determined to be feasible following consultation with fuel providers.

Parties Involved: Fuel providers, State Department of Agriculture, State Department of Revenue, State Department of Public Health and Environment.

Compliance Pathways: Fuel providers could meet the required reduction through the use of a variety of alternative fuel blends and vehicle technologies. For example, Table G-2 illustrates three possible scenarios through which the State of California has envisioned that it could meet the LCFS being developed there. In California, a group of professors and energy research experts associated with the University of California (Berkeley and Davis campuses) have conducted additional analyses which show the feasibility of alternative scenarios for meeting the LCFS goals on the timetable that has been established in that state.

Table G-2. LCFS compliance scenarios for California

Scenario Number	1	2	3
Total Petroleum Displaced by Low-Carbon Fuels (B gal)	3	3.1	3.2
Low-Carbon Fuels			
Total Ethanol Demand (B gal)	2.7	3.8	4.7
Number of Flex Fuel Vehicles (millions)	3	6	8.5
Number of Plug-in Hybrids (millions)	4.1	1.7	0
Number of Hydrogen Fuel Cell Vehicles (millions)	0.5	0.5	0.2

Source: Office of the Governor (State of California), "The Role of a Low Carbon Fuel Standard in Reducing Greenhouse Gas Emissions and Protecting Our Economy." White Paper. January 8, 2007. <http://gov.ca.gov/index.php?/fact-sheet/5155/>

Various fuel types and vehicle technologies reduce GHG emission by different degrees. Table G-3 provides reduction estimates.

Table G-3. Estimated impacts of alternative fuels on GHG emissions

Fuel/Technology	Blend	Feedstock	Estimated Reduction (grams of GHGs per mile)*
Ethanol	E10	corn	1.5%
Ethanol	E10	cellulosic	7.2%
Ethanol	E85	corn	17.6%
Ethanol	E85	cellulosic	83.2%
Plug-in hybrid	–	–	35.7%
Electric	–	–	31.9%
Hydrogen fuel cell	–	–	46.6%
Biodiesel	B20	–	9.9%
Biodiesel	B100	–	53.9%
Compressed natural gas	–	–	13.2%
Liquefied natural gas	–	–	13.6%

* All reductions relative to gasoline with the exception of biodiesel, which is calculated relative to diesel fuel.

Source: GREET v1.7 outputs

Implementation Mechanisms

The policy components described below could be implemented to increase low carbon fuel use.

Carbon Fuel Accounting—All of the policy recommendations being considered would be evaluated on the basis of full life cycle or net accounting that measures the net carbon emission per usable unit of energy delivered. In the case of traditional fuels, this includes ‘upstream’ carbon emissions of harvesting, mining, processing, transportation, and other energy inputs and carbon outputs from production to consumption. Biofuels should undergo the same net carbon accounting, including fertilizer, fuel used on the farm for seeding and harvesting, processing, and transportation.

Low Carbon Fuel Standard—A benchmark for promotion of low carbon fuels should be based on energy output per volume of GHG generated, allowing policy to promote fuels with a favorable GHG energy ratio. The LCFS will require all fuel providers in Colorado to ensure the mix of fuel they sell into the Colorado market meet, on average, a reduced level of the carbon intensity of GHG emissions, as measured in grams of CO₂e per unit of fuel energy sold. The standard will also be measured on a full life cycle basis in order to include all emissions from fuel production to consumption.

The LCFS is market-based and performance-based, allowing averaging, banking and trading to achieve lowest cost and consumer-responsive solutions. A LCFS is also *fuel neutral* where fuel providers will choose which fuels to sell and in what volumes. This provides flexible options for compliance including: blending or selling increasing amounts of lower carbon fuels, using previously banked credits and purchasing credits from fuel providers who earned credits by exceeding the standard.

A Governor’s Executive Order would initiate the process for development of the LCFS, followed by a detailed report and rule-making proceedings that would involve consultation before implementation. The appropriate state agencies will undertake a study to develop the framework for the LCFS. Once the study is completed, it would be introduced to the State’s legislative proceedings, at which point the appropriate state agency will conduct public hearings on the proposal. The final report is expected to be finalized by 2010 and upon the adoption of this report, an appropriate state agency will initiate a rule-making proceeding, establishing and implementing the LCFS.

Credits for Compliance—Fuel providers, defined as refiners, importers, and blenders of passenger vehicle fuels, would demonstrate on an annual basis that their fuel mixtures provided to the market met the target by using credits previously banked or purchased. Providers that exceed the performance target for the compliance period will be able to generate credits in proportion to the degree of over performance and quantity of fuel provided. These credits can be used for future use or sold to other regulated fuel providers. Penalties for noncompliance will be determined during the Implementation Process.

Contingency Option for Fuel Feebate System—Strategies for incentivizing and providing market signals that would affect consumer demand shifts may be considered as a contingency for successful implementation, if other implementation measures for LCFS is not anticipated to meet the goals on the timetable set by the legislature. The fuel feebate system would be revenue neutral, and would place a higher surcharge on higher carbon intensity fuels and provide a rebate to consumers for the use of lower carbon intensity fuels. The fuel would also be measured on a life cycle basis in order to include all emissions from fuel production to consumption. The fuel

feebate system would provide a market-motivated incentive for both producers and consumers to move towards fuels with lower carbon intensity. As an alternative to a revenue-neutral system, the program may be structured to generate an appropriate amount revenue for a State Carbon Mitigation Trust Fund. Net revenues collected could finance loans, incentives, and rebates for direct investment in research by Colorado institutions, infrastructure for transportation alternatives, and in-state production of lower carbon fuels.

Since there can be much political controversy linked to a new tax or “fee,” this policy recommendation is considered as a contingency that would be considered as an option in the future. The fuel feebate system could be implemented through a new fuel tax infrastructure whereby the tax might need to be collected at the refinery level (as opposed to the distribution level). Revenues can directly move other goals, favorably shift the market towards low carbon fuels, and assist with funding programs.

