

# GreenCityBlueLake Institute

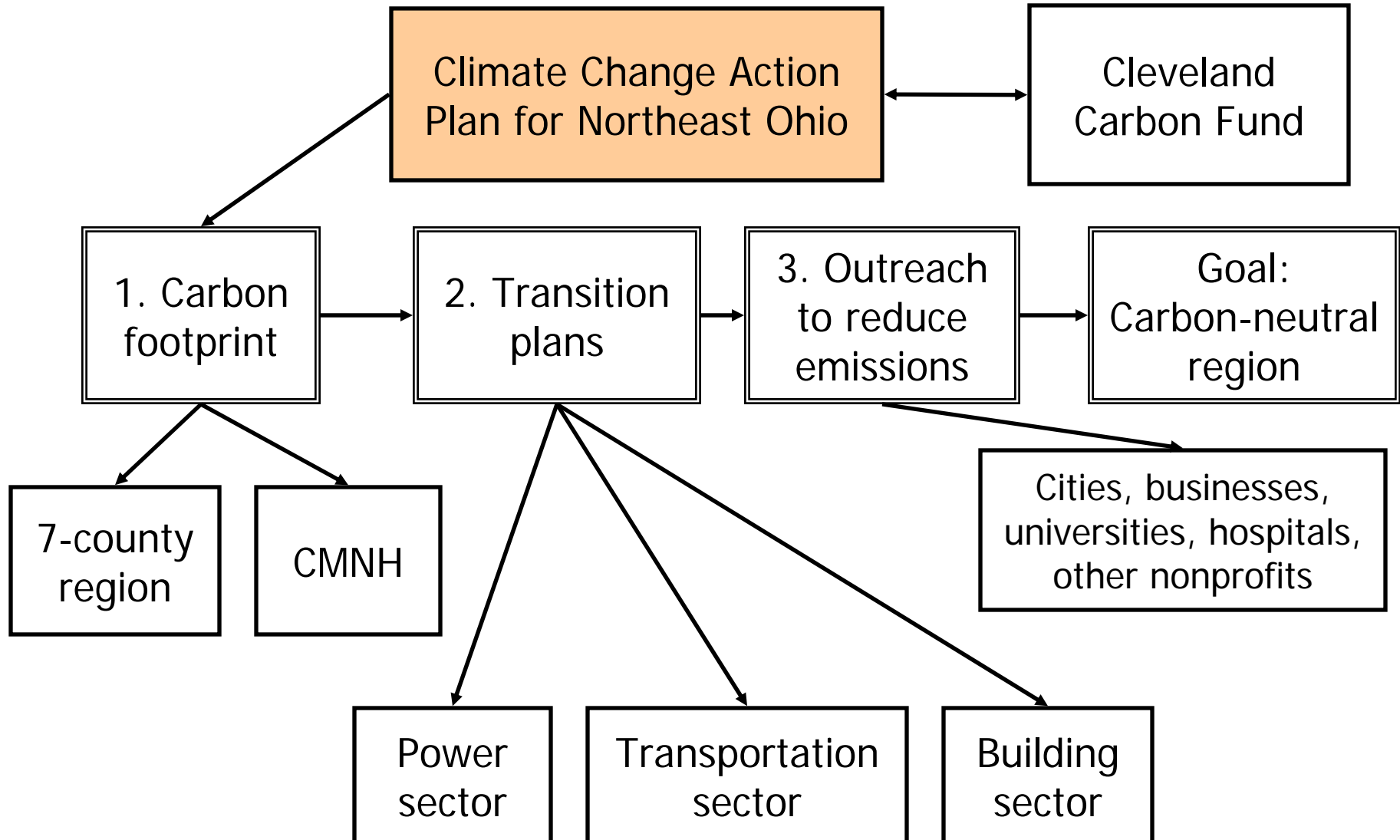


Developing a Roadmap for Climate Change  
and Northeast Ohio

Cleveland Clean Air Century Campaign  
September 24, 2008



# Program Overview





# Additional Benefits of CO<sub>2</sub> Reductions

**“The Economist says that this year alone, the oil-importing nations will transfer \$2 trillion dollars to the oil exporting nations. That’s money that won’t go to improve our infrastructure, won’t go to protect our environment, and won’t go to educating our youth.”** *Rick Cole, in June 2008 “The Planning Report” interview.*

## Improved:

- **Quality of life**
- **Air quality**
- **Human health**
- **Efficiency in transportation sector**
- **Economic development**
- **Energy security**



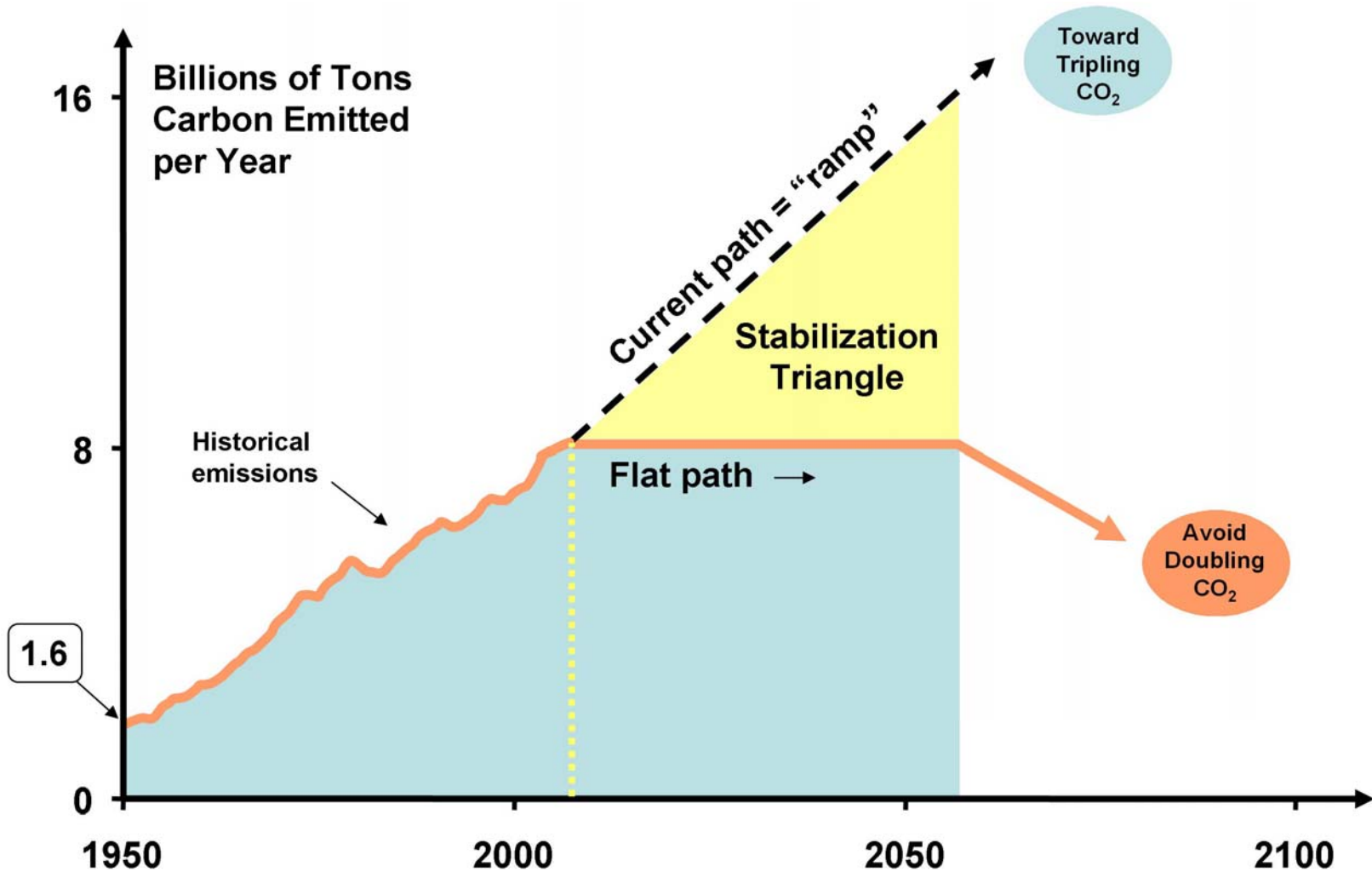
# How Do We Tackle Climate Change?



