

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 Arkansas. This sector accounted for 26% of Arkansas'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 27%.

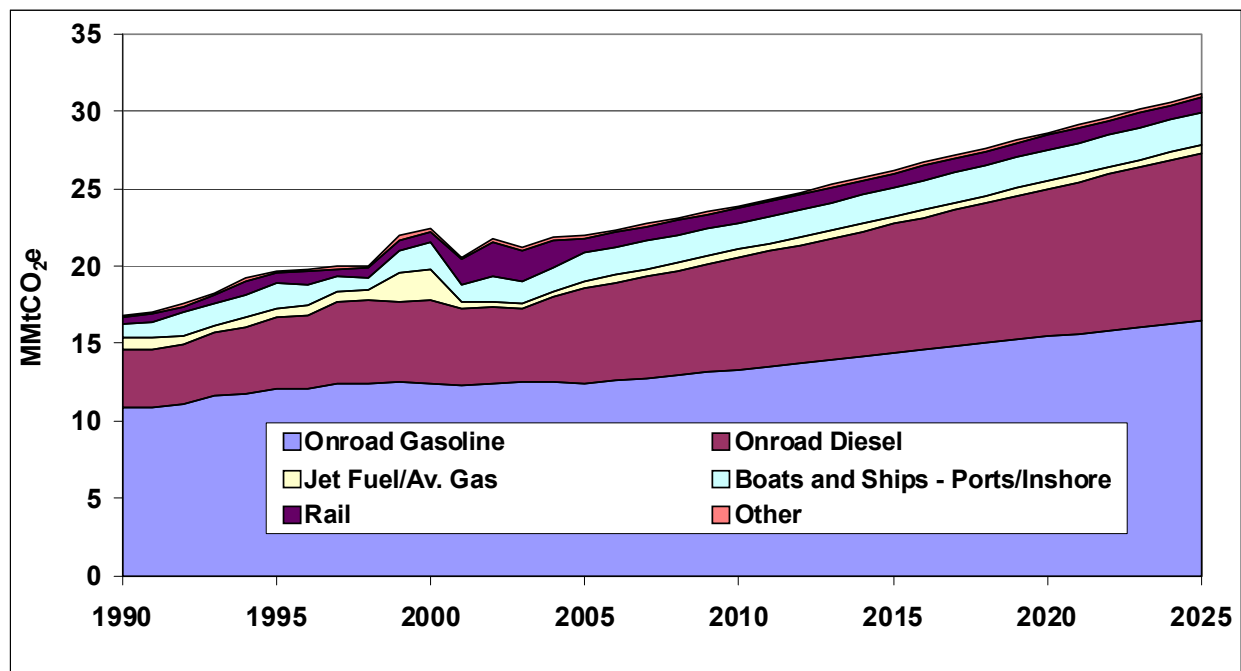
From 1990 to 2005, Arkansas' GHG emissions from transportation fuel use have risen steadily at an average rate of about 1.8% annually. The GHG emissions associated with Arkansas' transportation sector also rose accordingly, increasing by 5 million metric tons of carbon dioxide equivalent (MMtCO₂e) emissions during the same time period from about 17 MMtCO₂e to 22 MMtCO₂e. If left unabated, this number is expected to increase by 29%, to 31 MMtCO₂e by 2025.

Carbon dioxide (CO₂) accounts for about 98% of transportation GHG emissions, with most of the remaining GHG emissions coming from nitrous oxide (N₂O) 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 6-1 shows historic and projected transportation GHG emissions by fuel and source. As a result of Arkansas' population and economic growth and an increase in total vehicle miles traveled (VMT), on-road gasoline consumption increased by about 15% between 1990 and 2005 and accounted for 57% of the total transportation emissions in 2005. Meanwhile, on-road diesel fuel consumption rose by 61% 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, 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 32%, and GHG emissions from on-road diesel consumption are expected to increase by 78% between 2005 and 2025. The consumption of these fuels will significantly contribute to the projected 41% increase in overall emission levels for the entire state of Arkansas over 2005 levels by 2025.

