

Chapter 6

Transportation and Land Use Sectors

Overview of Greenhouse Gas Emissions

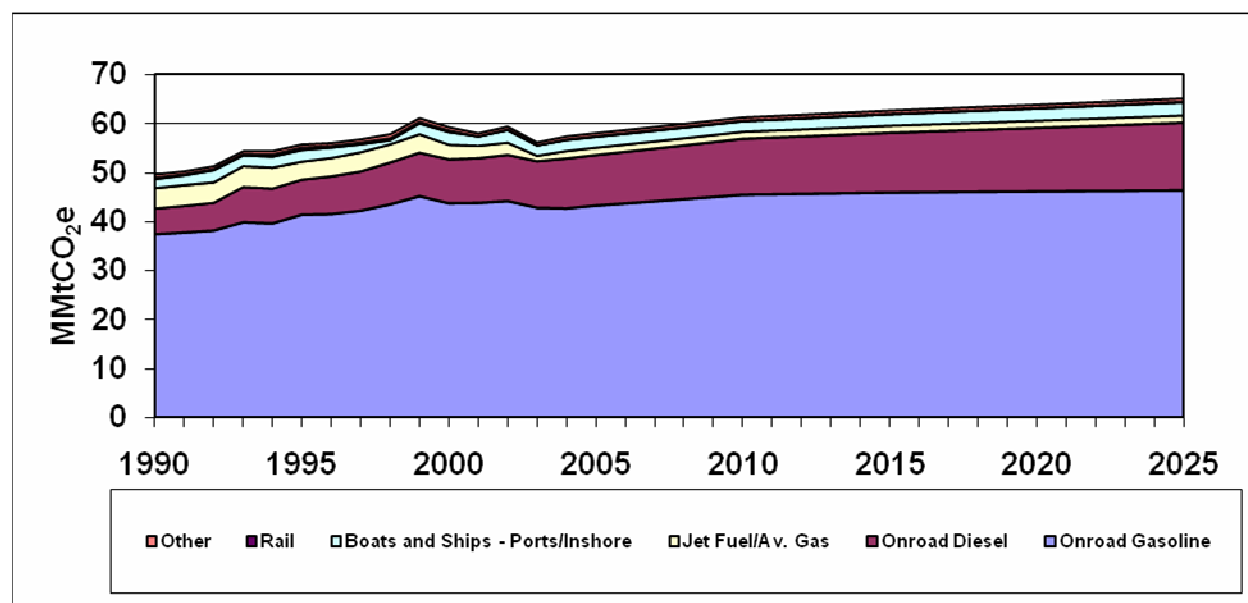
The transportation sector, which includes light- and heavy-duty (on-road) vehicles, aircraft, rail engines, and marine engines, is one of the largest contributors of gross greenhouse gas (GHG) emissions in Michigan. This sector accounted for 24% of Michigan's gross GHG emissions in 2005, which was slightly under the national average of 27%. By 2025, the share of emissions associated with the transportation sector is anticipated to decrease slightly to 22%, primarily due to low growth in the number of vehicle miles traveled (VMT) and the more stringent fuel economy standards of the Energy Independence and Security Act.

From 1990 to 2005, Michigan's GHG emissions from transportation fuel use have risen steadily at an average rate of about 1.1% annually. The GHG emissions associated with Michigan's transportation sector also rose accordingly, increasing by 8 million metric tons of carbon dioxide equivalent (MMtCO_{2e}) emissions during the same time period from about 50 MMtCO_{2e} to 58 MMtCO_{2e}.

Carbon dioxide (CO₂) accounts for about 98% of transportation GHG emissions, with most of the remaining transport-related GHG emissions coming from nitrous oxide (N₂O) emissions from gasoline engines. Emissions released from on-road gasoline consumption account for approximately 74% 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 6-1 shows historic and projected transportation GHG emissions by fuel and source. As a result of an increase in total vehicle miles traveled (VMT), on-road gasoline consumption increased by about 16% between 1990 and 2005. Meanwhile, on-road diesel fuel consumption rose by 96% during that period, accounting for 18% of GHG emissions from the transportation sector in 2005, suggesting an even more rapid growth in freight movement within or across the state.

Growth in VMT is expected to be very low in Michigan, primarily due to limited economic and population growth in the future. GHG emissions from on-road gasoline consumption are projected to increase by about 7%, and GHG emissions from on-road diesel consumption are expected to increase by 34% between 2005 and 2025. The consumption of these fuels will significantly contribute to the projected 12% increase in transportation emission levels for the entire state of Michigan over 2005 levels by 2025.