Source: <http://media.learningfundamentals.com.au/combating-global-warming-map.jpg>

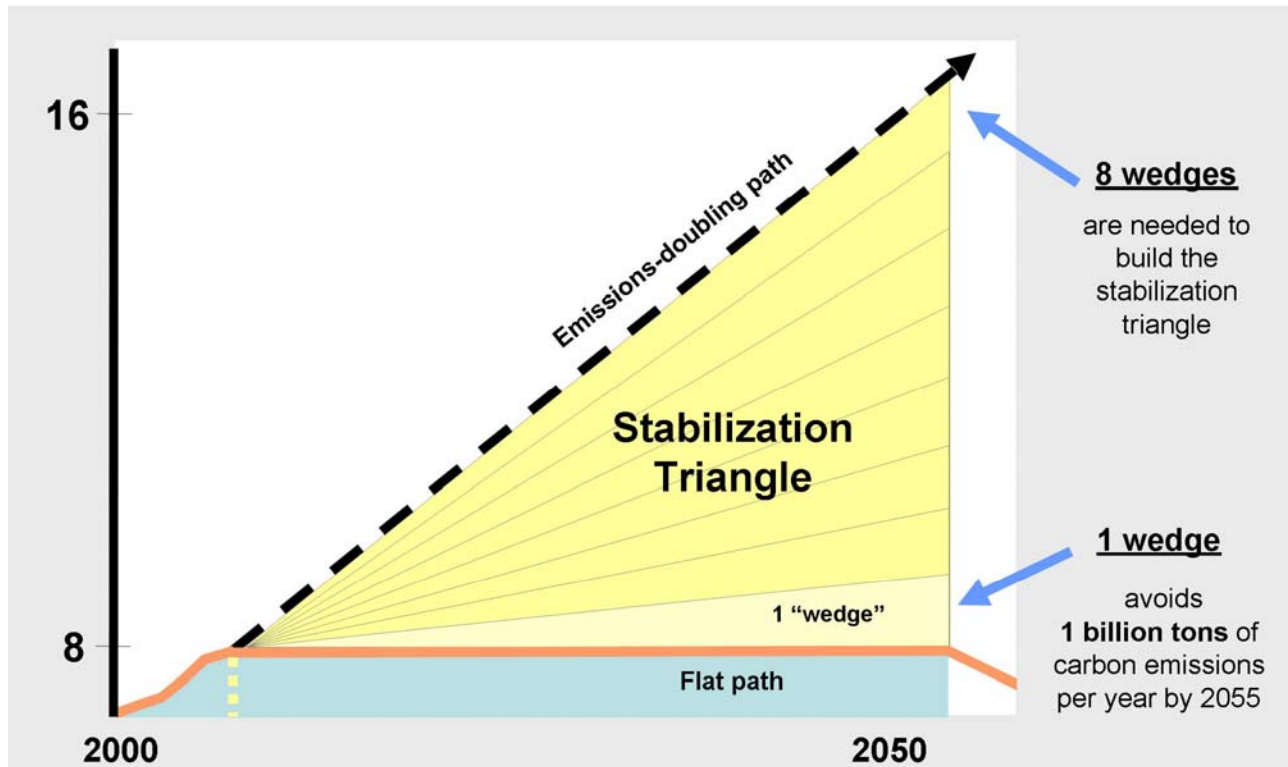


# CO<sub>2</sub> Stabilization Triangle





# CO<sub>2</sub> Stabilization “Wedges”



## Examples of Wedges:

1. Efficient vehicles
2. Reduced use of vehicles
3. Efficient buildings
4. Efficient coal power plants
5. Gas instead of coal power plants
6. Capture CO<sub>2</sub> at baseload power plant
7. Nuclear power for coal power
8. Wind power for coal power
9. PV power for coal power
10. Capture CO<sub>2</sub> at H<sub>2</sub> plant
11. Capture CO<sub>2</sub> at coal-to-synfuels plant
12. Wind H<sub>2</sub> in fuel-cell car for gasoline in hybrid car

Source: Princeton Stabilization Wedges,  
<http://www.princeton.edu/~cmi/resources/stabwedge.htm>

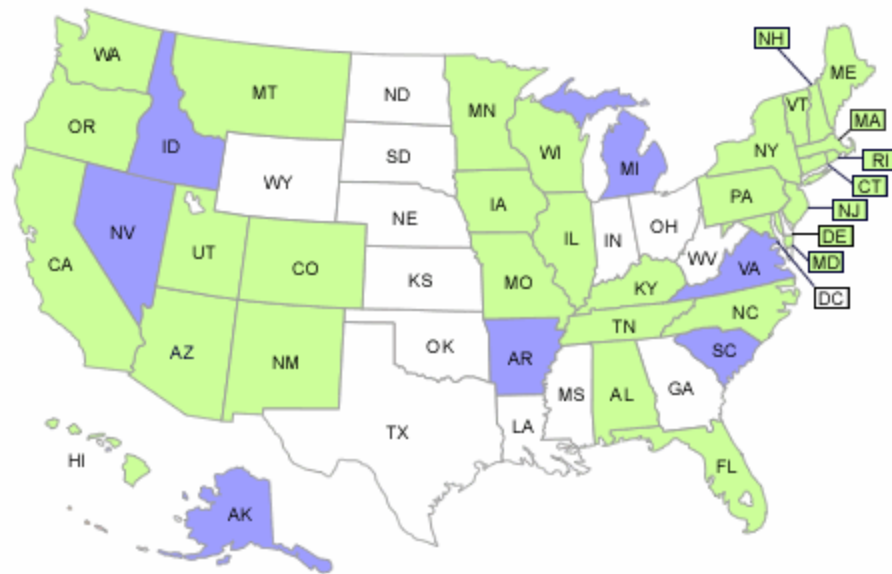




# Why Now?

## Climate Change Action Plan

Information current as of May 2008.