State and Local Government Fleet ‘Leadership’ Programs—State and local government agencies can show leadership by initiating programs to demonstrate how feasible the purchase of low carbon fuels or alternative fuel vehicles in contracts would be. The award of construction contracts is another area in which the state can immediately have an effect on GHG emissions. After these programs are implemented, the benefits of GHG emission reductions, as well as lower fuel costs should be documented. The appropriate state agencies would publish reports showing and demonstration the benefits of such program so that other public and private organizations can learn from the experiences.

Carbon Reduction Requirements—Reduction in carbon-intensive fuels can also be achieved directly through voluntary or mandated goals. Options include a specific mandate (e.g., 10% of fuel used in Colorado markets will be either ethanol or biodiesel by 2025) or flexible mandates (e.g., by 2020, the total amount of GHG emissions from fuel consumption will be 90% of current levels), or a yearly reduction by current producers. Legislative action will put these goals in place. Policy will also be designed to avoid a situation similar to the flex fuel dilemma whereby ethanol-capable vehicles were purchased for compliance, but no ethanol had been used.

Transportation Alternatives—State agencies would calculate the carbon reduction benefits of alternative transportation vehicles such as hydrogen, natural gas, and electricity, including neighborhood electric vehicles (NEVs) and other specialized transportation. Policy would be created to provide incentives for these vehicles and infrastructure for their use based on the achievable GHG reductions.

Biofuels Sustainability Criteria—The state should ensure that in-state production of biofuels feedstocks do not adversely affect wildlife. The state should develop sustainability criteria for biofuels sourcing.

Related Policies/Programs in Place

California is in the process of finalizing their report for an LCFS. Implementation of the LCFS is expected by the end of 2008. Other states, including those in the western United States, are currently considering the adoption of LCFSs.

HR 6, the Energy Security Act of 2005, established a renewable fuel standard that requires that 4 billion gallons of ethanol and/or biodiesel be used in 2006 nationally and increasing to at least 7.5 billion gallons in 2012.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.38	2.21	MMtCO ₂ e
Net present value (2006–2020)		N/A	\$ Million
Cumulative emissions reductions (2006–2020)		16.14	MMtCO ₂ e
Cost-effectiveness		N/A	\$/MtCO ₂ e

Data Sources: The estimate of GHG emissions reductions from the LCFS is based upon a 10% reduction in carbon intensity taken off of a baseline from the Colorado Inventory and Forecast of GHG emissions.

Quantification Methods: The result of the 10% reduction in carbon intensity is based upon the current carbon intensity for light-duty vehicle fuels in Colorado and the forecast levels of gasoline consumption for the horizon year. A ramp-up period is estimated so that the 10% goal would be reached at the horizon year, 2020.

Key Assumptions:

- Program starts in 2009, first year of emission reduction
- Program reaches 2% carbon intensity reduction goal by 2010
- Program reaches 10% carbon intensity reduction goal by 2018
- Program only applies to fuel for light-duty vehicles, replacing current gasoline fuel.

Key Uncertainties

Transportation fuel providers would need to undertake changes in their production and distribution methods in order to achieve the goals. Because the policy does not prescribe particular technology pathways, there is uncertainty surrounding which fuels and technologies fuel providers will use to meet the standard. The program assumes that providers will use the most cost-effective options to meet the standard, but compliance costs are unknown at this time.

Additional Benefits and Costs

Additional air quality impacts may result from changes in the sources and types of transportation fuels.

Feasibility Issues

A recent report released by UC Berkeley analyzed California's LCFS for technical feasibility. It found that a 10% reduction in carbon content of fuels is ambitious, but achievable by 2020.⁶

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

⁶ Alexander E. Farrell et al., "A Low-Carbon Fuel Standard for California Part 1: Technical Analysis," May 29, 2007. UC Berkeley Transportation Sustainability Research Center. Paper UCB-ITS-TSRC-RR-2007-2. <http://repositories.cdlib.org/its/tsrc/UCB-ITS-TSRC-RR-2007-2>

TLU-6. Clean Car Program for Autos and other Light-duty Vehicles

Policy Description

Colorado would adopt the State Clean Car Program in order to reduce GHG emissions from new light-duty vehicles. Under the current federal law, states have the option of choosing between the federal standard for air pollution emissions and the state standard. This policy assumed the standards, which must still be approved by US EPA, would take effect in Colorado beginning with Model Year 2011 (calendar year 2010). Other Clean Car Program elements can include standards requiring reductions in smog- and soot-forming pollutants, and promoting introduction of very low-emitting technologies into new vehicles.

New cars and light trucks in all states must comply with Federal emission standards, and, generally speaking, states have the choice of adopting a stronger set of standards applicable in California. In 2005, California finalized a set of GHG standards for new light-duty vehicles, phased in from 2009 to 2016. States that already have adopted or stated an intention to adopt the Clean Car Program standards include, at least, Arizona, California, Connecticut, Florida, Maine, Massachusetts, Montana, New Jersey, New Mexico, New York, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, and Washington.

Policy Design

Goal levels: Adopt GHG emission standards for light-duty cars and trucks equivalent to those established by the California Air Resources Board (CARB). The California standards phase in during the 2009 through 2016 model years. When fully phased in, the near term (2009–2012) standards will result in about a 22% reduction per-mile GHG emissions as compared to the 2002 fleet, and the mid-term (2013–2016) standards will result in about a 30% reduction.

Timing: To meet federal compliance, a rule writing process would take place by the appropriate agencies so that Colorado can implement the California standards. Regulatory program could begin with vehicle model year 2011.

Parties Involved: Applies to model year 2011 new cars and light trucks. The law would directly affect automobile manufacturers, car dealers, and consumers.

Other: The California standards currently are being litigated. The timing may be affected by the date of enactment of legislation, likely litigation, and the regulatory process.

Implementation Mechanisms

Institute a regulatory program beginning with vehicle model year 2011.

