Chapter 5
Transportation and Land Use Sectors

Overview of Greenhouse Gas Emissions

The transportation sector, which includes light- and heavy-duty (on-road) vehicles, aircraft, rail engines, and marine engines, is one of the largest contributors of gross greenhouse gas (GHG) emissions in Iowa. This sector accounted for 17% of Iowa's gross GHG emissions in 2005, which was slightly under the national average of 27%. However, by 2025, the share of emissions associated with the transportation sector is anticipated to increase slightly to 20%.

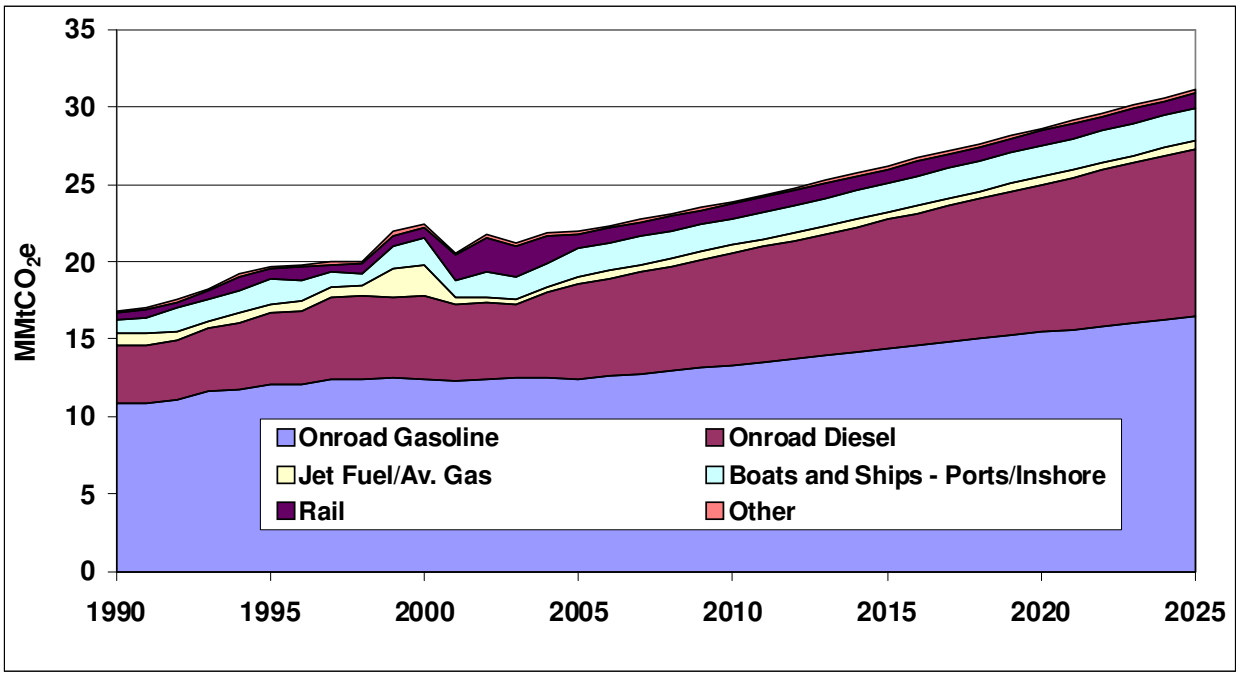
From 1990 to 2005, Iowa's GHG emissions from transportation fuel use have risen steadily at an average rate of about 1.4% annually. The GHG emissions associated with Iowa's transportation sector also rose accordingly, increasing by 3.8 million metric tons of carbon dioxide equivalent ($MMtCO_2e$) emissions during the same time period from about 17 $MMtCO_2e$ to nearly 21 $MMtCO_2e$. If left unabated, this number is expected to increase by nearly 30%, to 29.4 $MMtCO_2e$ by 2025.

Carbon dioxide (CO_2) accounts for about 98% of transportation GHG emissions, with most of the remaining GHG emissions coming from nitrous oxide (N_2O) emissions from gasoline engines. Emissions released from on-road gasoline consumption account for approximately 57% of the transportation sector's GHG emissions. This has historically been the largest share of transportation GHG emissions, and this trend is forecast to continue.