- Completed: 30**  
 AL, AZ, CA, CO, CT, DE, FL, HI, IA, IL, KY, ME, MD, MA, MN, MO, MT, NH, NJ, NM, NY, NC, OR, PA, RI, TN, UT, VT, WA, WI
- In Progress: 7**  
 AK, AR, ID, MI, NV, SC, VA
- No Policy in Place: 14**  
 DC, GA, IN, KS, LA, MS, NE, ND, OH, OK, SD, TX, WV, WY



# Midwest Emissions Overview

**“The Midwest is responsible for 5 percent of global GHGs – a contribution larger than all countries, except China, Russia, and India”<sup>1</sup>**

Top 10 GHG Emitting Countries CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> (w/o LULUCF)		
Country	MtCO <sub>2</sub> Equivalent	World Rank
United States of America	6,872	1
China	4,963	2
Russia	1,916	3
India	1,889	4
<b>Midwest</b>	<b>1,564</b>	<b>--</b>
Japan	1,352	5
Germany	1,013	6
Brazil	850	7
Canada	684	8
United Kingdom	659	9
Italy	532	10

**Source:** WRI, CAIT (2006)  
**Notes:** Country data is from 2000. Midwest 8 data if from 2001. All totals exclude emissions from international bunker fuels and land use change and forestry.

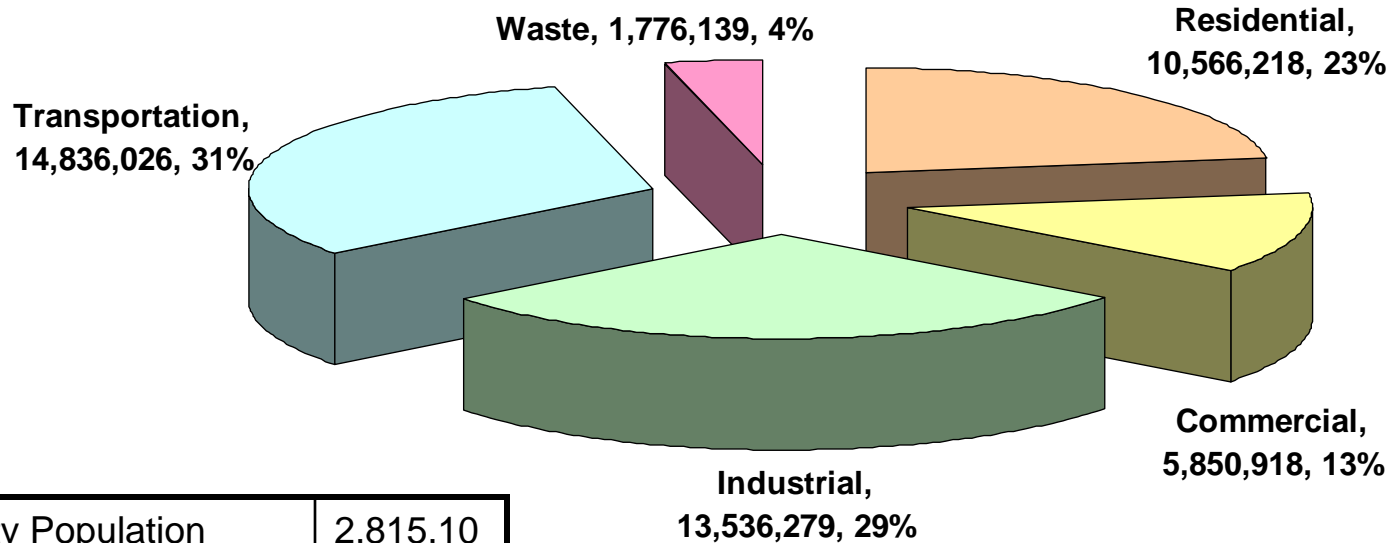
1. Charting the Midwest: An Inventory and Analysis of Greenhouse Gas Emissions in America's Heartland, World Resources Institute, October 2007, p.2.



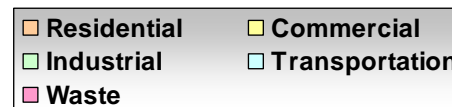
# Overview of Northeast Ohio CO<sub>2</sub> Equivalent Emissions

## 7 County Annual Emissions of CO<sub>2</sub> Equivalents (2005, tons)

Total Emissions: 46,656,580 CO<sub>2</sub>eqt



7 County Population (2006)	2,815,100
Per Capita Emissions	16.57 t/p



Source: GreenCityBlueLake Institute, ICLEI Clean Air and Climate Protection Software. Waste data from 2006. Excludes land use changes and agricultural emissions.

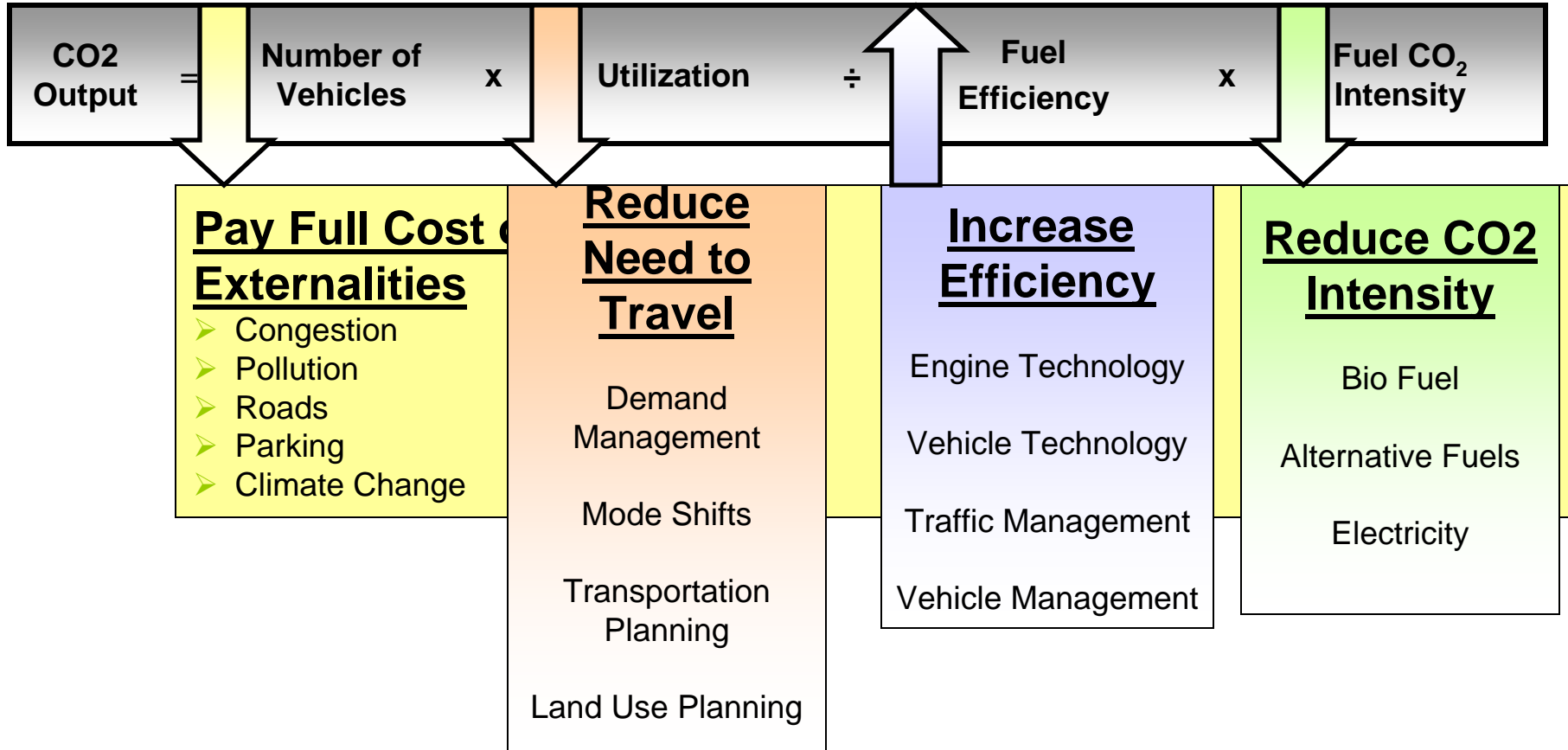
# How Did We Calculate CO<sub>2</sub> Emissions for 7 County Region?