Related Policies/Programs in Place

More than 12 other U.S. states have adopted or are considering adoption of these car emissions standards.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.7	3.4	MMtCO ₂ e
Net present value (2006–2020)		–\$1,880	\$ Million
Cumulative emissions reductions (2006–2020)		18.8	MMtCO ₂ e
Cost-effectiveness		–\$100	\$/MtCO ₂ e

Data Sources:

- CCS, Draft Colorado GHG Inventory and Reference Case Projections.
- California Air Resources Board, “Economic Impacts of the Climate Change Regulations: Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles,” August 6, 2004.
- California Air Resources Board, “Regulations To Control Greenhouse Gas Emissions From Motor Vehicles: Final Statement of Reasons,” August 4, 2005.
- CARB Staff Presentation, “Public Hearing to Consider Adoption of Regulations to Control Greenhouse Gas Emissions from Motor Vehicles,” September 23, 2004.
- Diane Brown and Elizabeth Ridlington, Cars and Global Warming: Policy Options to Reduce Arizona’s Global Warming Pollution from Cars and Light Trucks, Arizona Public Interest Research Group (PIRG) Education Fund: February 2006, <http://www.arizonapirg.org/AZ.asp?id2=22371>.
- Elizabeth Ridlington, Tony Dutzik, and Christopher Phelps, Cars and Global Warming: Policy Options to Reduce Connecticut’s Global Warming Pollution from Cars and Light Trucks, Spring 2005.

Quantification Methods:

- The CARB, the PIRGs, and a coalition of New England States have all calculated the impact of the Pavley standards on GHG emissions. CCS reviewed and compared results of these analyses of clean car programs, and found all three modeling efforts to be reasonable and valid. The PIRG model has been applied in Connecticut, Arizona, and New Mexico. The model estimated a 13.7% reduction in GHG emissions from passenger vehicles by 2020 in Arizona and a 12% reduction in Connecticut. Both CARB and the New England states estimated higher reductions, in the range of 18%–19%. The primary sources of variation in these modeling efforts are 1) the future mix of VMT by passenger vehicle type and 2) the fleet penetration rate.
- CCS assumes the effects of the Clean Car Program in Colorado will be greater than the PIRG model results for Connecticut and Arizona, and less than the results of the California and New England modeling efforts. CCS estimates the effect on Colorado GGH emissions in 2020 to be the median of the lower and upper bounds of prior modeling efforts, or 15.5%.
- Estimation of cost to consumers includes a conservative price of \$1.74 per gallon of gasoline, well below current prices. A higher price would yield even greater projected savings to consumers from the clean car program. As a result, the net cost-effectiveness to society would be even greater than projected, if higher fuel price projections were used.

Key Assumptions:

- The prior modeling efforts have established a valid and reasonable method of projecting GHG emissions reductions from this policy. The CCS comparison of the three modeling methods provides some independent professional validation of the models and their results. The key assumption of the emissions reduction projected by CCS is that the most likely scenario for emissions reductions is one that would fall between the more conservative scenario projected by the PIRG model and the more optimistic scenario projected by the California and the New England models.

Key Uncertainties

The net emissions impact of this policy depends on fleet turnover rates for light-duty vehicles and future patterns of consumer purchase choices between passenger cars and light-duty trucks.

Additional Benefits and Costs

A thorough analysis of the Clean Car standards conducted by the State of California found that approximately \$4 in benefits to the state economy for every \$1 in cost. In year 2020, the annual savings are estimated to be \$5.3 billion and the annualized costs estimated to be \$1.2 billion. The net positive impact to the economy was shown to include increase in state income, jobs, number of businesses, net savings to consumers, and no adverse impact to state competitiveness.

Analysis by the California Air Resources Board suggests that the near term regulations (2009-2012) would increase the average retail prices of passenger cars and small trucks by \$17 to \$367. Mid-term regulations (2013-2016) would increase the car and light truck prices by \$434 to \$1,064. These increased costs will be more than offset by operating cost savings over the lifetime of the vehicle. According to the California Air Resources Board: “Using the average increase in vehicle prices associated with the fully phased-in regulation (2016), and an assumed fuel price of \$1.74 per gallon, staff calculated that the increased vehicle payment minus the reduction in operating cost would result in a monthly savings of about \$3.50 to \$7.00. At higher fuel prices, the monthly savings increase.”⁷

Feasibility Issues

Implementation of this policy can only occur if the California standards are enacted. To date, the US EPA has not granted California the waiver necessary to enact the standards.

In defining the Clean Car Program, the CARB analyzed a range of vehicle technologies that auto manufacturers can employ to meet the standards.⁸ All technologies are either readily available or have been demonstrated by manufacturers in at least prototype form. The Clean Car Program does not mandate the use of any specific technologies to reduce CO₂ emissions, but rather encourages the use of the maximum feasible and cost-effective technologies. As a result, CARB analyzed various technology development scenarios for the 2009 model year and beyond.

⁷ California Air Resources Board, “Regulations To Control Greenhouse Gas Emissions From Motor Vehicles: Final Statement of Reasons,” August 4, 2005.

⁸ California Environmental Protection Agency Air Resources Board. Regulations to Control Greenhouse Gas Emissions from Motor Vehicles: Initial Statement of Reasons. August 6, 2004. Available at: <http://www.arb.ca.gov/regact/grnhs gas/isor.pdf>

Technologies that showed particular potential for reductions in CO2 emissions at favorable costs include

- Discrete variable valve lift,
- Dual cam phasing,
- Turbocharging with engine downsizing,
- Automated manual transmissions,
- Camless valve actuation, and
- Improvements in air conditioning systems.

Automakers are likely to use these technologies in new cars to comply with the Clean Car Program.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-7. Transit Marketing, Promotion, and Pricing Incentives

Policy Description

This policy would promote greater use of public transit and a reduction in automobile travel through various forms of marketing and pricing incentives. Travel patterns are affected by public knowledge and attitudes; therefore marketing becomes an important tool in order to increase transit usage. Instead of merely advertising its availability, transit marketing could be an ongoing dialogue between community partners and transit agencies. Employer-provided transit benefit programs encourage commuting by transit (see TLU-10). Public transit can be made more affordable by offering other price incentives, such as group discounts or discounted pricing for multi-modal purchases.