Figure 5-1 shows historic and projected transportation GHG emissions by fuel and source. As a result of Iowa's population and economic growth and an increase in total vehicle miles traveled (VMT), GHG emissions from on-road gasoline consumption increased by about 14% between 1990 and 2005 and accounted for 63% of the total transportation emissions in 2005. Meanwhile, GHG emissions from on-road diesel fuel consumption rose by 44% during that period, accounting for 28% of GHG emissions from the transportation sector in 2005, suggesting an even more rapid growth in freight movement within or across the state.

In the absence of significant increases in vehicle fuel economy, a significant reduction in VMT, or technological breakthroughs in low-carbon fuels, on-road gasoline and diesel emissions are expected to continue to grow. GHG emissions from on-road gasoline consumption are projected to increase by about 33%, and GHG emissions from on-road diesel consumption are expected to increase by 75% between 2005 and 2025. The consumption of these fuels will significantly contribute to the projected 42% increase in overall GHG emission levels for the entire state of Iowa over 2005 levels by 2025.

Figure 5-1. Transportation GHG emissions by fuel source, 1990–2020



$MMtCO_2e$ - million metric tons of carbon dioxide equivalent; av. gas = aviation gas.

Key Challenges and Opportunities

Iowa has substantial opportunities to reduce transportation emissions. The principal means to reduce emissions from transportation and land use (TLU) are:

- Improving vehicle fuel efficiency,
- Substituting gasoline and diesel with lower-emission fuels, and
- Reducing total VMT.

In Iowa 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. Automobile manufacturers typically oppose dramatic increases in fuel economy. Key points of contention include the cost to manufacturers and cost to consumers. Even with the adoption of the new federal corporate average fuel economy (CAFE) requirements, there may still be opportunities for further increases in fuel efficiency while maintaining vehicle size and performance.

The use of fuels with lower per-mile GHG emissions is growing in Iowa, and larger market penetration is possible. Conventional gasoline- and diesel-fueled vehicles can use low-level blends of biofuels. Alternative-technology vehicles can also use higher-level blends of biofuels, as well as other types of alternative fuels, such as natural gas and hydrogen. The type of fuel used is a crucial determinant of impact on emissions, as some alternative fuels have relatively little GHG benefit. Currently, the most prevalent biofuel in Iowa is corn-based ethanol, which

has a GHG benefit of 15.9% from a life-cycle perspective.[1] Key determinants of impact will be the development and deployment of fuel types. At present, fuel distribution infrastructure is a constraining factor.

Reducing VMT is crucial to mitigating GHG emissions from transportation. Developing smarter land-use and transportation development patterns that reduce trip length and support transit, ride sharing, biking, and walking can contribute substantially to this goal. A variety of pricing polices and incentive packages can also help to reduce VMT. Developing better planning methods and regulations, and increasing funding of multiple modes of transportation will be key components in achieving these goals.

Overview of Policy Options and Estimated Impacts

The Iowa Climate Change Advisory Council (ICCAC) selected a set of 11 policies for the TLU sector that offer the potential for major economic benefits and emission savings. Implementing these policy options could lead to emission reductions of:

- 11.14 $MMtCO_2e$ per year by 2020, and
- 55.03 $MMtCO_2e$ cumulative from 2009 through 2020.

The weighted-average cost effectiveness of the selected policies is about -$59/$tCO_2e$. This average value includes policies that have both much lower and much higher likely costs per ton. One option, the cost of which particularly skews the numbers, is TLU-4, "Support Passenger Rail Service in Iowa." This policy option has an identified cost per ton of $597/$tCO_2e$ which is largely driven by high up-front capital costs associated with the development of new rail lines. It should be noted that by 2024 the cumulative ridership benefits are anticipated to outstrip these costs and this policy option will have a negative cost per ton beyond 2024.

The estimated impacts of the individual policy options are shown in Table 5-1. The ICCAC policy options are described briefly here and in more detail in Appendix H of this report. The options not only result in significant emission reductions, but offer a host of additional benefits as well. These benefits include reduced local air pollution; more livable, healthier communities; and economic development and job growth from the development of transit and rail, smart growth developments, and in-state biofuel production. To yield the levels of savings described here, these policies need to be implemented in a timely, aggressive, and thorough manner.