- **Gathered energy consumption data from 7 county region, using direct contacts and annual reports filed with state and federal government**
  - Electricity
  - Natural Gas
  - Diesel
  - Gasoline
  - Heating Oil
  
- **Utilized ICLEI Software for Calculations**
  - ICLEI - Local Governments for Sustainability (originally known as “International Council for Local Environmental Initiatives”) is an international association of local governments and national and regional local government organizations that have made a commitment to sustainable development. <http://www.iclei.org>
  
- **Current estimate for Northeast Ohio does not include emissions from agricultural activities or land use changes**
  
- **Ongoing process, data will be refined as better and more complete data is available**



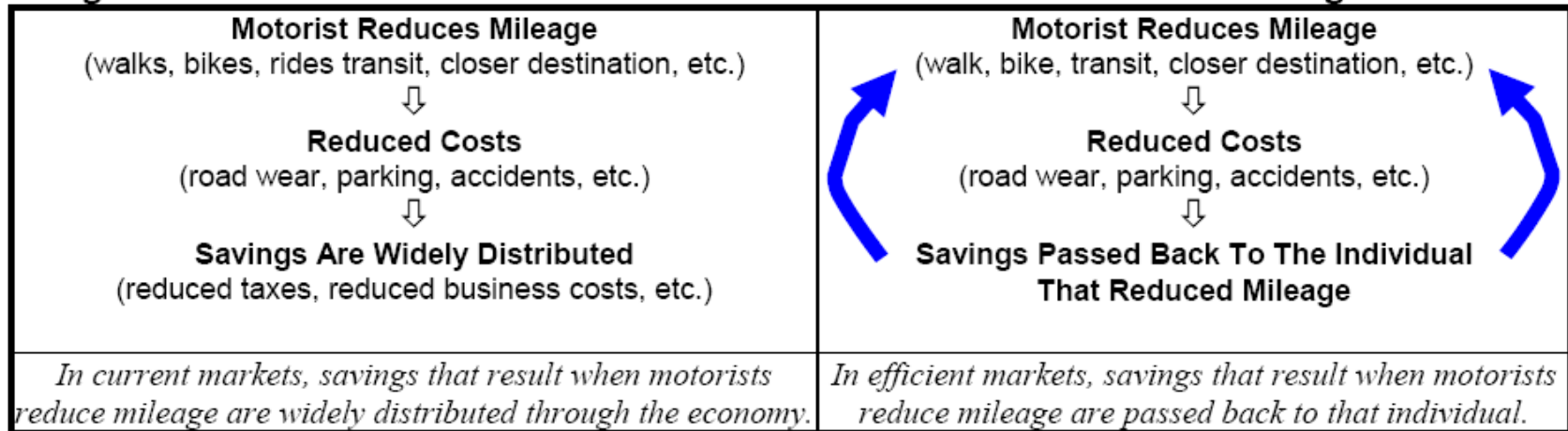
# Transportation CO<sub>2</sub> Reduction Strategies





# “Win-Win” Strategies

**Figure 1 Efficient Markets Reward Motorists Who Reduce Their Mileage**

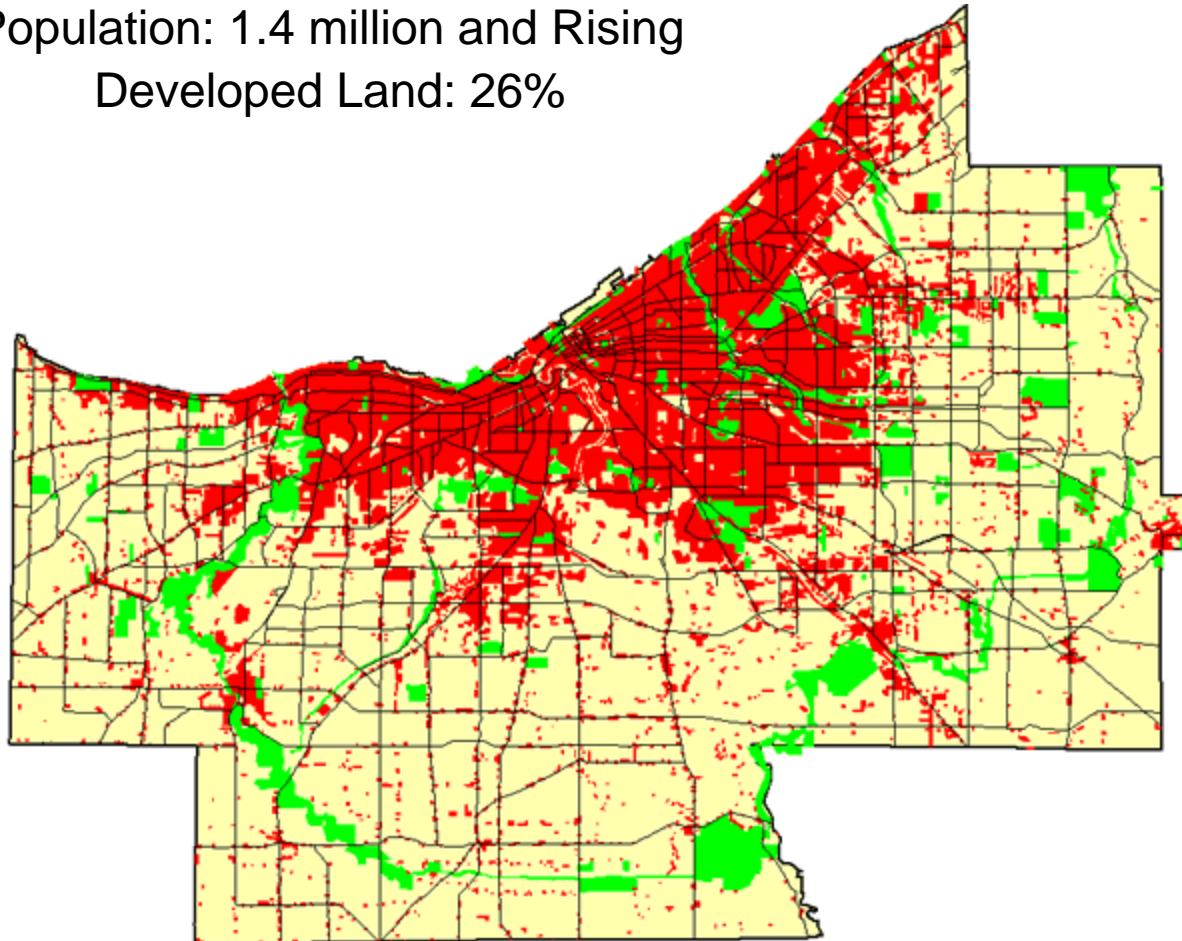
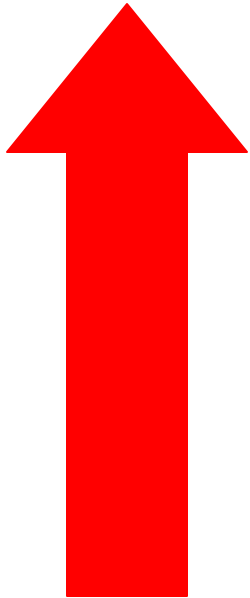


