

# MOVING FORWARD – Reducing Greenhouse Gas Emissions from Passenger Vehicles in Manitoba



Manitoba Vehicle Standards Advisory Board

JANUARY 30, 2009

Manitoba 

## ABSTRACT

*Moving Forward* provides recommendations for developing standards, programs and measures to improve fuel efficiency and reduce greenhouse gas emissions from Manitoba's private light-duty fleet as required by *The Climate Change and Emissions Reductions Act*. Prepared by the Manitoba Vehicle Standards Advisory Board for the Minister of Manitoba Science, Technology, Energy and Mines, the report reviews fuel efficiency and emissions standards from national and international perspectives, with particular attention to the standards proposed by the California Air Resources Board; it also recommends complementary programs and measures to reduce greenhouse gases from passenger vehicles. The report also includes an introduction providing context and analysis of light-duty vehicle purchase trends and energy use in Manitoba.

## Letter From Board Co-Chairs

The Honourable Jim Rondeau  
Minister of Manitoba Science Technology, Energy and Mines  
Legislative Building,  
Winnipeg, Manitoba

January 30, 2009

Dear Minister Rondeau:

Please find attached the report of the Manitoba Vehicle Standards Advisory Board (VSAB) titled *Moving Forward – Reducing Greenhouse Gas Emissions from Passenger Vehicles in Manitoba*.

This report complies with the requirements of *The Climate Change and Emissions Reductions Act* and includes recommendations regarding standards, programs and measures to reduce greenhouse gas emissions from Manitoba's private light-duty vehicle fleet.

On behalf of the board, we thank you for the opportunity to contribute to the long term strength and leadership of Manitoba. We can all be proud of the government's commitment to Kyoto targets and reducing greenhouse gas emissions for the benefit of future generations.

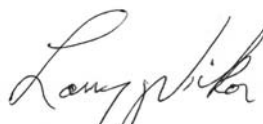
The task of achieving Kyoto targets will be challenging. So, too, was the task of the VSAB and you will find that many of our recommendations may very well require substantive societal change. As is so often the case, reducing GHG emissions from private light-duty vehicles in Manitoba has its own unique considerations not found in other jurisdictions. We worked hard, therefore, to propose uniquely Manitoba strategies.

One important learning for the Board was that Manitobans' total annual vehicle kilometres travelled increased by 27 per cent from 2000 to 2007. We expect this is a good indication that our economy is strong and our citizens mobile. However, given that Manitoba led the nation in the size of that increase, and given that the Canadian overall increase was only 6.5 per cent, you can see that the obligation not simply to stabilize but actually reduce GHG emissions from this class of vehicles will not be trivial.

In the absence of a dominant national or North American standard the board is presenting recommendations that attempt to strike an appropriate balance between standards for vehicle manufacturers and other complementary measures more directly within the control of the governments and citizens of Manitoba.



**Marilyn McLaren** (co-chair)  
President and CEO, Manitoba Public Insurance



**Larry Vickar** (co-chair)  
President, Vickar Community Chevrolet

### BOARD MEMBERS

**Randall McQuaker**  
Executive Director,  
Resource Conservation  
Manitoba

**Ajaleigh Williams**  
Chapter Coordinator,  
Red River Valley Clean  
Cities Coalition,  
Winnipeg Chapter Inc.  
Project Coordinator,  
City of Winnipeg Fleet  
Management Agency