Figure 6-1. Transportation GHG emissions by fuel source, 1990–2025

MMtCO₂e - million metric tons of carbon dioxide equivalent; av. gas = aviation gas.

Key Challenges and Opportunities

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

- Improving vehicle operations efficiency,
- Replacing conventional gasoline and diesel with lower-emission fuels, and
- Reducing total VMT.

The use of fuels with lower per-mile GHG emissions is growing in Michigan, 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 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 Michigan is corn-based ethanol, which has minimal GHG benefit 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. Developing better planning

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 I for more details on assumed reduction factors for various types of biofuels.

methods and regulations, and increasing funding of multiple modes of transportation will be key components in achieving these goals.

Overview of Policy Recommendations and Estimated Impacts

The Michigan Climate Action Council (MCAC) recommends a set of 10 policies for the TLU sector that offer the potential for major economic benefits and emission savings. Implementing these policy recommendations could lead to emission reductions of:

- 10.5 MMtCO₂e per year by 2025, and
- 95.1 MMtCO₂e cumulative from 2009 through 2025.

The weighted-average cost effectiveness of the recommended policies is about $-\$36/\text{tCO}_2\text{e}$, representing a cost savings. This average value includes policies that have both much lower and much higher likely costs per ton.

The estimated impacts of the individual policies are shown in Table 6-1. The MCAC policy recommendations are described briefly here and in more detail in Appendix I of this report. The recommendations 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 in-state biofuel production. To yield the levels of savings described here, the recommended policies need to be implemented in a timely, aggressive, and thorough manner.

There are three complementary TLU policy options that serve to reduce single occupancy vehicle travel. Congestion mitigation (TLU-5) is designed to improve traffic flow and travel time via expanding the use of intelligent transportation systems. Land use planning and incentives (TLU-6) strategies include promoting and expanding regional growth management options that result in more compact, mixed-use, transit-oriented, walkable development as well as transportation system management and pricing that allows for greater investment in alternatives to the single occupancy vehicle, such as public transit. The transit and travel options of TLU-7 complement TLU-5 and TLU-6 by providing the increased public transit capacity and service improvements needed to achieve the aggressive statewide goals for increasing transit ridership as well as carpool and vanpool participation.

Two policy options recognize that Michigan can reduce GHG emissions in the transportation sector by encouraging more energy-efficient freight movement – (TLU-8) Increase Rail Capacity and Address Rail Freight System Bottlenecks, and (TLU-9) Great Lakes Shipping. These options seek to improve rail and marine infrastructure to take advantage of opportunities to move freight via the most efficient means of transport possible in the Midwest.

TLU-1 focuses on further developing biofuels and expanding the biofuels market can significantly reduce GHG emissions, while boosting the state's economy.

Table 6-1. Summary list of MCAC Transportation and Land Use (TLU) policy recommendations

Policy No.	Policy Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2009–2025 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total 2009–2025			
TLU-1	Promote Low-Carbon Fuel Use in Transportation	2.6	5.9	53	\$820	\$16	Unanimous
TLU-2	Eco-Driver Program	1.1	2.2	22	–\$3,921	–\$176	Unanimous
TLU-3	Truck Idling Policies	0.36	0.76	7.0	–\$596	–\$85	Unanimous
TLU-4	Advanced Vehicle Technology	0.01	0.03	0.19	\$281	\$1,458	Unanimous
TLU-5	Congestion Mitigation	0.08	0.18	1.7	–\$135	–\$81	Unanimous
TLU-6	Land Use Planning and Incentives	0.14	0.43	3.2	–\$598	–\$189	Unanimous
TLU-7	Transit and Travel Options	0.13	0.54	3.5	\$655	\$185	Unanimous
TLU-8	Increase Rail Capacity, and Address Rail Freight System Bottlenecks	0.10	0.19	2.0	\$69	\$35	Unanimous
TLU-9	Great Lakes Shipping	0.24	0.27	2.5	NQ	NQ	Unanimous
	Sector Totals	4.76	10.5	95.1	–\$3,425	–\$36	N/A
	Sector Total After Adjusting for Overlaps	4.76	10.5	95.1	–\$3,425	–\$36	N/A
	Reductions From Recent Actions	0	0	0	\$0	\$0	N/A
	Sector Total Plus Recent Actions	4.76	10.5	95.1	–\$3,425	–\$36	N/A

GHG = greenhouse gas; MMtCO₂e = million metric tons of carbon dioxide equivalent; \$/tCO₂e = dollars per metric ton of carbon dioxide equivalent; NQ = not quantified.

Note: Negative numbers indicate cost savings.