Source: “Win-Win Emissions Reductions Strategies,” Victoria Transport Policy Institute, Dec. 2007, [www.vtppi.org/wwclimate.pdf](http://www.vtppi.org/wwclimate.pdf)

# Developed Land in Cuyahoga County (1948)

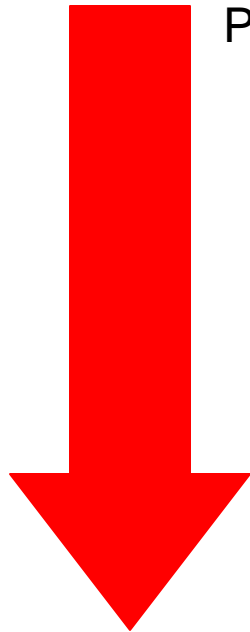


Population: 1.4 million and Rising  
Developed Land: 26%

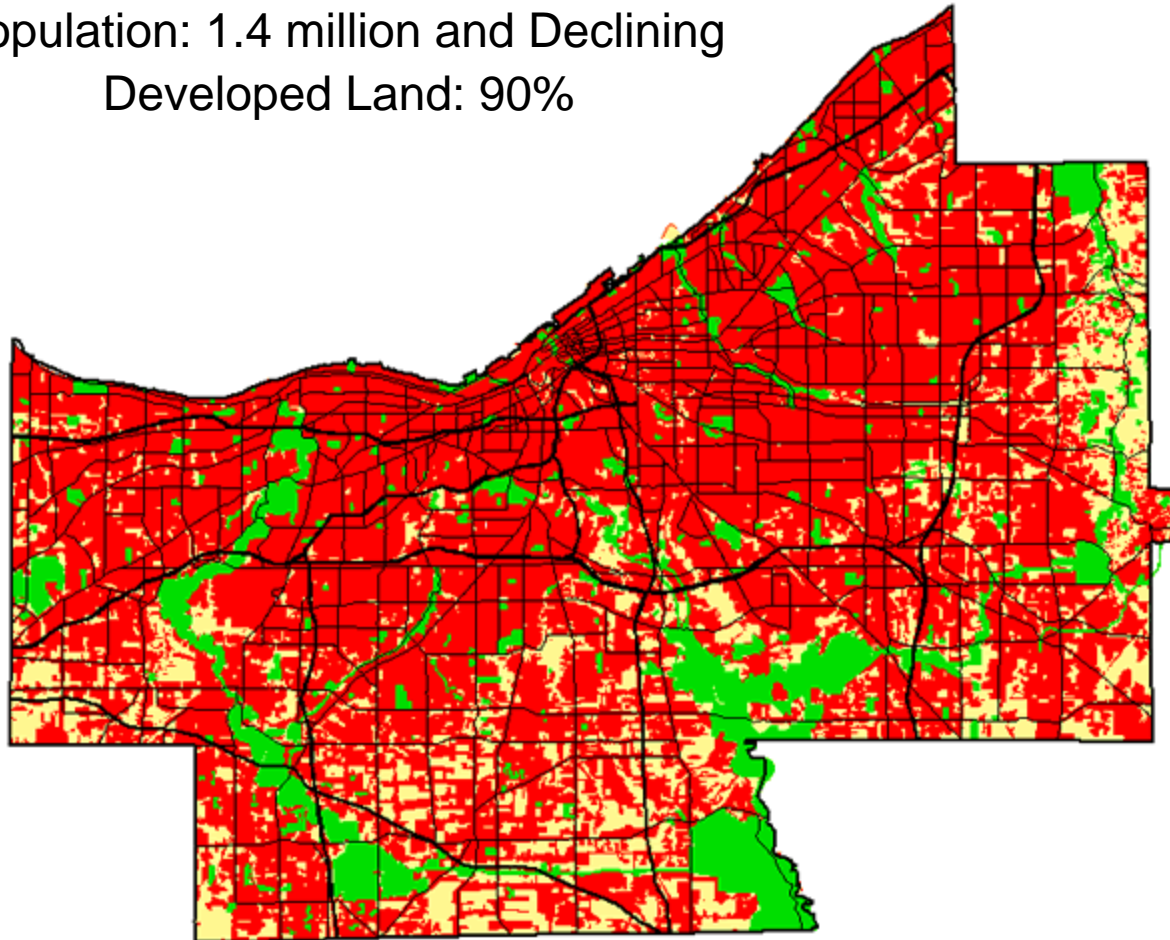


© 2008  
GreenCityBlueLake Institute

# Developed Land in Cuyahoga County (2002)



Population: 1.4 million and Declining  
Developed Land: 90%



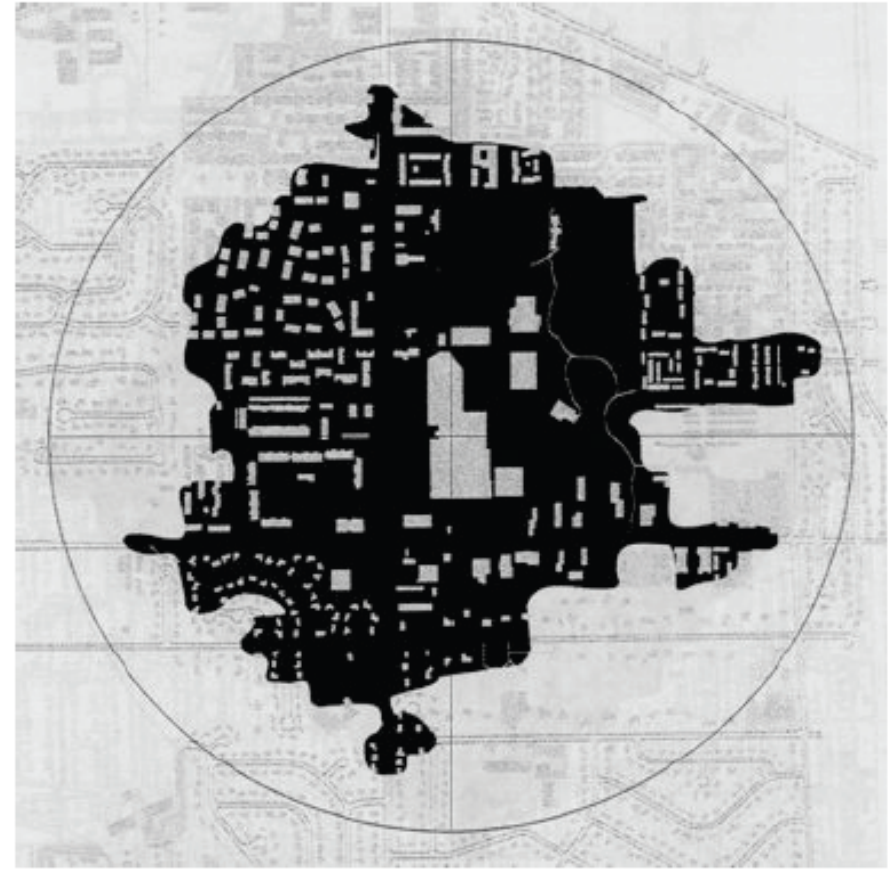
© 2008  
GreenCityBlueLake Institute



# Land Use and VMT

## Destinations within ¼ Mile of Center of Contrasting Street Networks in Seattle

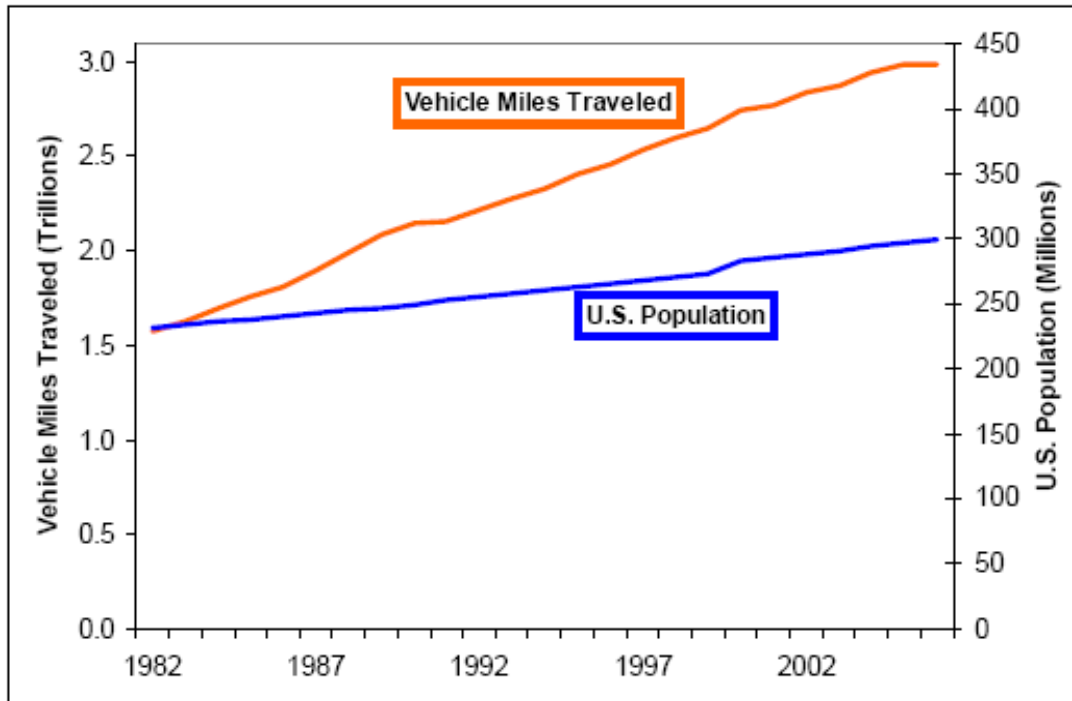
(Moulden et. al, 1997)





# Trend: Vehicle Miles Traveled and Vehicle Registrations Increasing

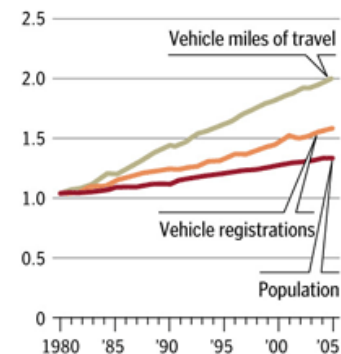