Policy Design

Goals:

- Expand participation in employer-sponsored annual transit passes (e.g., Eco Pass, PassFort). By 2012, 10% of employees in Colorado's urban areas would be offered annual transit passes; by 2020, 25% of urban area employees would be offered annual transit passes.
- Expand number of employers offering Commuter Checks (pre-tax transit fare program). Goal of 25% transit commuters in state metropolitan areas will use Commuter Checks by 2012 and 50% by 2020.
- Work with transit agencies to develop and implement new transit marketing programs in metropolitan areas.
- In conjunction with TLU-3, this policy will reduce light-duty vehicle urban VMT by 6% compared to 2020 VMT under a baseline scenario.⁹ Thus, between 2007 and 2020, light-duty urban VMT would grow by 22% instead of 28%.

Timing: New marketing programs and discounted fare programs implemented by 2009.

Parties Involved: Transit agencies, CDOT, MPOs.

Implementation Mechanisms

Regulatory mechanisms

- Regulatory requirement that employers over a certain size threshold must provide transit passes to employees if located within a jurisdiction that offers them; STATE LAW
- Require transportation demand management (TDM) plans, including transit pass provisions, as a condition of development approvals for commercial and residential developments over some size threshold if located within a jurisdiction that offers ecopasses. (Boulder generally does this as part of the development review process for anything requiring discretionary approval.) LOCAL GOVERNMENT ORDINANCE

⁹ VMT reduction goal of 6% based on recent modeling by Robert Johnston of University of California, Davis.

- Require all public employers located within jurisdictions that offer transit passes to provide them to employees. STATE LAW
- Require all public educational institutions at middle school, high school, community college and university level to provide transit passes to students. STATE LAW
- Pass a state law or regulation that has State agencies opt out of doing transit passes. (Assumes State agencies can now only opt in to such programs.)

Incentives mechanisms

- Provide matching funds to employers to start transit pass programs. (Boulder and Boulder County currently have programs which provides a subsidy during the first year, the subsidy is reduced the second year, and eliminated the final year.) STATE DOT FUNDING
- Provide matching funds to residential neighborhoods to start transit pass programs. LOCAL GOVERNMENT FUNDING
- Provide a state tax incentive for employer transit pass programs. STATE LAW

Transit agency mechanisms

- Ensure that all major transit systems in Colorado offer employer-provided transit passes.
- Transit agencies should offer special amenities to attract a broader range of commuters such as real time arrival information, WiFi on vehicles, and measures to increase the comfort of passengers both at waiting facilities and during transit.

Related Policies/Programs in Place

Employer-provided transit passes are already available through Denver RTD (EcoPass) and Fort Collins Transfort (PassFort).

Colorado Springs' Mountain Metro provides WiFi access on some buses. The Roaring Fork Transportation Authority (RFTA) of Pitkin County has achieved increases in bus ridership by making its commuter buses more comfortable.¹⁰

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

Quantified as part of TLU-3.

Key Uncertainties

See TLU-3.

¹⁰ TCRP Report 46, The Role of Transit Amenities and Vehicle Characteristics in Building Transit Ridership: Amenities for Transit Handbook and The Transit Design Game Workbook. 1999.

Additional Benefits and Costs

See TLU-3. Any reduction in miles driven results in a net savings to drivers, due to savings on gas and vehicle maintenance. The value of this benefit is in the range of \$600 per ton of GHGs.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-8. Variable Priced Automobile Insurance

Policy Description

Variable priced insurance transfers some of the fixed cost of annual auto insurance premiums to a variable basis, thereby providing an incentive vehicle owners to drive less. One form of this concept is “pay-at-the-pump insurance,” whereby insurance premiums are paid as a fuel tax surcharge. Another form is Pay-As-You-Drive (PAYD) insurance, whereby a portion of vehicle insurance payments are assessed on a per-mile basis. Variable priced insurance has been promoted by a variety of groups for reasons that include emissions reductions, safety (through decreased driving) and fairness (by changing insurance costs to more closely track the portion of individuals’ risk that is created by miles driven).

Several companies in the United States offer PAYD insurance today:

- Progressive Insurance is implementing an initial 5,000-car pilot in Texas, which has seen reductions in driving of about 20%.¹¹ A similar pilot in Minnesota filled up its 4,800 spots quickly, and Progressive has since rolled out the program in Michigan and Oregon.¹²
- GMAC Insurance and OnStar vehicle services have designed a new mileage discount program that will allow motorists who own GM Vehicles with OnStar service to earn an extra discount based on the miles they drive. This program is currently available in Arizona, Indiana, Illinois, and Pennsylvania with plans to expand the program to additional states in the near future.
- King County Metro (Seattle) is in negotiations with an insurance company to run a 5-year pilot program offering PAYD insurance to some of its 150,000 Transit Pass holders. King County is seeking \$2.2 million from the government and partner agencies to fund a statewide PAYD pilot program.

Any of these programs or pilots could be useful sources of models for a Colorado pilot project.

Policy Design

The State of Colorado would change insurance regulations to allow the provision of the PAYD insurance policy, and initiate and promote a pilot program of PAYD. Following a successful implementation of PAYD on a pilot basis, and after PAYD has been demonstrated to effectively reduce emissions, Colorado would then require that Colorado insurance providers offer PAYD as a choice and an option for all consumers. An alternative to a requirement that PAYD would be offered would be a more slow, market driven process where successful adoption of PAYD insurance could also happen. It is anticipated that competition within the insurance industry would build increasing pressure in the business environment whereby increasing numbers of companies offer it in order to stay competitive.

¹¹ For mid-program summaries of the Texas initiative, see: www.nctcog.org/trans/air/programs/payd/index.asp

¹² See <https://tripsense.progressive.com/>

Rates can be set—as most insurance rates are—for classes. PAYD rates would be charged within classes, so that a driver in that class (for example, “rural”) traveling the average distance would pay the same under PAYD as before.