Michigan can achieve greater alternative fuel use through a combination of research and development, as well as through implementing voluntary and mandatory measures. Promoting Low-Carbon Fuel Use in Transportation (TLU-1) can help make biofuels more efficient and more available, while at the same time providing an economic benefit to the Michigan economy by promoting in-state development and production of these fuels.

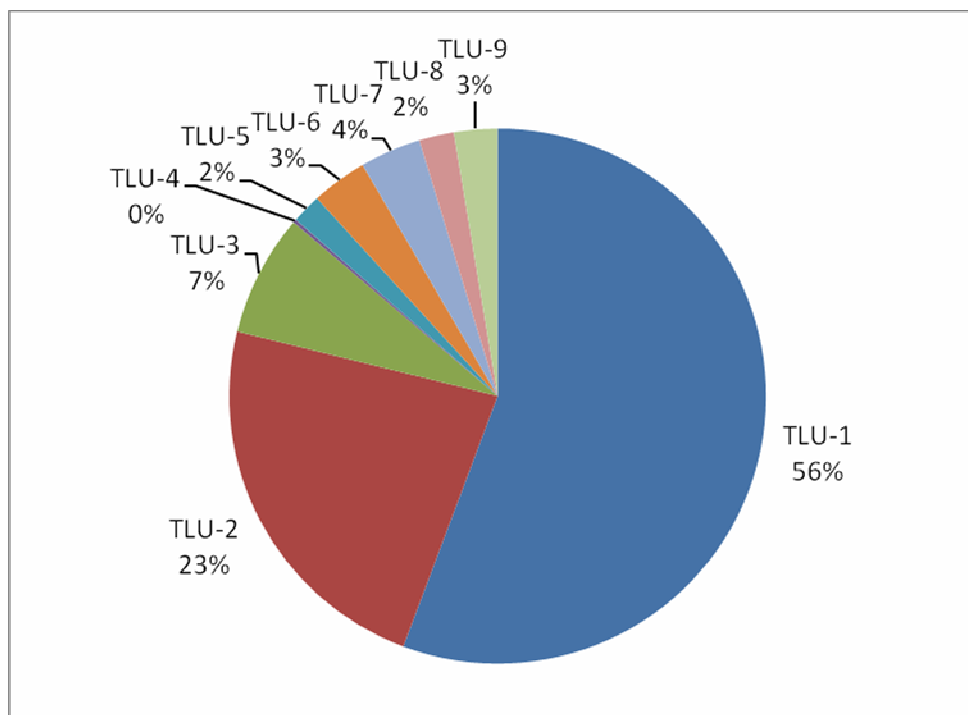
Public education, towards more efficient driving practices in TLU-2 (Eco-Driver Program), works in conjunction with a number of the other recommended policies. Educating citizens on how they can minimize their impact, operate their vehicle more efficiently, and cut their GHG emissions can be a key to the success of many of these policies. Reducing truck idling (TLU-3) can also serve to reduce the GHG impact of transportation without any change in VMT.

The advanced vehicle technology option (TLU-4) seeks to achieve per vehicle GHG emission benefits beyond those expected to be achieved via the new CAFÉ standards, by providing incentives for public fleet owners to purchase advanced technology vehicles. This policy could serve to strengthen Michigan as a leader of automotive research, which would have benefits

across the state. In addition, progress on advanced vehicle technology can have benefits beyond Michigan for energy security, economic growth and environmental quality.

Figure 6-2 shows the breakdown of the projected impacts of the recommended TLU policies, taken together, in terms of avoided GHG emissions. For the TLU policies recommended by the MCAC 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 the recommended policies effective. While adoption of the recommended policies can result in considerable benefits to Michigan’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 6-2. Aggregate GHG emission reductions from all MCAC Transportation and Land Use (TLU) recommendations, 2009–2025



Transportation and Land Use Sectors Policy Descriptions

The policy recommendations summarized here not only result in significant emission reductions and cost savings but also offer a host of additional benefits, such as reduced local air pollution; more livable, healthier communities; and increased transportation choices.

TLU-1. Promote Low-Carbon Fuel Use in Transportation

This policy recommendation promotes low-carbon transportation fuels through a package of incentives, education, and standards, including recommendations by the Michigan Renewable Fuels Commission (RFC). The goal is to reduce the average “carbon intensity” of on-road transportation fuels sold within the state to achieve a 5% reduction of GHG emissions on a life cycle carbon dioxide basis by 2015 and 10% reduction by 2025. The policy follows the June 2007 report of the Michigan RFC that recommended a variety of actions to stimulate the production and use of renewable, low-carbon fuels within the state. These include: (1) a low-carbon fuels program to encourage federal policy in this area and consider establishing a state policy; (2) establish a next-generation renewable fuels feedstock program with a goal of achieving 10% use of renewable fuels by 2012 and 25% by 2025; and (3) create a green retailers program with tax incentives for E85 and biodiesel sales that rewards retail and wholesale outlets that attain benchmarks in the sale of biofuels.