## U.S. Population and Vehicle Miles Traveled, 1982-2006



### Mileage Up

As Americans move farther from urban centers, the miles they travel in cars outpace the nation's population growth, which increases greenhouse-gas emissions.

**Growth in population, vehicle registration and vehicle miles of travel in the United States**  
Index with 1980=1



SOURCES: Federal Highway Administration, Department of Transportation; Census Bureau

THE WASHINGTON POST

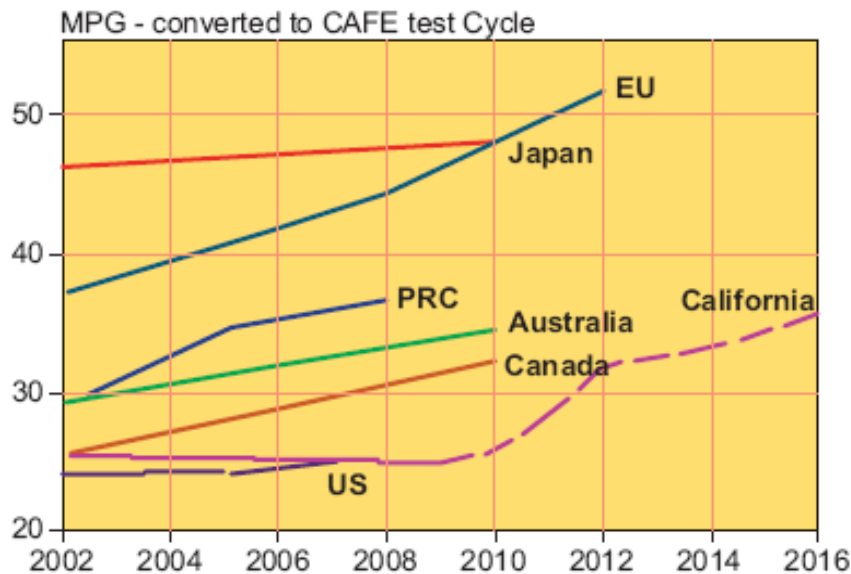
Source: Bailey, et.al, "The Broader Connection between Public Transportation, Energy Conservation and Greenhouse Gas Reduction," February 2008, [www.apta.com/research/info/online/documents/land\\_use.pdf](http://www.apta.com/research/info/online/documents/land_use.pdf)