The necessary equipment for remote mileage readings is standard on GM OnStar-equipped vehicles. Add-on equipment to relay mileage automatically has been added in several pilot projects for several hundred dollars. All model year 1996 vehicles and newer have on-board diagnostics (OBD) that already electronically monitor mileage. This data can be quickly downloaded via transponders. Also, current odometers are sufficiently tamper-proof to support yearly mileage readings with no additional technology. A system would need to be set up to manually read odometers where VMT cannot be monitored electronically.

Goals: Assuming a pilot program is successful and the State mandates insurance companies to offer PAYD, market penetration could increase to 50% by 2020.

Timing: See above.

Parties Involved: Insurance companies, State Legislature, Colorado citizens, Governor.

Implementation Mechanisms

Change insurance regulations to enable PAYD in Colorado. Conduct a pilot project to evaluate effectiveness of PAYD insurance to reduce VMT. Assuming the pilot is successful, change insurance regulations to require that Colorado insurance providers offer PAYD among their other options for consumers. All consumer would have the choice and the option to opt into PAYD insurance as an alternative to their existing type of policy.

Related Policies/Programs in Place

None.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.32	0.94	MMtCO ₂ e
Net present value (2006–2020)		<\$0	\$ Million
Cumulative emissions reductions (2006–2020)		7.19	MMtCO ₂ e
Cost-effectiveness		<\$0	\$/MtCO ₂ e

Data Sources:

The Arizona PIRG Education Fund analyzed the potential GHG savings from a PAYD automobile insurance policy. The strategy for a PAYD policy analyzed assumes that insurers are required to offer mileage-based insurance for certain elements of vehicle insurance, including collision and liability. The PIRG Education Fund assumes the PAYD policy is required, phased in over time, and that all drivers in Arizona are eventually covered.

To calculate GHG savings, the Arizona PIRG Education Fund converted Arizona state automobile collision and liability insurance expenditures to an insurance cost per mile (6.4 cents/mile). If insurance consumers pay 80% of their collision and liability insurance on a per-mile basis, then drivers would be assessed a charge of about 5.1 cents/mile. This per-mile insurance charge would reduce VMT by about 8%.¹³ (To put this charge in context, at 20 mpg, 5.1 cents/mile = ~\$1/gallon of gasoline.)

CCS compared the PIRG Education Fund results for estimated reductions in vehicle miles of travel with other studies of PAYD policies, including those produced by the Economic Policy Institute and Resources for the Future (RFF). CCS found that the Arizona PIRG estimates were comparable with other estimates, which ranged from 8% to 20%. The 8% reductions estimates CCS used for estimated reductions in VMT and GHG emissions reductions fell within the lower range of the comparable estimates.

Quantification Methods:

- 2010 Reduction = LDV VMT × 10% of drivers × 8%
- 2020 Reduction = LDV VMT × 50% of drivers × 8%

Key Assumptions:

The PAYD program is voluntarily adopted by drivers. 50% of drivers drive less than the average. These drivers stand to benefit monetarily from participating in PAYD without changing their driving habits. Therefore at maximum implementation, 50% of drivers will participate.

The cost-effectiveness and net present value was estimated for this policy on a qualitative basis. The costs of compliance for an environmental standard are usually estimated by looking at the three potential categories of costs: (1) cost to complying business, (2) cost to consumers, and (3) cost to government. The net cost-effectiveness is estimated to be less than zero (a net savings to society) because the cost to government is negligible and there is a net cost savings to the consumers that choose the option of PAYD insurance. It is not expected that there will be a significant cost to the insurance industry to offer and provide the insurance product, but further consultations with the affected industry would be advised as the policy is considered by the legislature.

Key Uncertainties

The key uncertainty in this policy is the extent to which insurance companies will make PAYD insurance available to consumers, and the extent to which consumers demand the policies. Although several small-scale offerings of this type of insurance exist, there has been no large-scale introduction of PAYD insurance to date.

¹³ Elizabeth Ridlington and Diane E. Brown, *A Blueprint for Action: Policy Options to Reduce Arizona's Contribution to Global Warming*, Arizona Public Research Interest Group Education Fund, April 2006, pp. 25–26. <http://www.arizonapirg.org/AZ.asp?id2=23683>. See also: <http://www.serconline.org/payd/links.html>, which links to a wide variety of PAYD studies and materials.

Additional Benefits and Costs

A reduction in vehicle travel would mean a reduction in criteria pollutant emissions, with associated air quality and public health benefits. This policy might also reduce vehicle crashes.

Feasibility Issues

Although variable priced insurance can be designed to have no relative impact on high-mileage classes such as rural drivers, concerns about potential disproportionate impacts on high-mileage classes will remain until detailed implementation proposals are developed.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-9. Parking Management

Policy Description

The location, supply, and pricing of parking can have a major impact on travel decisions, including choice of mode. *Parking management* refers to policies and programs that result in more efficient use of parking resources. Managing parking by restricting parking availability or encouraging market rate pricing can encourage more transit usage, ridesharing, bicycling, and walking. Reducing requirements for parking supply can also encourage infill and transit-oriented development by lowering the cost of such projects.

Policy Design

This policy would encourage innovative parking management by local governments as a way to reduce automobile use and encourage infill and transit-oriented development. Local governments influence the supply and/or management of most public and private parking. When appropriately applied, parking management can significantly reduce the number of parking spaces required in a particular situation, providing a variety of economic, social, and environmental benefits. Specific action items are listed below.

Employer-to-Commuter Parking Incentives to Encourage Mode Shift (see TLU-10)

- *Parking cash-out*—Commuters who are offered subsidized parking can choose cash instead.
- *Discounted or preferential parking* for rideshare (carpool and vanpool) vehicles.
- *Bicycle parking and changing facilities* increase the convenience and security of bicycle transportation.

Market Based Incentives

Unbundled Parking means that parking is rented or sold separately, rather than automatically included with building space. Developers can make some or all parking optional when selling buildings.