Some policy options focus on reducing VMT by further developing other modes of transportation, such as transit (TLU-1a) and passenger rail (TLU-4). Other VMT reduction strategies include implementing programs to eliminate or make commuting more efficient by improving pedestrian, bicycling, and carpooling options or placing work centers within established communities (TLU-5a, TLU-5b). Further rail development and implementing new freight strategies can also significantly reduce VMT associated with freight transportation (TLU-9). Another way to reduce VMT is to develop denser, mixed-use communities where the need

[1] Biofuels analysis was based on information from the Argonne National Laboratory's GREET model, version 1.8, which indicates a life-cycle emission reduction of 15.9% for E85 corn ethanol. See Appendix H for more details on assumed reduction factors for various types of biofuels.

for long commutes becomes significantly reduced and transit can be easily implemented (TLU-1). All of the above mentioned policy options help to reduce GHG emissions by moving people and freight more efficiently and providing other options for people and freight to reach their destinations.

Qualitative policies (policy options that are nonquantifiable) are an important component of the combined policies, but because they are not quantified, these options are not reflected in the GHG emission reductions or costs. These options focus on establishing a reliable source of capital funding for transportation related GHG reduction policies (TLU-2) and developing a distributed workplace model where smaller work centers are located in communities, thereby reducing VMT (TLU-5b). While the implementation of these options may contribute to significant GHG emission reductions, the immediate impact of these policies individually is not quantifiable.

Further developing the efficiency of vehicles can also have a major impact on reducing GHG emissions. TLU-6 focuses on providing incentives such as feebates, tax credits for low GHG vehicles, and operating incentives for low GHG vehicles to promote the purchase and operation of more efficient vehicles. Increased utilization of these low GHG emission vehicles can significantly impact overall GHG emissions associated with light-duty vehicle VMT. Working in concert with TLU-6, TLU-8 promotes the development of fuel efficient vehicles by promoting increased fuel economy standards through the adoption of a State Clear Car Program. TLU-7 aims at increasing vehicle efficiency by impacting consumer choice through educating consumers about vehicle maintenance and operation techniques and encouraging the use of fuel efficient tires.

Iowa can achieve greater alternative fuel use while simultaneously reducing GHG emissions by putting in place a low-carbon fuel standard (TLU-10). Such a policy option ensures that fuel sold in Iowa would meet, on average, a declining standard for GHG emissions measured in CO2 equivalent per unit of fuel energy.

Table 5-1. Summary list of TLU policy options

No.	Policy Options	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2020 (Million $)	Cost-Effectiveness ($/tCO$_2$e)	Level of Support
		2012	2020	Total 2009–2020			
TLU-1	Smart Growth Bundle with Transit	0.076	0.242	1.53	-$377	-$245	Unanimous
TLU-1a	Expand and Improve Transit Infrastructure	0.004	0.026	0.127	$7.2	+$57	Supermajority
TLU-2	GHG Impacts for State and Local Capital Funding	*Quantified as part of TLU-1 and TLU-1a*					Unanimous
TLU-4	Support Passenger Rail Service in Iowa	N/A	0.008	0.026	$15	+$597	Majority
TLU-5a	Adopt Best Workplaces for Commuters in Iowa	0.02	0.02	0.21	$18	$84	Supermajority
TLU-5b	Distributed Workplace Models	*Non-quantified, qualitative option*					Unanimous
TLU-6	Light Duty Vehicles Fuel Efficiency Incentives	0.44	3.65	17.70	NQ	NQ	Supermajority
TLU-7	Fuel Efficient Operations for	0.11	0.65	3.41	-$306.9	-$90	Unanimous