Source: Washington Post, May 4, 2008, <http://www.washingtonpost.com/wp-dyn/content/article/2008/05/03/AR2008050301079.html>



# International CAFE Standards

**Figure 9: Comparison of Fuel Economy and GhG Emission Standards Normalized by CAFE-converted Miles per Gallon**



CAFE = Combined Average Fleet Economy; EU = European Union; GhG = greenhouse gases; MPG = miles per gallon; PRC = People's Republic of China; US = United States.

Source: Feng and Sauer. 2004.

If VMT remains constant, the increase in fuel efficiency standards mandated by Congress in 2007 would reduce green house gases from transportation by nearly 25% by 2030. *Growing Cooler.*

Source: "Energy Efficiency and Climate Change Considerations for On-road Transport in Asia," Asian Development Bank, 2006



# Scenario Assumptions

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832				33,590
Biodiesel cars	0.5%	13,448	40	129,760,832				33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832				25,839
Electric cars	0.0%	0	60	0				0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203				7,293,875
Motorcycle (2WV)	0.4%	10,750	25	103,808,665				42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1.4</b>			<b>14,633,241</b>

<b>Vehicle Type Definitions</b>	
<b>Sub Compact Auto</b>	
	Honda Civic
	Toyotal Corolla
	Ford Focus
	Dodge Neon
	Chevrolet Cavalier
	Volkswagen Jetta
<b>Mid Size Auto</b>	
	Honda Accord
	Toyota Camry
	Volkswagen Passat
	Chevrolet Monte Carlo
	Mercury Sable
	Chrysler Sebring
<b>Full Size Auto</b>	
	Chevrolet Impala
	Dodge Intrepid
	Ford Taurus
	Ford Crown Victoria
	Pontiac Bonneville
	Lincoln Town Car

Vehides Registered by County (2005)	Non		Other Vehicles	Total Registrations
	Passenger Cars	Commercial Trucks		
Cuyahoga	944,546	77,473	131,541	1,153,560
Geauga	71,101	12,729	25,313	109,143
Lake	181,438	26,141	35,343	242,922
Lorain	210,163	39,034	50,301	299,498
Medina	124,283	24,405	35,261	183,949
Portage	105,757	25,796	34,712	166,265
Summit	397,322	55,137	81,886	534,345
<b>Total</b>	<b>2,034,610</b>	<b>260,715</b>	<b>394,357</b>	<b>2,689,682</b>

Source: Ohio County Profiles, Office of Strategic Research



# Scenario Assumptions

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788				
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622				
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550				
Hybrid cars	0.5%	13,448	40	129,760,832				
Biodiesel cars	0.5%	13,448	40	129,760,832				
Plug-in hybrid	0.5%	13,448	52	129,760,832				
Electric cars	0.0%	0	60	0				
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203				
Motorcycle (2WV)	0.4%	10,759	25	103,808,665				
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>				

Fuel Efficiency (miles/ USgal gasoline eq)			
	2005	2010	2020
<b>Gasoline</b>			
Auto full size	18.61	19.498	21.275
Auto mid size	19.965	20.918	22.824
Auto compact/ subcompact	25.65	26.5	28.2
Heavy Truck	4.843	4.866	4.88
Light Truck/ SUV/ Pickup	13.717	13.988	14.113
Motorcyde	25.186	25.402	25.402
Passenger Vehicle	17.7	17.5	18.4
<b>Diesel</b>			
Auto full size	19.378	19.378	19.378
Auto mid size	-	-	-
Auto compact/ subcompact	39.311	40.668	42.292
Heavy Truck	5.634	5.664	5.664
Light Truck/ SUV/ Pickup	16.859	16.934	16.934
Motorcyde	-	-	-
Passenger Vehicle	17.7	17.5	18.4
Transit Bus	5.634	5.644	5.644
<b>CNG</b>			
Transit Bus	6.93	6.93	6.93

Northeast Ohio daily VMT and calculated annual VMT		
	Daily VMT	Annual VMT
NOACA (2005)	49,263,324	16,256,896,920
AMATS (2003)	19,121,831	6,310,204,230
<b>TOTAL</b>	<b>68,385,155</b>	<b>22,567,101,150</b>

Source: NOACA, AMATS



# Scenario Example: Smaller Vehicles

## 2030 CO<sub>2</sub> Reduction: 7.81%

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>

2030 Smaller Vehicles	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	12.1%	325,452	18.61	3,140,212,125	168,737,890	20.71	3,494,392,955	1,747,196
Mid Size Auto	14.0%	376,555	19.965	3,633,303,285	181,983,636	20.71	3,768,699,110	1,884,350
Sub Compact/Compact	47.0%	1,264,151	25.65	12,197,518,172	475,536,771	20.71	9,847,890,987	4,923,945
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	25.0%	672,421	14	6,488,041,581	463,431,541	20.71	9,597,203,792	4,798,602
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>		<b>25,952,166,323</b>	<b>1,302,825,626</b>	<b>20.71</b>	<b>26,980,220,047</b>	<b>13,490,110</b> <b>7.81%</b>



# Scenario Example: Increased Fuel Efficiency

## 2030 CO<sub>2</sub> Reduction: 32.73%

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>

2030 Fuel Efficiency Increase	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	25	3,399,733,788	135,989,352	20.71	2,816,203,481	1,408,102
Mid Size Auto	13.0%	349,659	28	3,373,781,622	120,492,201	20.71	2,495,272,986	1,247,636
Sub Compact/Compact	34.0%	914,492	35	8,823,736,550	252,106,759	20.71	5,220,878,863	2,610,439
Hybrid cars	0.5%	13,448	45	129,760,832	2,883,574	20.71	59,715,935	29,858
Biodiesel cars	0.5%	13,448	45	129,760,832	2,883,574	20.71	59,715,935	29,858
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	23	9,861,823,203	428,774,922	20.71	8,879,499,857	4,439,750
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>		<b>25,952,166,323</b>	<b>949,778,128</b>	<b>20.71</b>	<b>19,668,959,405</b>	<b>9,834,480</b> <b>32.79%</b>