Example: An apartment that normally rents for \$1,000 with two parking spaces could be unbundled to \$800 plus \$100 per parking space.

Policies/Regulations

- *Parking tax reform* includes various tax policies that support parking management, including *commercial parking taxes* (a tax on parking rental transactions) and *per-space parking levies* (a special property tax applied to parking facilities).
- *Improve Enforcement and Control*—Ensure that parking regulation enforcement is efficient, considerate, and fair.
- *Address spillover parking*—Use management, enforcement and pricing to address spillover problems, such as undesirable use of nearby parking facilities.

- *Parking requirements*—Reduce or eliminate requirements for minimum number of parking spaces at new development; establish parking caps for new development.
- *Charging facilities*—If plug-in hybrid vehicles become a significant part of the fleet mix, government owned parking facilities would offer charging stations.

Goals:

- By 2010, establish a state program to encourage local governments to voluntarily revise parking policies in accordance with the actions outlined above.
- By 2010, state lead by example by adopting parking incentives to encourage mode shift (as outlined above) for state-owned parking facilities.

Timing: As described above

Parties Involved: Local governments, public and private sector businesses, developers.

Implementation Mechanisms

Parking pricing in most instances does not require a vote of the people. Code changes often require public meetings to be held to adopt/revise ordinances, giving the public the opportunity to provide input. Parking policies should primarily be customer oriented— not revenue- or violator-oriented.

A phased implementation strategy is recommended. Depending on the parking supply already available, local governments may skip some of the steps if they have already been incorporated as part of an integrated parking management and transportation plan.

Zoning Code Changes—Most municipal codes require developers and employers to provide a certain number of parking spaces for every built square foot of space, or for a certain number of employees or customers at the site. Local governments can amend parking requirements to limit, rather than require a minimum number of parking spaces per floor area or employee. This approach encourages development density, preserves land for other uses, and makes it easier for employers to adopt parking mgmt programs to reduce the demand for driving.

Shared Parking Facilities—Shared parking facilities serve multiple users or destinations. This is most successful if destinations have different peak periods. Developers could be charged “in lieu fees” to help fund public parking facilities instead of providing private facilities that serve a single destination. This tends to be more cost-effective and efficient. It can be mandated or optional.

Unbundle Parking—Unbundling means that parking is rented or sold separately, rather than automatically included with building space. This is more equitable and efficient, since occupants only pay for parking they need. Location-efficient mortgages can incorporate unbundled parking.

Smart Growth (see TLU-1)—A general term for development policies that result in more efficient transportation and land use patterns, by creating more compact, development with multi-modal transportation systems. These land use patterns, in turn, tend to reduce vehicle ownership and use, and so reduce parking requirements. They allow more sharing of parking

facilities, shifts to alternative modes, and various types of parking pricing. Effective parking management is a key component of smart growth.

Congestion Parking Pricing—Local municipalities can charge more during peak driving hours for on-street parking using advanced parking meters. This encourages drivers with flexibility to drive during less congested hours, spreading parking demand more evenly throughout the day, and reducing local traffic congestion.

Parking Tax Reform—Parking tax reform includes tax policies that support parking management, including commercial parking taxes on parking rental transactions and per-space parking levies applied to parking facilities. These can help reduce parking supply and increase parking prices, as well as providing revenues for public programs.

Improve Enforcement and Control—Improving enforcement and control supports parking management by increasing regulatory and pricing effectiveness. As parking management activities expand, so too should enforcement activities. Occasional “amnesty” notices should be part of any enforcement program. Parking policies should primarily be customer oriented—not revenue or violator oriented.

Improve User Information and Marketing—Provides information to travelers about parking availability, regulations, price, and about travel options, such as walking, ridesharing and transit. User information can be provided by signs, maps, brochures, Web sites, and electronic guidance systems.

Financial Incentives—Travelers (mainly commuters) are offered financial benefits for reducing their automobile trips; basically the benefits represent the cost savings that result from reduced parking demand. *Parking cash-out* means that commuters who are offered subsidized parking can choose cash instead. Another incentive is to provide *discounted* or *preferential parking* for carpool/vanpool vehicles. In urban areas commuters tend to shift to walking and transit. In suburban areas they tend to shift to cycling and ridesharing.

Related Policies/Programs in Place

No related Colorado policies or programs were identified. California has a parking cash-out law that requires employers with 50 or more employees who provide free or subsidized parking on leased spaces (with a few exceptions) to offer a parking cash-out option. The law has been effective since 1998.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.03	0.03	MMtCO ₂ e
Net present value (2006–2020)		–\$40	\$ Million
Cumulative emissions reductions (2006–2020)		0.34	MMtCO ₂ e
Cost-effectiveness		–\$110	\$/MtCO ₂ e

Data Sources:

Parking cash-out

- Employees by firm size: County Business Patterns 2005
- The number of parking spaces subject to the regulation is estimated using the national percentage of employees with access to free parking (Donald Shoup, “Congress Okays Cash Out,” Access Fall 1998 No. 13) and the percentage of free parking spaces that are leased rather than owned by employers (California Legislative Analyst’s Office, “Extra Cash or Free Parking,” 2002).
- Average monthly parking cost in Denver: Downtown Denver 2006 Parking Inventory
- Average monthly parking cost in Boulder:
http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=3546&Itemid=1273

Parking surcharge

- Parking inventories for Boulder and Denver¹⁴

Quantification Methods:

Parking cash-out

- We modeled the program after California’s parking cash-out law, which requires employers with 50 or more employees that provide free parking on leased spaces to provide a cash-out program. (Employers who own their parking facilities can also voluntarily join the program, but these are not included in the quantification.)
- We used the EPA’s Commuter model to assess the impact of an employer parking cash-out program on light-duty VMT. Major inputs include the number of affected employees (36,000 in Denver and 11,100 in Boulder) and the amount of the parking subsidy (\$5.90/day in Denver and \$3.10/day in Boulder).