No.	Policy Options	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2020 (Million $)	Cost-Effectiveness ($/tCO_2e$)	Level of Support
		2012	2020	Total 2009–2020			
	Light Duty Vehicles						
TLU-8	New Vehicle Standards (Tailpipe GHG and Fuel Economy)	N/A	0.8	4.1	-$246	-$60	Unanimous
TLU-9	Freight Strategies (Truck and Rail)	0.39	0.63	5.9	$30	+$5	Supermajority
TLU-10	Fuel Strategies (20% Low Carbon Fuel Standard)	0.60	5.11	22.03	-$1,359	-$62	Unanimous
	Sector Total After Adjusting for Overlaps and Synergies	**1.64**	**11.14**	**55.03***	**-$2,218.50**	**-$59**	
	Reductions From Recent Actions (Federal CAFE Requirements)	**0.26**	**1.93**	**9.39**	***Not Quantified***		
	Sector Total Plus Recent Actions	**1.9 (8.3)**	**13.07 (48)**	**64.42**	**N/A**	**N/A**	

CAFE = corporate average fuel economy; GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; N/A = not applicable

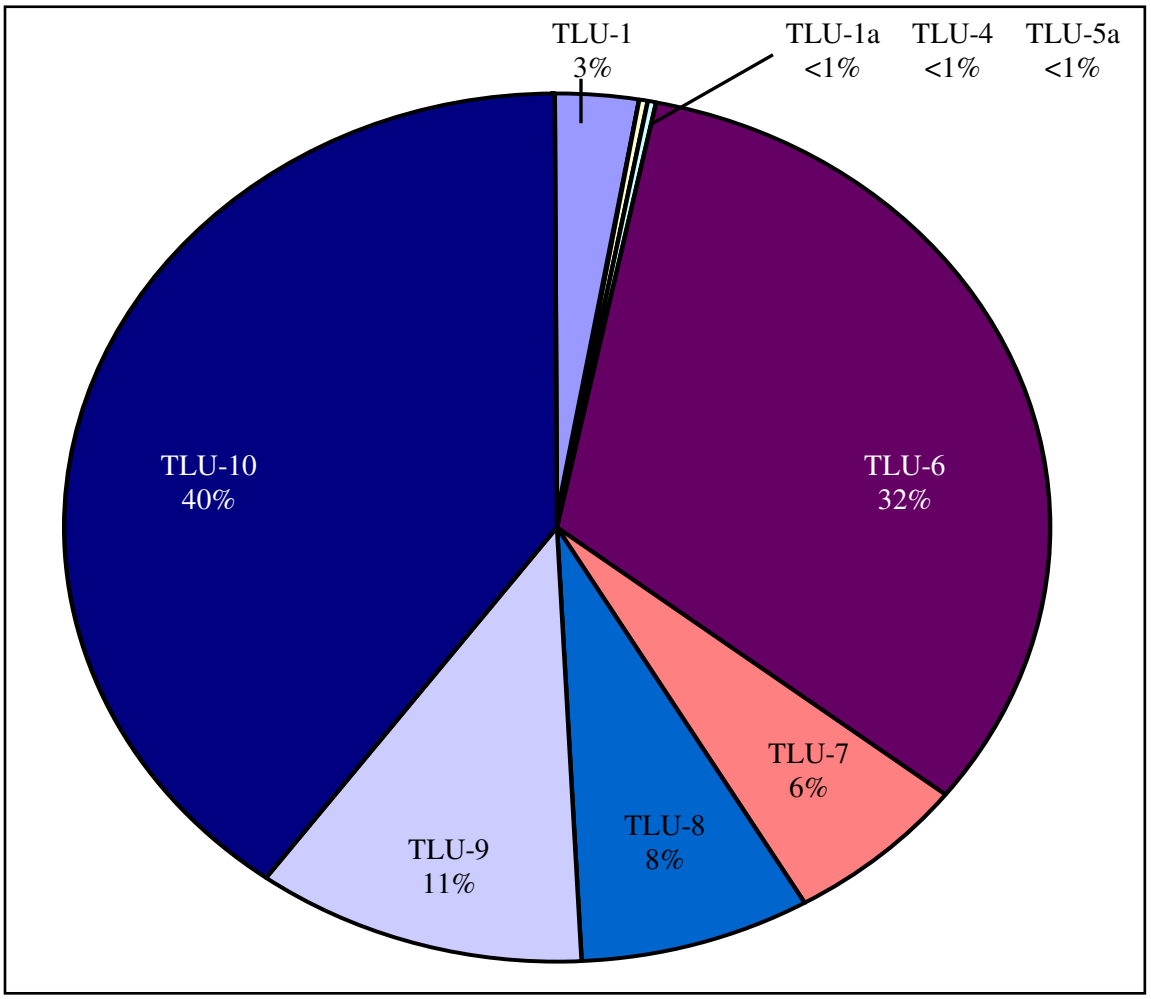
Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings.