**Jeff Zabudsky**  
President and CEO,  
Red River College



# Table of Contents

Letter From Board Co-Chairs	1
Definitions	4
Executive Summary	5
Summary of Key Findings	5
Recommendations for a Vehical Standard in Manitaoba	6
Recommended Complementary Measures	6
Manitoba Vehicle Standards Advisory Board	8
PART 1 – Vehicle Purchase and Use Trends In Manitoba	9
Summary	9
Light-duty Vehicle Emissions in Manitoba	9
Light-duty Vehicle Purchase Trends in Manitoba	10
Analysis of Manitoba’s Existing Light-duty Vehicle Fleet	11
Light-duty Vehicle Use & Fuel Economy Trends in Manitoba	12
PART 2 – Summary of Vehicle Efficiency Standards	13
United States	13
California	13
Key Comparisons Between CARB and CAFE	14
Canada	14
British Columbia	15
Québec	15
International Vehicle Efficiency Standards	15
PART 3 – Choosing a Vehicle Emission Standard Suitable to Manitoba	16
Board Recommendations on Emission Standards and Conditions for Implementation	17
Recommended Complementary Programs and Measures	18
Appendix	20
Notes	22

## Definitions

**Light-duty Vehicle (LDV)** – A passenger car or passenger car derivative capable of seating 12 passengers or less. (40 CFR 86.1803-01) [Note: The federal “light-duty vehicle” definition is essentially identical to the California definition for “passenger car.”]<sup>1</sup>

**Light-duty Truck (LDT)** – Any motor vehicle rated at 8,500 pounds gross vehicle weight rating (GVWR) or less that has a vehicle curb weight of 6,000 pounds or less, and has a basic vehicle frontal area of 45 square feet or less, which is:

- 1) Designed primarily for purposes of transportation of property or is a derivation of such a vehicle, or
- 2) Designed primarily for transportation of persons and has a capacity of more than 12 persons, or
- 3) Available with special features enabling off-street or off-highway operation and use. (40 CFR 86.1803-01)<sup>2</sup>

**California Air Resources Board (CARB)** – California’s lead air quality agency, consisting of an eleven member board appointed by the Governor and several hundred employees. CARB is responsible for attainment and maintenance of the state and federal air quality standards, and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.<sup>3</sup>

**Corporate Average Fuel Economy (CAFE)** – Corporate Average Fuel Economy is the sales weighted average fuel economy, expressed in miles per gallon (mpg), of a manufacturer’s fleet of passenger cars or light trucks with a gross vehicle weight rating (GVWR) of 8,500 lbs. or less, manufactured for sale in the United States, for any given model year. Fuel economy is defined as the average mileage traveled by an automobile per gallon of gasoline (or equivalent amount of other fuel) consumed as measured in accordance with the testing and evaluation protocol set forth by the Environmental Protection Agency (EPA).<sup>4</sup>

**Company Average Fuel Consumption (CAFC)** – Set by Transport Canada under a voluntary Motor Vehicle Fuel Consumption Standards (MVFC) Program and inaugurated in 1978. Under the Program, vehicle manufacturers are committed to meet a progressively stringent annual Company Average Fuel Consumption

(CAFC) standard for new automobiles sold in Canada. The CAFC standards in Canada are similar to the US Corporate Average Fuel Economy (CAFE), except that the former standards are voluntary, while the latter are mandatory.<sup>5</sup>

**Motor Vehicle Fuel Consumption Standards Act (MVFCSA)** – MVFCSA was passed in 1981 to enforce the CAFC’s standards as part of the government’s off-oil policy of the early 1980’s. The Act was not proclaimed at that time, as the Minister accepted the vehicle manufacturers’ voluntary commitment to meet and not exceed the required standards. The Act was proclaimed in 2007 to permit mandatory regulation of fuel efficiency standards.<sup>6</sup>

**National Highway Traffic Safety Administration (NHTSA)** – The NHTSA is an agency of the Executive Branch of the U.S. Government, part of the Department of Transportation. NHTSA mission is to save lives, prevent injuries and reduce economic costs due to road traffic crashes, through education, research, safety standards and enforcement activity. It is also responsible for fuel economy standards for motor vehicles, the latter through the Corporate Average Fuel Economy (CAFE) system.<sup>7</sup>