# Scenario Example: Reduced VMT

## 2030 CO<sub>2</sub> Reduction: 10%

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>

2030 VMT Reductions	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,059,760,409	164,414,853	20.71	3,404,867,185	1,702,434
Mid Size Auto	13.0%	349,659	19.965	3,036,403,460	152,086,324	20.71	3,149,555,685	1,574,778
Sub Compact/Compact	34.0%	914,492	25.65	7,941,362,895	309,604,791	20.71	6,411,605,621	3,205,803
Hybrid cars	0.5%	13,448	40	116,784,748	2,919,619	20.71	60,462,384	30,231
Biodiesel cars	0.5%	13,448	40	116,784,748	2,919,619	20.71	60,462,384	30,231
Plug-in hybrid	0.5%	13,448	52	116,784,748	2,245,861	20.71	46,509,526	23,255
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	8,875,640,882	633,974,349	20.71	13,128,974,788	6,564,487
Motorcycle (2WV)	0.4%	10,759	25	93,427,799	3,737,112	20.71	77,395,588	38,698
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>		<b>23,356,949,690</b>	<b>1,271,902,527</b>	<b>20.71</b>	<b>26,339,833,162</b>	<b>13,169,917</b> <b>10.00%</b>



# Scenario Example: Increased VMT, Increased Avg. Efficiency

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>

2030 Increased VMT, Fuel Efficiency	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	25	4,079,680,546	163,187,222	20.71	3,379,444,177	1,689,722
Mid Size Auto	13.0%	349,659	28	4,048,537,946	144,590,641	20.71	2,994,327,583	1,497,164
Sub Compact/Compact	34.0%	914,492	35	10,588,483,860	302,528,110	20.71	6,265,054,636	3,132,527
Hybrid cars	0.5%	13,448	45	155,712,998	3,460,289	20.71	71,659,122	35,830
Biodiesel cars	0.5%	13,448	45	155,712,998	3,460,289	20.71	71,659,122	35,830
Plug-in hybrid	0.5%	13,448	52	155,712,998	2,994,481	20.71	62,012,701	31,006
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	23	11,834,187,843	514,529,906	20.71	10,655,399,828	5,327,700
Motorcycle (2WV)	0.4%	10,759	25	124,570,398	4,982,816	20.71	103,194,118	51,597
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>		<b>31,142,599,587</b>	<b>1,139,733,754</b>	<b>20.71</b>	<b>23,602,751,287</b>	<b>11,801,376</b> <b>19.35%</b>



# Scenario Example: Reduced VMT, Increased Avg. Efficiency

2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>

2030 Reduced VMT, Increased Efficiency	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	25	3,059,760,409	122,390,416	20.71	2,534,583,133	1,267,292
Mid Size Auto	13.0%	349,659	28	3,036,403,460	108,442,981	20.71	2,245,745,687	1,122,873
Sub Compact/Compact	34.0%	914,492	35	7,941,362,895	226,896,083	20.71	4,698,790,977	2,349,395
Hybrid cars	0.5%	13,448	45	116,784,748	2,595,217	20.71	53,744,341	26,872
Biodiesel cars	0.5%	13,448	45	116,784,748	2,595,217	20.71	53,744,341	26,872
Plug-in hybrid	0.5%	13,448	52	116,784,748	2,245,861	20.71	46,509,526	23,255
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	23	8,875,640,882	385,897,430	20.71	7,991,549,871	3,995,775
Motorcycle (2WV)	0.4%	10,759	25	93,427,799	3,737,112	20.71	77,395,588	38,698
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>23,356,949,690</b>	<b>854,800,315</b>	<b>20.71</b>	<b>17,702,063,465</b>	<b>8,851,032</b> 39.51%

# Scenario Example: Reduced VMT, Increased Avg. Efficiency, Smaller Vehicles



2008	%	# vehicles	Avg. Fuel efficiency	ANNUAL VMT Total	Gasonline Consumption (Gallons)	Gasoline CO2 Emissions Factor (lbs/CO2 per Gal)	Lbs/CO2	Short Tons CO2 (1=2000lbs)
<b>FLEET MIX</b>								
Full Size Auto	13.1%	352,348	18.61	3,399,733,788	182,683,170	20.71	3,783,185,761	1,891,593
Mid Size Auto	13.0%	349,659	19.965	3,373,781,622	168,984,805	20.71	3,499,506,316	1,749,753
Sub Compact/Compact	34.0%	914,492	25.65	8,823,736,550	344,005,324	20.71	7,124,006,246	3,562,003
Hybrid cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Biodiesel cars	0.5%	13,448	40	129,760,832	3,244,021	20.71	67,180,427	33,590
Plug-in hybrid	0.5%	13,448	52	129,760,832	2,495,401	20.71	51,677,251	25,839
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	38.0%	1,022,079	14	9,861,823,203	704,415,943	20.71	14,587,749,764	7,293,875
Motorcycle (2WV)	0.4%	10,759	25	103,808,665	4,152,347	20.71	85,995,098	42,998
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>	<b>26.6</b>	<b>25,952,166,323</b>	<b>1,413,225,030</b>	<b>20.71</b>	<b>29,266,481,291</b>	<b>14,633,241</b>
<b>2030</b>								
<b>FLEET MIX</b>								
Full Size Auto	12.1%	325,452	25	2,826,190,913	113,047,637	20.71	2,341,103,504	1,170,552
Mid Size Auto	14.0%	376,555	28	3,269,972,957	116,784,748	20.71	2,418,495,356	1,209,248
Sub Compact/Compact	47.0%	1,264,151	35	10,977,766,354	313,650,467	20.71	6,495,387,527	3,247,694
Hybrid cars	0.5%	13,448	45	116,784,748	2,595,217	20.71	53,744,341	26,872
Biodiesel cars	0.5%	13,448	45	116,784,748	2,595,217	20.71	53,744,341	26,872
Plug-in hybrid	0.5%	13,448	52	116,784,748	2,245,861	20.71	46,509,526	23,255
Electric cars	0.0%	0	60	0	0	20.71	0	0
Light-duty trucks / SUV	25.0%	672,421	23	5,839,237,423	253,879,888	20.71	5,257,598,599	2,628,799
Motorcycle (2WV)	0.4%	10,759	25	93,427,799	3,737,112	20.71	77,395,588	38,698
<b>TOTAL</b>	<b>100.0%</b>	<b>2,689,682</b>		<b>23,356,949,690</b>	<b>808,536,146</b>	<b>20.71</b>	<b>16,743,978,783</b>	<b>8,371,989</b> 42.79%



# What you can do...

---

- Calculate your footprint
  - [www.gcbl.org/climatechange](http://www.gcbl.org/climatechange)
- Make individual choices to reduce your footprint:
  - Drive less today (car pooling, public transit, flex work schedule)
  - Buy more efficient in the future (light bulbs, car, appliances)
  - Change habits (leaving lights on, eat less meat, shorter showers)
  - [www.gcbl.org/climatechange](http://www.gcbl.org/climatechange)
- Participate in the discussion online:
  - [www.gcbl.org/transitionplans](http://www.gcbl.org/transitionplans)