The numbering used to denote the above policy options is for reference purposes only; it does not reflect prioritization among these important policy options.

Deduct total TLU-6 2009-2020 reductions [17.7MMt] from 55.03 total = 37.3, before calculating cost/ton for TLU Options.

Figure 5-2 shows the breakdown of the projected impacts of the TLU policies selected for further development, taken together, in terms of avoided GHG emissions. For the TLU policies developed by the ICCAC to yield the levels of savings described here, the policies must be implemented in a timely, aggressive, and thorough manner. This means, for example, not only putting the policies themselves in place, but also attending to the development of supporting policies that are needed to help make these TLU policies effective. While their adoption can result in considerable benefits to Iowa's environment and consumers, careful, comprehensive, and detailed planning and implementation, as well as consistent support of these policies will be required if these benefits are to be achieved.

Figure 5-2. Aggregate GHG Emission Reductions, 2009–2020



Transportation and Land Use Sectors
Policy Descriptions

The policy options described briefly here not only result in significant emission reductions but also offer a host of additional benefits, such as reduced local air pollution; more livable, healthier communities; and increased transportation choices. A more thorough description of these policy options along with their goals, implementation strategies, and other details is available in Appendix H.

TLU-1. Smart Growth Bundle with Transit

This policy option calls for incentives and programs to encourage smart growth, including downtown revitalization, transit-oriented development, and enhancing the pedestrian and bicycle infrastructure, thereby reducing VMT. Current land-use development practices increase vehicle travel by dispersing destinations, which separates activities and favors automobile travel over alternative modes. "Smart growth" planning by local, regional, and state governments refers to development that reduces sprawl and maximizes environmental, fiscal, and economic resources. Under this policy option, Iowa would encourage, facilitate, and undertake a set of smart growth activities related to the following initiatives: downtown revitalization including infill and brownfield redevelopment, transit-oriented development, smart growth planning, the development of pedestrian and bicycle infrastructure, growth management planning, and the reformation of local zoning, tax, and building codes. Additionally, this policy option would provide both technical and financial support to local and regional agencies.

TLU-1a. Expand & Improve Transit Infrastructure

The goal of this policy option is to achieve an annual ridership increase of 100% by the year 2020, to be measured on a per capita basis. This will be achieved by making improvements to existing transit service, such as increasing service frequency, offering more forms of transit, improving the quality of service, promoting ridesharing activities, and reducing travel times on selected transit routes. Additionally fare reductions, employer subsidies, and state incentives may all be offered to assist in increasing ridership. This policy option will shift passenger transportation from single-occupant vehicles to public transit, thereby reducing GHG emissions.

Additional funding will be provided by increasing state financing to at least 25% for transit systems across the state with increasing ridership or the ability to document VMT-reducing strategies. State legislation will also be proposed to enable new transportation-related fees, generated solely by users in a regional area, to be allocated directly to RTAs for VMT-reducing services.

TLU-2. GHG Impacts for State and Local Capital Funding (to be a model for climate-friendly development patterns)

The focus of this policy option is to ensure that state and local capital funding programs for the development, siting, and expansion of state facilities as well as funding used for community development, is utilized to promote policies and facilities that support GHG emission reductions. This includes making state and local government buildings location-efficient with compact development design, and ensuring that capital funding for infrastructure and funding for community development goes towards policies and development that promotes GHG reductions. Programs such as "complete streets", smart growth development, and the development or enhancement of transit are all identified as projects that support GHG emission reductions and for which funding associated with this policy option could be dedicated.