**Megatonne** – (Mt) is one million tonnes.

**Greenhouse Gas** – These gases allow sunlight to enter the atmosphere freely. When sunlight strikes the Earth’s surface, some of it is re-radiated back towards space as infrared radiation (heat). Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere. Many gases exhibit these “greenhouse” properties. Some of them occur in nature (water vapour, carbon dioxide, methane, and nitrous oxide), while others are exclusively human made (certain industrial gases). Over time, if atmospheric concentrations of greenhouse gases remain relatively stable, the amount of energy sent from the sun to the Earth’s surface should be about the same as the amount of energy radiated back into space, leaving the temperature of the Earth’s surface roughly constant.<sup>8</sup>

# Executive Summary

## Summary of Key Findings

### Vehicle Standards in the U.S. and Canada

- Under The Clean Air Act the United States Environmental Protection Agency (EPA) sets emissions standards for new motor vehicles. The U.S. government introduced its first Corporate Average Fuel Economy (CAFE) standard in 1973, and passed new revised standards in 2007.
- California may also adopt state standards for new motor vehicles if the administrator of the EPA grants a waiver. Other states may adopt emissions standards for new motor vehicles if they are identical to the California standard. The EPA has historically granted waivers to California.
- In 2004 California enacted a bill to set unique standards for greenhouse gas emissions and requested a waiver from the EPA; this request was denied. On entering office the Obama administration asked the EPA to reassess the decision to deny the waiver.
- Eighteen states and four provinces (British Columbia, Manitoba, Quebec and Nova Scotia) have drafted legislation or signalled support for the California standard. These jurisdictions comprise 46 per cent of the North American vehicle market.
- Québec and B.C. have passed legislation to adopt the California standard and have developed regulations that are contingent on EPA approval of California's waiver.
- In Canada, vehicle standards have been implemented through a voluntary agreement with manufacturers. The federal government committed to developing mandatory regulations by the end of 2008, but missed this deadline. (Note: Since the board concluded, Canada announced the intent to regulate vehicle standards under the Canadian Environmental Protection Act (CEPA) effective 2011 model year.)

### Vehicle Purchase and Use Trends in Manitoba

- In Manitoba, light-duty vehicles (passenger cars and light trucks) comprise 15 per cent of all greenhouse gas emissions in the province, and 43 per cent of all emissions from all transportation activities. Between 1990 and 2006, emissions from all light-duty vehicles in Manitoba increased by 21.6 per cent; with most of this increase coming from the light-truck category (which includes small vans and SUVs).
- Between 1996 and 2006, the total stock of all light-duty vehicles in Manitoba increased by 37 per cent. The stock of passenger cars has remained relatively flat, while light trucks (including small vans and SUVs) have increased by 88 per cent.
- From 1996 to 2007, Canada experienced a 6.5 per cent increase in total annual light-duty vehicle kilometres traveled; over the same period Manitoba experienced an increase of 27 per cent, the highest among all Canadian provinces.
- From 1996 to 2006, the proportion of Canadians commuting to work by car decreased by 1.3 per cent, in Winnipeg this proportion increased by 1.4 per cent; the largest increase among 35 metropolitan areas surveyed.
- From 1996 to 2006, the number of Canadians using public transit to commute to work increased from 10.1 per cent to 11.0 per cent. In Manitoba, this number declined from 9.8 per cent to 8.9 per cent.

### Developing a Tailored Approach for Manitoba

- The California standard will achieve deeper greenhouse gas reductions earlier and is the board's preferred option; however, Manitoba accounts for only 2.8 per cent and 0.26 per cent of the Canadian and North American new car market respectively. Board recommendations consider Manitoba's small market influence.

Vehicle standards will have limited impact on reducing greenhouse gases if current vehicle purchase, ownership and use trends continue. Complementary measures to help Manitobans reduce light-duty vehicle emissions should be given equal consideration by the Manitoba government.