Figure 6-1. Transportation GHG emissions by fuel source, 1990–2020



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

Key Challenges and Opportunities

Arkansas 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 Arkansas 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 Arkansas, 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 Arkansas 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. A variety of pricing policies 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 Recommendations and Estimated Impacts

The Arkansas Governor's Commission on Global Warming (GCGW) 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:

- 3.2 MMtCO₂e per year by 2025, and
- 28.89 MMtCO₂e cumulative from 2009 through 2025.

The weighted-average cost effectiveness of the recommended policies is about $-\$78/\text{tCO}_2\text{e}$, 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 GCGW 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.

Some policies focus on reducing VMT by further developing other modes of transportation, such as transit (TLU-5), freight rail (TLU-7), and pedestrian and bicycling infrastructure (TLU-4 and TLU-6). These policies 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 recommendations that are nonquantifiable) are also an important component of the recommended policies, but are not reflected in the GHG emission reductions or costs. These recommendations focus on studying the feasibility of plug-in hybrid electric vehicles (PHEVs) (TLU-1), research and development of renewable transportation fuels (TLU-2), fuel efficiency incentives (TLU-9), public education (TLU-10), and procuring efficient fleet vehicles for the state (TLU-8). While the implementation of these recommendations may

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.

contribute to significant GHG emission reductions, the immediate impact of these policies individually is not quantifiable.

Further developing biofuels and expanding the biofuels market can significantly reduce GHG emissions, while boosting the state's economy. TLU-3 focuses on this area, while working in conjunction with the research and development of renewable transportation fuels afforded by TLU-2.

Table 6-1. Summary list of TLU policy recommendations

No.	Policy Recommendation	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*	Study the Feasibility of Plug-In Vehicles	<i>Not Quantified—Qualitative Study Recommendation</i>					Unanimous
TLU-2†	Research and Development of Renewable Transportation Fuels	<i>Incorporated Into Analysis for TLU-3</i>					Super Majority (1 objection)
TLU-3†	Advanced Biofuels Development and Expansion	0.88	2.54	21.26	–\$2,293	–\$108	Super Majority (1 objection)
TLU-4*	Smart Growth, Pedestrian and Bicycle Infrastructure	0.06	0.17	1.39	≤0 (Net Savings)	≤0 (Net Savings)	Unanimous
TLU-5*	Improve and Expand Transit Service and Infrastructure	0.001	0.007	0.03	1.5	\$1,479	Unanimous
TLU-6†	School and University Transportation Bundle	0.006	0.013	0.113	N/A	N/A	Unanimous
TLU-7*	Promote and Facilitate Freight Efficiency	0.33	0.47	6.1	\$48	\$104	Unanimous
TLU-8†	Procurement of Efficient Fleet Vehicles (Passenger and Freight)	<i>State "Lead by Example" Qualitative Recommendation</i>					Unanimous
TLU-9†	Fuel Efficiency: Clean Car Incentive	<i>Not Quantified—Qualitative Study Recommendation</i>					Super Majority (1 objection)
TLU-10*	Public Education	<i>Not Quantified</i>					Unanimous
	Sector Total After Adjusting for Overlaps	1.28	3.2	28.89	–\$2,244	–\$78	
	Reductions From Recent Actions (Federal CAFE Requirements)	1.02	3.26	26.9	<i>Not Quantified</i>		
	Sector Total Plus Recent Actions	4.28	8.36	86.0	–\$2,244	–\$78	

CAFE = corporate average fuel economy; GHG = greenhouse gas; MMtCO₂e = million metric tons of carbon dioxide equivalent; \$/tCO₂e = 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 recommendations is for reference purposes only; it does not reflect prioritization among these important policy recommendations.

* The GCGW approved this option at Meeting #9 (September 9, 2008); 18 members present and voting (one by phone).

† The GCGW approved this option at Meeting #10 (September 25, 2008); 21 members present and voting (none by phone).