TLU-4. Support Passenger Rail Service In Iowa

This policy option will focus on reducing single occupant vehicle travel by establishing and promoting a statewide passenger rail system in Iowa to supplement existing long-distance service. This rail system will include regional rail service from Dubuque to Chicago and between Omaha and Chicago with stops in Des Moines, Iowa City / Cedar Rapids, and the Quad Cities. A key to the success of this statewide passenger rail system will be in providing connections to other modes of transportation.

TLU-5a. Adopt Best Workplaces for Commuters in Iowa

This policy option focuses on reducing the VMT associated with commuters traveling to and from work. By making the daily commute more efficient or possibly eliminating the need for commuting to work, this policy reduces GHG emissions by reducing VMT. Promoting strategies such as telecommuting, carpooling, and vanpooling, and the use of alternative modes of transportation such as transit, bicycling, and walking to work this policy can be very effective at reducing VMT and roadway congestion during the peak commuting hours. The success of this policy option would depend upon buy-in from employers.

TLU-5b. Distributed Workplace Model

This policy option focuses on the commuting patterns of Iowa's knowledge-based workforce. The Distributed Workplace Model is a community work model that moves beyond the "work from home" methodology of telecommuting and remotely supporting employees, and instead provides community-based multi-location work centers that will enhance access for both employers and employees. These work centers will accommodate a cluster of employees working for multiple employers, thereby reducing VMT associated with the commute to work.

TLU-6. Light-Duty Vehicle Fuel Efficiency Incentives

This policy option focuses on reducing GHG emissions within Iowa by improving the fuel economy of the light duty vehicle fleet by providing incentives such as feebates, tax credits for low-GHG vehicles, operating incentives for low-GHG vehicles, and vehicle registration fees which are reduced for low-emission vehicles and increased for high-emission vehicles. The goal of this policy would be to increase the fuel economy of the light duty vehicle fleet in Iowa by 20% by 2012, 100% by 2020, and 250% of more by 2050. This policy option would need to pass through the legislative process and implemented by state and local government agencies in partnership with the affected parties.

This policy option assumes no direct correlation between fuel economy and GHG emission efficiency. Although it is likely that an increase in fuel economy will result in reduced GHG emissions, the amount of this decrease or potential increase is dependent upon the carbon content and energy content of the fuel.

TLU-7a. Fuel Efficient Operations for Light-Duty Vehicles

This policy option focuses on improving the efficiency of light-duty vehicles by increasing the utilization of simple add on devices such as fuel efficient tires, and providing education on how to efficiently operate and maintain light duty vehicles. Maintenance tips would include items such as keeping tires properly inflated and regularly changing oil and air filters.

TLU-8. New Vehicle Standards for Increased Fuel Economy and Reduced Greenhouse Gas Emissions

This policy option promotes the development of a state clean car program. This program would go beyond the current federal CAFÉ emissions standards for cars and light trucks and would come from the "Tier 2" state clean car standards expected to be proposed in the near future under the federal Clean Air Act. The goals of this program would be to improve fuel economy by 20% by 2012, 100% by 2020, and 250% or more by 2050.

TLU-9. Freight Strategies (Truck and Rail)

This policy option proposes reducing Iowa's overall GHG emissions generated by freight movement through a combination of identifying actions to support efficient freight movement, removing both physical and operational bottlenecks, encouraging railroad capital investment, and providing incentives for trucking companies to invest in hybrid technology.

TLU-10. Fuel Strategies: Low-Carbon Fuel Standard (20% Reduction)

This policy option seeks to reduce GHG emissions by decreasing the carbon intensity of vehicles fuels sold in Iowa. By setting a Low Carbon Fuel Standard (LCFS), all fuel providers in Iowa would be required to ensure the mix of fuel they sell into the Iowa market meets, on average, a

declining standard for GHG emissions measured in CO2 equivalent per unit of fuel energy. This policy option does not specify any particular fuel or vehicle technology, leaving the door open to both current technology and future advances in the development of law-carbon fuels. The creation in Iowa of a LCFS will compliment the Federal Renewable Fuel Standard (RFS) creating additional demand of Iowa's renewable fuels across the country and increasing exports of Iowa's renewable fuels across the country as other states begin formalizing their own state standards for renewable fuels and GHG controls.