## Recommendations for a Vehicle Standard in Manitoba

The Vehicle Standards Advisory Board recommends that Manitoba:

- Monitor the EPA's position on the California standard. If California is granted a waiver, Manitoba should adopt the California standard following independent economic analysis to ensure that this will not result in hardship for Manitoba businesses and consumers, and proceed based on the results of this analysis.
- Support a single dominant North American standard that incorporates the strengths of both the revised CAFE standard and the California standard and achieves greenhouse gas reductions equivalent to the standard proposed by California.
- Adopt California's new vehicle labelling program designed to help consumers choose the most environmentally friendly vehicle that meets their needs.
- Communicate Manitoba's preference for the California standard to Canada's federal government and to provincial and territorial ministers.
- Ensure that the provincial government fleet meets or exceeds the California standard while maintaining and improving the functional and safety needs of the fleet.

## Recommended Complementary Measures

The Vehicle Standards Advisory Board recommends Manitoba undertake the following complementary programs and measures:

- 1. Reduce emissions from existing vehicles.**
  - Promote fuel efficiency through programs on vehicle maintenance, tire inflation, reduced idling, and voluntary mobile emissions testing.
  - Work with Manitoba fuel retailers to ensure the public has convenient access to on-site air compressors at all filling stations. Encourage government fleets to locate air compressors in parking areas for easy access by staff.
  - Develop a strong green driver training program, and make education materials available at automobile dealerships and insurance offices.
  - Broaden programs to scrap older vehicles and provide incentives to shift to cleaner vehicles or public transit.
  - Limit the salvage auction of pre-1995 vehicles undertaken by Manitoba Public Insurance to vehicles for parts only.
  - Assess the practicality of integrating emissions testing into vehicle safety inspections.
  - Maintain and enforce current highway speed limits in Manitoba and improve the synchronization of traffic lights.
- 2. Encourage consumers to purchase low-emitting vehicles.**
  - Replace Manitoba's Hybrid Electric Vehicle Rebate program with a greenhouse gas reduction-based vehicle rebate that may include a surcharge on high-emitting vehicles. This program should be developed in consultation with stakeholders and include thorough analysis of impacts on businesses and consumers.
  - Develop consumer awareness programs that encourage Manitobans to select the right vehicle based on intended use.







**3. Help Manitobans drive less.**

- Support active transportation infrastructure throughout Manitoba.
- Improve transit services throughout the province and develop rapid transit.
- Starting with the public sector, require large employers to develop and offer mandatory workplace transportation demand management programs that promote ridesharing, public transit, walking and cycling.
- Encourage Manitoba student organizations to develop options for integrating discounted bus passes into annual student fees.

**4. Develop and demonstrate vehicle and fuel advancements.**

- Evaluate new and emerging vehicle technology such as plug-in hybrid electric vehicles, electric vehicles, and vehicle-to-grid technology.
- Provide support to light-duty fleets for testing new technologies and measuring emission reductions.
- Continue to promote the production and use of alternative fuels such as ethanol, biodiesel and other renewable diesels, using small local production and distribution. Encourage the development of second generation (non-food-based) feed stocks.

## Manitoba Vehicle Standards Advisory Board



Governments are struggling to reconcile two uniquely interconnected concerns: how to decrease their reliance on limited fossil fuel resources; and how to reduce emissions of climate changing greenhouse gases. Vehicle fuel efficiency standards and other emission reduction programs play a critical role in addressing both of these policy goals.

Enacted June 2008, *The Climate Change and Emissions Reductions Act* (CCERA) directed the Minister of Science, Technology, Energy and Mines to appoint the Manitoba Vehicle Standards Advisory Board. In September 2008, the board was established and required, by legislation, to provide recommendations to the minister by January 31, 2009.

*The Climate Change and Emissions Reductions Act* commits the province to reducing greenhouse gas (GHG) emissions to 6 per cent below 1990 levels by 2012. The act is backed by *Beyond Kyoto*, Manitoba's updated climate change action plan, a comprehensive strategy outlining over 60 actions that will achieve GHG reductions from all sectors. Beyond Kyoto commits Manitoba to reducing GHG emissions from the transportation sector by up to one megatonne.