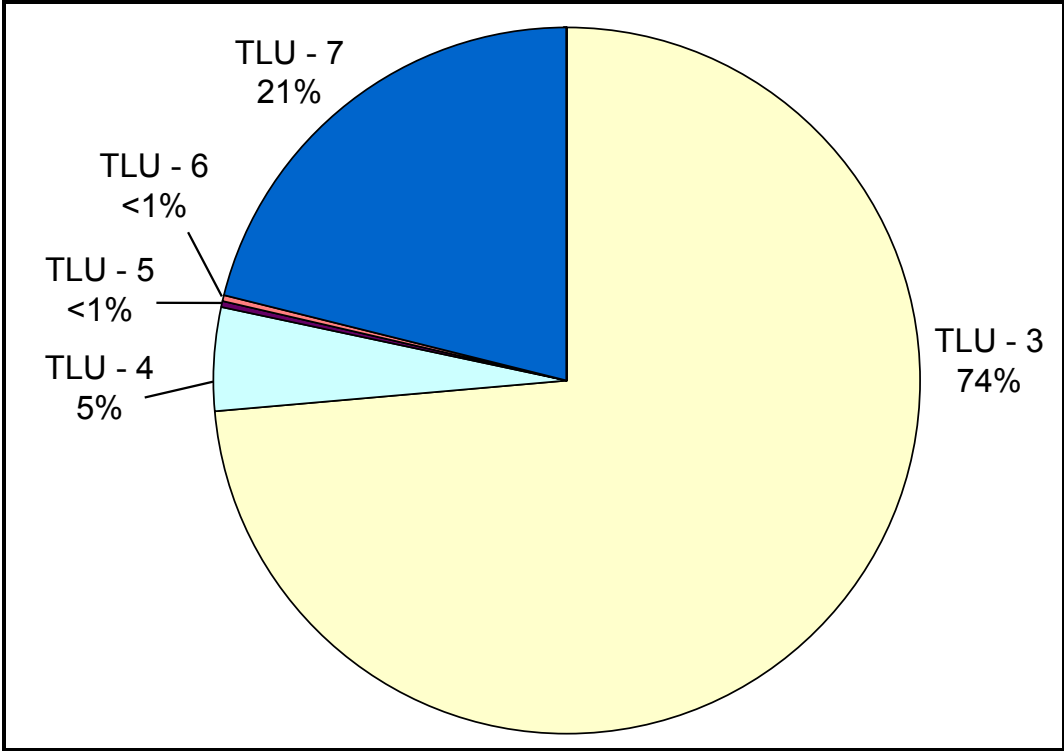
Arkansas can achieve greater alternative fuel use through a combination of research and development, as well as through implementing voluntary and mandatory measures. Research and Development of Renewable Transportation Fuels (TLU-2) can work in conjunction with Advanced Biofuels Development and Expansion (TLU-3) to help make biofuels more efficient and more available, while at the same time providing an economic benefit to the Arkansas economy by promoting in-state development and production of these fuels.

A number of policies would work together to reduce VMT by increasing the viability of other modes of travel. These policies will require increased coordination among state and local governments and businesses in many cases. TLU-4 (Smart Growth, Pedestrian and Bicycle Infrastructure) promotes protecting open space, while revitalizing downtown areas focusing on infill development, transit-oriented development, and the development of pedestrian and bicycle infrastructure. Related to TLU-4 is TLU-5 (Improve and Expand Transit Service and Infrastructure), which promotes both increasing transit service and developing a high-speed intra-city passenger rail system. Such a rail system would be most efficient traveling from city center to city center, where there is sufficient population density to support the system. The density necessary to support this rail system could be developed through the policies set forth in TLU-4. Similarly, TLU-6, which promotes walking, bicycling, and utilizing carpools and transit systems to access schools, colleges, and universities, and promotes the siting of new schools in walkable communities, works very well in cooperation with TLU-4 and TLU-5. All three of these policies will require cooperation among planning agencies, state and local governments, developers, and communities as a whole.

Public education, listed as a separate policy recommendation under TLU-10 (Public Education), works in conjunction with numerous other recommended policies. Educating citizens on how they can minimize their impact, operate their vehicle more efficiently, reduce their VMT, and cut their GHG emissions can be a key to the success of many of these policies. Additionally public education can help to generate the support necessary for the success of other policies, such as smart growth communities (TLU-4), safe routes to school (TLU-6), the procurement of efficient fleet vehicles (TLU-8), and the incentivizing of clean cars (TLU-9).