TLU-2. Eco-Driver Program

Because driving behavior can significantly influence a vehicle’s fuel economy performance, this policy would establish an eco-driving program. This program would incorporate a wide range of initiatives that can help drivers maximize the fuel efficiency from their existing vehicles by better understanding the direct impact that driving style, driving patterns, vehicle technologies, and vehicle maintenance (such as proper tire inflation) have on a vehicle’s fuel economy. The primary focus of an eco-driving campaign would target light-duty vehicles, where driver education on eco-driving principles would have the greatest benefit. An integrated eco-driving program in Michigan would be designed to achieve a fuel-economy increase of at least 10% in the mid-term and up to 20% in the long-term.

A properly designed eco-driving program must move beyond a list of driver “tips” and focus on providing the appropriate tools and programs to systematically change driver behavior. Key eco-driving principles would cover: driving style, starting and idling, trip planning, vehicle drag/weight, proper maintenance and vehicle technology applications. The eco-driving program would include program initiatives on direct driver training, general eco-driving education, vehicle maintenance, and vehicle applications such as real-time fuel economy indicators. The program would also consider a low-rolling-resistance tire initiative, options to have currently licensed drivers to undergo additional driver training and options to incorporate direct eco-driver training in the process of commercial truck licensing.

TLU-3. Truck Idling Policies

This policy option aims to reduce GHG and other emissions from unnecessary idling of heavy-duty vehicles, including trucks and buses. Much of this idling takes place during mandatory rest periods to provide heating or cooling of the truck's cabin air. Additional idling occurs during vehicle operation, for example, when loading and unloading buses and trucks. The implementation of public and private fleet anti-idling policies and ordinances, targeted education of bus and truck operators, and creation of low-cost means to access available EPA-verified technologies will help encourage emissions reductions from heavy-duty diesel engines.

Heavy-duty engine idling can be reduced by (1) providing increased availability of electrification at privately owned truck stops or encouraging greater use of auxiliary power units (APUs; on-board generators) for heating, cooling, and other creature comforts on heavy-duty vehicles, (2) providing financial assistance (e.g., low-interest revolving loans) to truck-stop operators and truck owners/operators for infrastructure development or equipment purchase and (3) providing targeted educational activities as appropriate with truck, bus, and truck-stop owners and operators.

This policy has a goal of achieving diesel idling reductions from heavy-duty diesel engines of 40% by 2015 and 80% by 2025. It would also promote the adoption of a Michigan anti-idling law based on the EPA Model State Idling Law and/or encourage adoption of local ordinances to address idling during operation of buses and heavy trucks.

TLU-4. Advanced Vehicle Technology

This recommendation calls for the creation of a policy that will expand the development and use of more efficient vehicle design and/or hybrid propulsion systems. The goal is to make loans and subsidies available to municipalities, local governments, and waste management organizations to encourage more rapid adoption of advanced vehicles by public fleets (transit agencies and schools) to achieve the use of advanced vehicle technologies (hybrid or hydrogen technology) in 10% of the fleet by 2025.

This policy could serve to reestablish Detroit as a leader of automotive research, which would have benefits across the State. In addition, progress on advanced vehicle technology can have benefits for beyond the borders of Michigan in terms of energy security, economic growth, and environmental quality.

TLU-5. Congestion Mitigation

The goal of this policy recommendation is to improve traffic flow and travel time through expanding the use of intelligent transportation systems (ITS). In conjunction with expanding ITS, the following actions should also be considered: identifying and improving key bottlenecks, constructing modern roundabouts at appropriate intersections, and continuing the use of the MDOT courtesy patrol on congested roadways. A 4-day workweek and flex-time should be

encouraged to reduce congestion. All of these elements contribute to reducing travel delay for both recurring and nonrecurring congestion.

Promoting the development of intermodal freight terminals will facilitate freight shipment on rail and air thus reducing the volume of freight on Michigan roadways. By supporting these efforts, the congestion mitigation policy option will allow for more efficient travel and increased economic output.

The goals for this policy are to reduce travel time delay from recurring and nonrecurring congestion in Michigan’s major urban areas (Metro Detroit and Grand Rapids) by 10% by 2025 and to reduce travel time related to nonrecurring congestion (i.e., road construction) by continuing to implement and refine the Michigan Work Zone Safety and Mobility Policy.