The Manitoba Vehicle Standards Advisory Board was tasked with making recommendations to the minister for achieving the most cost-effective efficiency improvements and emissions reductions for new private vehicles from 2010 to 2016, and beyond. In addition, the board was required to recommend targets, complementary programs and measures to achieve these improvements and reductions.

In making its recommendations, the board was given flexibility to consider a range of options, but was asked to closely evaluate the emissions reduction methodology of the California Air Resources Board (CARB). The board was asked to evaluate existing cost-effective, road-ready technology that would lead to maximum efficiency improvements, while preserving consumer choice.

The board was co-chaired by Marilyn McLaren, president and CEO of Manitoba Public Insurance, and Larry Vickar, president of Vickar Community Chevrolet. Three additional members were appointed to the board representing a cross-section of stakeholders and diversity of opinions. Secretariat support was provided by the International Institute for Sustainable Development. Analytical and research support was provided by the Transport Institute at the University of Manitoba.

The board met eight times between October 2008 and January 2009. Eleven organizations presented to the board, including the Canadian Vehicle Manufacturers Association, the Association of International Automobile Manufacturers of Canada, the Manitoba Motor Dealers Association, Transport Canada, the California Air Resources Board, Pollution Probe, the Pembina Institute, Green Car Congress, and the University of Winnipeg Centre for Sustainable Transportation, and a written submission was tabled by Resource Conservation Manitoba. The Transport Institute at the University of Manitoba reviewed the most recent technical literature, case studies and statistics, and presented the results of their review to the board. However, the views expressed here are those of the board's members.

Although there were some diverging opinions regarding the effectiveness of the various standards presented to the board, there was consensus around the need for more stringent fuel emission standards, and acknowledgement that complementary programs and measures should play a role in encouraging Manitobans to reduce their use of transportation-related fossil fuels.

## PART 1 – Vehicle Purchase and Use Trends In Manitoba

### Summary

Greenhouse gas emissions from light-duty vehicles in Manitoba have continued to rise. There have been incremental improvements in vehicle fuel economy across the fleet, and a trend toward fewer average annual vehicle kilometres traveled per vehicle. However, the choice of vehicle, a significant increase in the number of vehicles and double digit increases in the total vehicle kilometres travelled by Manitobans have put the GHG reduction targets further and further out of reach.

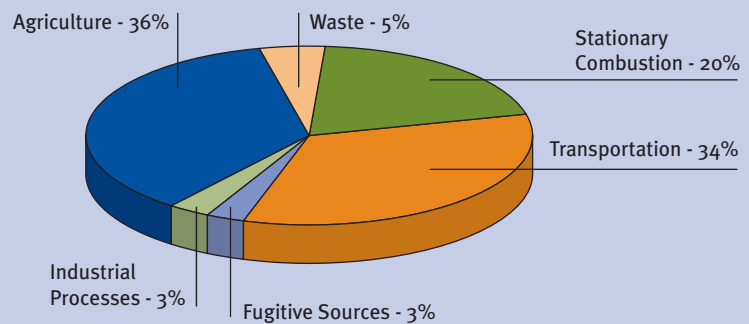
Light-duty trucks account for about 46 per cent of the entire vehicle market in the United States. They are owned primarily by households with children, higher incomes, and tend to be driven more than other types of vehicles. Similarly, in Manitoba consumers have been shifting away from passenger cars toward trucks, small vans and SUVs. Trends observed across the private light-duty fleet include more vehicles on our roads, a shift to larger, less fuel efficient vehicles, and an increase in total annual vehicle kilometres driven in Manitoba that is significantly higher than the national average.