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 GCGW 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 the adoption of the recommended policies can result in considerable benefits to Arkansas' 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, 2009–2025



Transportation and Land Use Sectors Policy Descriptions

The policy recommendations described briefly 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. Study the Feasibility of Plug-In Vehicles

This policy recommendation will implement a study that will review relevant, completed, ongoing, and forthcoming studies, including the 3-year national study (begun in 2007 and expected to be completed by 2010) by the Electric Power Research Institute, Ford Motor Company, and Southern California Edison, which will develop and evaluate technical approaches for integrating plug-in hybrid electric vehicles (PHEVs) into the nation's electric grid system.² Following the review of the relevant studies, this policy will assess the potential effectiveness of implementing some or all of the following options: converting state and local government fleets to PHEVs, providing funding for school districts to acquire plug-in electric hybrid school buses, providing rate recovery for utility research and development investments in pilot tests of vehicle-to-grid systems, assessing the need of electric vehicle charging in state parking facilities, developing and funding at least one vehicle-to-grid pilot involving a fleet of public plug-ins parked in a state garage, identifying Arkansas companies and economic sectors with potential vehicle electrification markets, and developing a strategy to help Arkansas companies position themselves for success in those markets.

TLU-2. Research and Development of Renewable Transportation Fuels

This policy recommendation provides support and assistance for the development of low-carbon fuels that are not yet commercially available in Arkansas, such as cellulosic ethanol. Support and assistance will surround the funding of the research and development related to biofuel/biodiesel production, such as investigating the production of biofuels from Arkansas-based biomass feedstocks from agricultural production, agricultural processing, forest or wood resources or production processes, or other cellulosic crops. This will be done in order to increase the capacity of the state university system to develop and produce such fuels cost-effectively. Additionally this policy will attempt to identify funding sources to conduct analyses and identify which renewable fuels will provide the best options for Arkansas and its constituent regions and cities.

² Ford Motor Company. "EPRI Joins Ford-SCE Analysis of Plug-In Hybrids on Grid." March 27, 2008. Available at <http://www.ford.com/about-ford/news-announcements/press-releases/press-releases-detail/pr-epri-joins-fordsce-analysis-of-27955>.

TLU-3. Advanced Biofuels Development and Expansion

This policy recommends that Arkansas encourage state and national industries to reach for specific goals, as measured by specific volume amounts or percentages of advanced biofuels that would produce fewer GHG emissions when considered on a per-volume and/or per-energy-unit basis. The state could incentivize the development of in-state industries and businesses that produce and distribute alternative fuels with the goal of this policy recommendation being to increase the use of alternative fuels that emit less GHG emissions in automobile and other gasoline-powered vehicles to the level of at least 10% of the total consumed by 2015, with particular emphasis on biofuels.

This policy also recommends that the state encourage industry and research universities to work together to create an Arkansas Alternative Energy Institute.

TLU-4. Smart Growth, Pedestrian and Bicycle Infrastructure

This policy recommendation calls for incentives and programs to encourage smart growth, including enhancing the pedestrian and bicycle infrastructure. 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 recommendation, Arkansas would encourage, facilitate, and undertake a set of smart growth activities related to the following initiatives: mixed use, open-space protections, downtown revitalization, "greyfield" redevelopment,³ infill development, transit-oriented development, and pedestrian and bicycle infrastructure. This policy recommendation seeks to preserve open, recreational, and agricultural spaces and to prevent sprawl, especially on the periphery of urban areas where sprawling development may otherwise occur.

TLU-5. Improve and Expand Transit Service and Infrastructure

The goal of this policy recommendation is to reduce light-duty vehicle VMT in urban areas from the 2008 baseline growth by 1% per year starting in 2010 until 2025. This will be achieved by making improvements to existing transit service, such as increasing service frequency, improving the quality of service, and reducing travel times on selected transit routes. This policy recommendation will also include expanding transit routes to reach more people. It will shift passenger transportation from single-occupant vehicles to public transit, thereby reducing GHG emissions.