Parking surcharge

- We estimated the total number of public parking spaces in downtown Denver, Boulder, Fort Collins, and Colorado Springs based on data from Denver and Boulder.
- Reduction in VMT = No. of parking spaces × vehicles per space per day × average vehicle round trip length × increase in parking charge × elasticity of demand

In terms of cost, we consider only the first order costs and benefits of the two policies. For the parking cash out program, there is a simple transfer of cash from employers to employees. Employers save some money on taxes as a result, but also incur some administrative fees. Total cost to employers is about \$30/ton. Total cost to employees is about -\$140/ton.¹⁵ We did not consider the foregone state and federal tax revenue. The net cost of the parking surcharge is

¹⁴ Downtown Denver 2006 Parking Inventory ; City of Boulder Parking Best Practices Review, Final Report, Nov. 7 2005

¹⁵ Calculated using the Best Workplaces for Commuters Business Savings Calculator.
<http://www.bwc.gov/resource/calc.htm>

effectively zero. A surcharge represents an additional cost to drivers, which is offset by additional local government revenue.

Key Assumptions:

Parking cash-out

- The parking cash-out program applies to employers with 50 or more employees that provide free parking on leased spaces.
- Results presented are based on implementation in downtown Denver and Boulder only. The amount of employer subsidized leased spaces in other cities is presumed to be negligible.

Parking surcharge

- A parking surcharge of 10% goes into effect in 2010.
- Each parking space accommodates an average of 2 vehicles per day, with an average round-trip length of 21 miles.
- We assume an elasticity of -0.2 . Vaca and Kuzmyak (2005)¹⁶ found that the price elasticity of vehicle travel with respect to parking pricing ranges from -0.1 to -0.3 (meaning that a 10% increase in parking price would typically be expected to reduce vehicle trips by 1%–3%, depending on the location, availability of transit and HOV options, and demographics).

Key Uncertainties

This policy depends on implementation by local governments.

Additional Benefits and Costs

Any reduction in miles driven results in a net savings to drivers, due to savings on gas and vehicle maintenance. The value of this benefit is in the range of \$600 per ton of GHGs.

Feasibility Issues

None identified.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

¹⁶ Vaca and Kuzmyak, 2005. “Parking Pricing and Fees” Chapter 13, TCRP Report 95, Traveler Response to Transportation System Changes, Transit Cooperative Research Program, Transportation Research Board.

TLU-10. Commuter Benefits Programs

Policy Description

Employers can significantly reduce automobile travel by their employees when they offer commuter benefits programs. Such programs often include free or low cost transit passes, strong telework programs, carpooling matching and vanpool subsidies, guaranteed ride home services, parking cash-out, amenities for bicyclists, and other benefits. State and local government agencies can offer these programs to their employees and can encourage private employers to offer such programs. The state can also require that large employers to participate in an employee trip reduction program.

Policy Design

The ultimate goal of this policy is to shift commuters from single-occupancy vehicles (SOVs) to alternative modes of transportation. Commuter benefits programs should be part of a larger Colorado Corporate Climate Challenge, which would tie in with the Residential, Commercial, and Industrial (RCI) sector program(s) to also encourage energy conservation and minimize waste. It could be a stand-alone program or serve as a menu item in the Corporate Climate Challenge.

- Ensure employer support and participation.
- Have state commit \$10M dollars to the program by 2010 (possible funding through creation of Clean Energy Fund, if approved in 2007).
- Commuters can only shift to modes other than driving alone to the extent that other modes are available, practical, and convenient. There is a need for dedicated funding to support infrastructure for walking, biking, transit, and rideshares, among other options. The Colorado Transportation Finance and Implementation Panel (“blue ribbon panel”) is currently exploring funding options for Colorado’s transportation system. Encourage the panel to dedicate funding for alternative modes.

Goals: By 2010, all employers in Colorado served by a transportation authority or district with more than 100 employees will offer a commuter benefits program. To reach this over-all goal:

- By 2010, 300 employers in Colorado will participate in the national Best Workplaces for Commuters program. (Currently, approximately 160 Colorado employers participate.)
- By 2010, all state agencies, all colleges and universities, and all local governments (over 100 employees) who are served by a transportation authority or district will offer a commuter benefits program with benefits no less than those established for the national Best Workplaces for Commuters program.
- By 2010, the state would adopt an employee trip reduction act and require that employers with more than 100 workers (per location) participate in an employee trip reduction program.

Timing: Full implementation by 2010. 2008 for legislation for a potential vote in 2008 or 2009 to be effective sometime in 2010.

Parties Involved: CDOT, MPOs, municipalities, regional transportation districts or authorities, employers, state legislature.

Implementation Mechanisms

Issuance of an executive order mandating that all state agencies, state universities, and local governments with greater than 100 employees in one location implement a commuter benefits program meeting the Best Workplace for Commuters National Standard of Excellence (www.bwc.gov).

Drafting of a State Bill mandating that all private employers and private colleges/universities with more than 100 employees in one location and served by a transportation authority implement a commuter benefits program meeting the Best Workplace for Commuters National Standard of Excellence.

Scoping of a guidance document for how program funds will be distributed as incentives to state agencies, local governments, colleges/universities, and private employers.

The policy could also be implemented as part of a cross-cutting corporate climate challenge for the State of Colorado. This would involve developing specific benchmarks for single-occupancy vehicle trip reduction as well as benchmarks in other sectors. Tax incentives could be given to private entities that earn points by meeting reduction goals across sectors. The initial corporate climate challenge participation could require conducting a GHG inventory and registering with the multistate climate registry that will begin in Colorado in 2008 (www.theclimateregistry.org). The corporate climate challenge participation could be either mandatory or voluntary for employers with more than 100 employees at one location and could be incentivized with program funds.

Related Policies/Programs in Place

The EPA’s Best Workplace for Commuters National Standard of Excellence (www.bwc.gov) provides guidance, standards, and resources for entities to develop commuter benefit programs.