TLU-6. Land Use Planning and Incentives

State policies and programs need to be implemented that encourage local and regional planning and development strategies in order to reduce the projected growth of VMT and corresponding GHG emissions. The state will enable each region to adopt a unique mixture of policies to reach reduction goals in its own manner. Strategies include promoting and expanding regional growth management options that result in more compact mixed-use, transit-oriented, walkable development; transportation system management and pricing that allows for greater investment in alternatives to the single-occupancy vehicle, such as public transit; and use of other land-use-related economic development tools as recommended in the Michigan Land Use Leadership Council’s Report (2003).

The goals are (1) to reduce low density development and the conversion of greenfield open land to development 25% by 2015, 50% by 2025, and 80% by 2050; (2) to encourage communities to utilize an “infill” approach for both new and redevelopment projects by focusing on areas where infrastructure already exists; and (3) to work to ensure that at least 60% of new/future statewide growth utilizes more compact development or transit-oriented development design.

These goals can be accomplished through: (1) multi-jurisdictional land use planning and zoning policies, tax base sharing, and providing state and local incentives; (2) market-based approaches in future land development and housing policies that focus investments toward achieving higher density, transit-oriented, and compact or mixed-use development; (3) integrated transportation policies, investments, system management, and pricing; and (4) enactment of a new Statewide Comprehensive Planning Law.

TLU-7. Transit and Travel Options

This policy recommendation focuses on reducing the number of single-occupant vehicle trips and improving the efficiency of daily travel by: (1) creating, enhancing, and promoting public transit options such as commuter rail, light rail, streetcars, and bus rapid transit; (2) enhancing transit service through route expansion, increased service frequency, longer service hours, and/or better system coordination; and (3) facilitating increased carpooling, vanpooling, biking, and walking. These actions will reduce GHG emissions by decreasing VMT, thus reducing fuel

consumption. The first goal is to double transit ridership by 2015 and double it again by 2025 (for longer line-haul systems). The second goal is to double the number of carpool and vanpool participants by 2015 and double again by 2025.

A number of actions are included to help achieve the goals, including amending the Michigan Constitution to provide a broader range of funding mechanisms for public transit, building additional park-and-ride lots, provide incentives for transit-oriented development, incorporate bike lanes into roadway construction/reconstruction, encourage/require sidewalks in new developments and encourage their addition in areas where they are now absent, implement metropolitan transit plans, pursue implementation of inter-city transit service where it is cost-effective and undertake a public education campaign to effectively communicate the benefits of public transit to people who are not current users.

TLU-8. Increase Rail Capacity and Address Rail Freight System Bottlenecks

This policy encourages more energy efficient freight movement via railroads, where it is practical to do so. Making or facilitating transportation infrastructure improvements that increase rail capacity, support connectivity, and reduce rail freight system bottlenecks will help accomplish this shift. For short hauls, truck freight is, and will likely continue to be, the mode of choice; intermodal rail freight tends to be most effective for trips of 700-800 miles or longer. This policy will reduce transportation sector GHG emissions from freight movement by making system improvements with the goal of increasing the tonnage of rail freight traveling to, through and from Michigan an additional 50% by 2020.

Freight tonnage for shipments to, through, and from Michigan is expected to increase on all freight modes, but by far the majority of this increase is anticipated to be truck freight. Increasing the projected tonnage of rail freight an additional 50% by 2020 potentially shifts million of tons of cargo that would otherwise travel by truck. It is important to recognize that shipping decisions are made by the private sector, and are not under the control of government. Investment to encourage greater use of rail lines and intermodal shipping must be made with that reality in mind. A variety of approaches are suggested to accomplish this, including construction of intermodal terminals, preserving existing service and preserving right-of-ways for future new service.

TLU-9. Great Lakes Shipping

This policy recommendation promotes the use of marine transportation as the most energy-efficient form of surface transportation to move cargo over long distances (150 miles or more). While Great Lakes shipping decisions and services are private sector responsibilities, the public sector has a role in providing navigation channels and related infrastructure. Actions include maintaining the existing marine infrastructure, maintaining federal navigation channels to their congressionally authorized depths, improving the marine infrastructure by deepening commercial navigation channels at selected commercial ports, encouraging the development or expansion of “short sea shipping” (also known as “marine highway”) within the Great Lakes, as well as considering the use of ferry boats to move people and cars and consider a biodiesel program at Michigan ports if it is feasible to burn this fuel in marine diesel engines. The focus of this policy

is on increasing shipping within the Great Lakes – not on increasing traffic through the St. Lawrence Seaway.