This policy recommends that incentives be offered to potential passengers and that loans and/or subsidies be made to operators (public or private) to provide improved and less expensive intercity bus service. Also, financing will be provided in addition to regulatory relief, and eminent domain will be used to develop, either publicly or privately, a high-speed intercity

³ Greyfields are underutilized land in the form of parking lots, declining strip malls, and vacant parcels.

passenger rail system to serve major urban areas, or financial assistance will be made available to improve services already provided by Amtrak on other routes.

TLU-6. School and University Bundle

This policy recommendation focuses on encouraging the reduction of transportation GHG emissions when transporting students to K-12 schools, colleges, and universities. This is accomplished by utilizing the federal Safe Routes To School program, which promotes students at the K-12 level walking and riding their bikes to school. Additionally, this policy recommends that school districts study the most efficient bus routes to limit the VMT by school buses. At high schools, colleges, and universities, will promote car and van pooling and policies that limit the availability of student parking. Goals for this policy recommendation include a 5% reduction in total VMT for transporting students to school by 2012, which increases to a goal of a 10% reduction by 2025.

TLU-7. Promote and Facilitate Freight Efficiency

This policy recommendation focuses on promoting and facilitating freight efficiency by improving railroad infrastructure and rail yards, increasing rail and river shipping capacity, providing economic assistance and regulatory streamlining for the improvement of intermodal rail yards and the relief of freight bottlenecks, providing electrification at truck stops to reduce idling, supporting and promoting policies and legislation that improve regulatory oversight of the railroad industry, providing plug-in power at port sites to enable vessels to turn off engines and reduce idling, and providing incentives for purchasing and/or upgrading to more efficient trucks.

The goals of this policy recommendation are to reduce truck idling by Class 8 (tractor-trailer) trucks by 80% by 2010 and 100% by 2020 by reforming the state transportation board, investing in rail infrastructure, establishing standards for truck stop electrification, assessing port facilities and rail-switching yards, and providing incentives to trucking companies that invest in the purchase of low-emission engines and lightweight tractor/trailer combinations.

TLU-8. Procurement of Efficient Fleet Vehicles (Passenger and Freight)

This policy recommends that state and local government agencies “lead by example” by enacting procurement policies and or joining the U.S. Environmental Protection Agency’s SmartWay program and utilizing SmartWay Upgrade Kits that result in the adoption of lower-emitting vehicle fleets. In leading by example, state and local governments will ensure that their vehicle fleets meet or exceed the targets set for the state as whole, while ensuring that the means are available for all public and private vehicles to also exceed these standards voluntarily.

TLU-9. Fuel Efficiency: Clean Car Incentive

This policy recommendation promotes the use of a market-based incentives program to provide rebates to Arkansans who purchase new vehicles that reduce oil consumption and have lower GHG emissions by being more fuel efficient. This program would be self-financed, being paid

for with disincentives (fees) to those who purchase new vehicles that are less fuel-efficient. The rebates or fees would be subtracted or added to the purchase price of the vehicle at the point of sale. Incentives and disincentives should equal out to zero, as the point at which incentives are provided or disincentives are included—the “pivot point”—would rise in proportion to each vehicle’s gasoline savings or consumption. The pivot point is essentially the average mileage standard that divides the incentives from disincentives. The goals of this policy recommendation include increasing the sales of fuel-efficient vehicles, reducing the sales of inefficient vehicles, and raising the average mile-per-gallon (mpg) rate within the state.

TLU-10. Public Education

This policy recommendation focuses on better informing the public of the measures they as individuals can take to reduce their transportation-related GHG emissions. It encourages drivers to voluntarily reduce their fuel consumption as well as their VMT. This policy would educate the public about transportation options and consequences, proper vehicle operation and maintenance aimed at increased mpg reducing GHG emissions, and city planning choices. This curriculum would be a requirement for all driver training programs and would be distributed through other possible venues as deemed appropriate by the agency(ies) developing the program.