Several states have implemented commuter benefits programs/ordinances: <http://www.nctr.usf.edu/clearinghouse/statestatutes.htm#AZTRO>

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	0.42	0.45	MMtCO ₂ e
Net present value (2006–2020)		–\$1,140	\$ Million
Cumulative emissions reductions (2006–2020)		4.77	MMtCO ₂ e
Cost-effectiveness		–\$240	\$/MtCO ₂ e

Data Sources:

- Number of employees affected: County Business Patterns 2005 and Current Employment Survey (Bureau of Labor Statistics), May 2007.
- Average daily VMT per employee: EPA's Commuter model

Quantification Methods:

- $\text{VMT reduction} = \text{affected employees} \times \text{average daily commute VMT} \times 250 \text{ days/year} \times -11.50\%$

We consider the first order costs and benefits of commuter benefits programs. Cost to employers includes any cash incentives to employees, as well as administrative costs and some small capital costs. Employers save money on parking facilities and, in the case of telecommuter incentives, on office space. The net cost to employers is around $-\$100/\text{ton}$ for the scenarios considered. Cost to employees is simply the value of cash incentives. The average was $-\$140$ per ton. We did not consider any foregone state and federal tax revenue.¹⁷

Key Assumptions:

- Average reduction in employee VMT by employers participating in the Best Workplaces for Commuters program is 11.5%. (Assumption based on average results of several possible program configurations, as determined by EPA's Commuter model.)
- All commercial establishments with 100 or more employees will provide benefits that meet the Best Workplaces for Commuters standards.
- All state and federal agencies as well as the local governments of Denver, Boulder, Fort Collins, and Colorado Springs will provide benefits that meet the Best Workplaces for Commuters standards.

Key Uncertainties

If no state-level requirement is adopted, this option depends on the voluntary actions of private companies.

Additional Benefits and Costs

Any reduction in miles driven results in a net savings to drivers, due to savings on gas and vehicle maintenance. The value of this benefit is in the range of $\$600$ per ton of GHGs.

Feasibility Issues

- Can the State of Colorado mandate the implementation of Best Workplace for Commuter programs for all state agencies and local governments?
- How can Colorado get large employers to participate and buy-in to the program? Should the program be mandated or voluntary?

¹⁷ Calculated using the Best Workplaces for Commuters Business Savings Calculator.

<http://www.bwc.gov/resource/calc.htm>

- Should the commuter benefit program be instituted as a stand-alone program or as part of a larger Colorado Corporate Climate Challenge?
- How should limited program funds be distributed as incentives to all potential participants?

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.

TLU-11. Driver and Consumer Education

Policy Description

Education is the first step to successful implementation. Drivers will voluntarily reduce fuel use and GHG emissions from their activities when they have the information necessary to make proper decisions.

The option would involve development and implementation of a curriculum that addresses the limiting of GHGs in transportation through

- Improved vehicle maintenance—regular vehicle tune-ups, fuel efficient tires, coolest temperature fueling, and use of tire pressure monitoring systems;
- Improved vehicle operation—turn off vehicle while parked, observe speed limits, eliminate jack-rabbit starts;
- Improved transportation choice—low-GHG emitting vehicles, right-size vehicle, carpooling use of alternative fuels, walking, biking, telecommuting, or mass transit.

This curriculum would be a requirement for all driver training programs with questions pertinent to training included on the written/driving portion of private and commercial driver licensing tests. (There are currently driver training programs in Utah and Arizona incorporating this type of curriculum in classroom settings.) In addition, programs including this curriculum are to be mandated for both state and municipal fleet operators. All GHG saving application methods included in the curriculum would be enforced at state and municipality fleet levels. In the interest of time and expense, it is recommended that existing curriculum from such entities as DOE or National Energy Foundation be examined for application and modified as needed.

This option would also involve a state marketing program for fuel efficient replacement tires and energy efficient driving practices and devices, and training for state and municipal fleet operators.

Policy Design

Goals:

- Reduce transportation GHG emissions through education to promote intelligent transportation purchasing choices and vehicle operation.
- Consumer information program would begin in 2008, with program expansion as resources are made available.
- By 2009, the State or appropriate agency would develop a marketing program for fuel efficient replacement tires and energy efficient driving practices and devices (including tire pressure monitoring systems).
- By 2010, the State or appropriate agency would ensure that a training be delivered for all state and municipal fleet operators.

- By 2010, private and commercial driver licensing tests would be modified to incorporate information about fuel saving driving practices.

Timing: See above.

Parties Involved: Driver training programs; Department of Motor Vehicles (DMV); State, commercial, and municipal fleets

Implementation Mechanisms

It is recommended to solicit help for curriculum development by such nonprofit organizations as Colorado’s Clean Cities Coalitions, American Lung Association, and Colorado Energy Science. US DOE Grant funding may be available to aid in the development. Once developed, the information can be disseminated throughout state driver training programs, both private and public. It can be delivered to all State fleet groups and can be used by DMV to select pertinent questions for license testing.

Related Policies/Programs in Place

At present, there is curriculum being delivered in High School Driver Training Programs at Amphitheater School District in Tucson, Arizona with contact there Marc Lappitt and at Jordan School District in Salt Lake County, Utah with contact being Jim Hinckle.

Type(s) of GHG Reductions

Net reduction in CO₂ emissions.

Estimated GHG Savings and Costs per MtCO₂e

	2012	2020	Units
GHG emission savings	Not quantified	Not quantified	MMtCO ₂ e
Net present value (2006–2020)		Not quantified	\$ Million
Cumulative emissions reductions (2006–2020)		Not quantified	MMtCO ₂ e
Cost-effectiveness		Not quantified	\$/MtCO ₂ e

Data Sources: Not applicable.

Quantification Methods: Not quantified.

Key Assumptions: Not applicable.

Key Uncertainties

None.

Additional Benefits and Costs

Maintaining proper tire pressure provides operating cost savings to vehicle owners, as well as safety benefits.

Feasibility Issues

None.

Status of Group Approval

Completed.

Level of Group Support

Unanimous consent of those CAP members present and voting.

Barriers to Consensus

None.