Manitoba has a distinct economic, social, cultural and climatic environment that influences transportation characteristics and consumer choices. Over the ten-year period between 1996 and 2006, the number of light-duty passenger vehicles registered in Manitoba increased by 37 per cent. This number is still increasing. From 2000 to 2007 Canada experienced an increase of 6.5 per cent in total annual light-duty vehicle kilometres traveled, while Manitoba experienced an increase of 27 per cent, the highest increase among all provinces.<sup>9</sup>

### Light-duty Vehicle Emissions in Manitoba

Emissions from all transportation activities in Manitoba (including light-duty, heavy-duty, off road machinery and equipment, rail and aviation) comprise 34 per cent of Manitoba's emissions profile (approximately 7.2 megatonnes). Emissions from light-duty vehicles only, the segment considered in this report, account for 15 per cent of all emissions in Manitoba.<sup>10</sup>

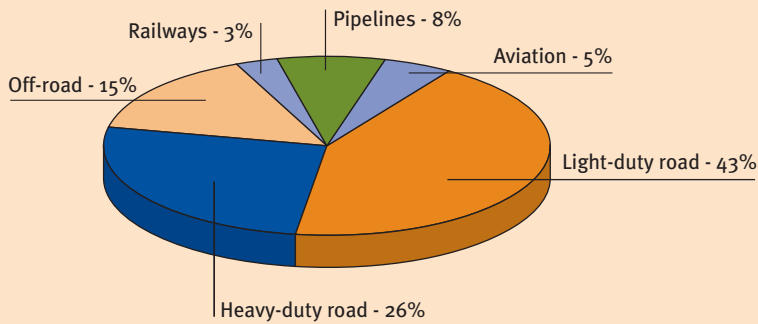
**FIGURE 1:**  
Manitoba GHG Emissions by Sector (2006)



Source: Environment Canada, National Inventory Report 1990-2006 (2008)

Of the 7.2 megatonnes of GHGs emitted by all transportation activities occurring in the province, light-duty (gas and diesel) road transportation comprises the largest segment (43 per cent), followed by heavy-duty road transportation (26 per cent), and off-road equipment used in agriculture, forestry and mining (15 per cent).<sup>11</sup>

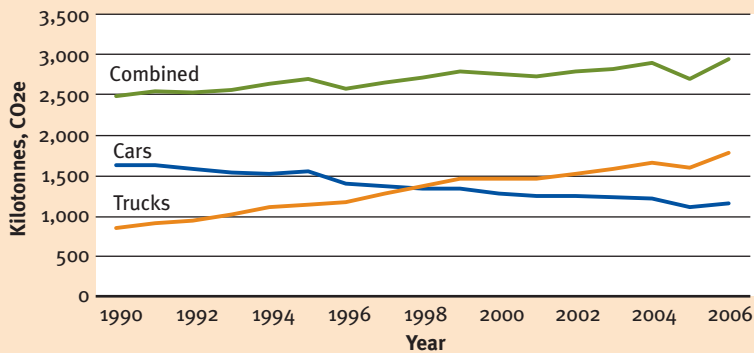
**FIGURE 2**  
Transportation Emissions by Activity in Manitoba (2006)



Source: Environment Canada, National Inventory Report 1990-2006 (2008)

Between 1990 and 2006 emissions from light-duty vehicles increased 21.6 per cent (approximately half a megatonne), although some sectors are likely to achieve greater reductions than others, on a proportionate basis light-duty vehicles are now 27.4 per cent above the target to be achieved in three years. Over this same period, it is important to note that emissions from light duty cars decreased by 29 per cent, while emissions from light-duty trucks (which includes mini vans and SUVs) more than doubled.<sup>12</sup>

**FIGURE 3**  
Light-duty Vehicle Emissions in Manitoba (1990-2006)



Source: Environment Canada, National Inventory Report 1990-2006 (2008)

## Light-duty Vehicle Purchase Trends in Manitoba

In 2007 Manitobans purchased 2.8 per cent of the new vehicles sold in Canada.<sup>13</sup> This is 0.26 per cent of the total North American auto market.<sup>14</sup>

Manitoba is one of four provinces where truck sales exceed car sales in 2007; (Saskatchewan, Alberta and British Columbia are the other three). Of all light-duty vehicles sold in Canada in 2007, 50.8 per cent were cars while 49.2 per cent were trucks. Over the same period, 42.9 per cent of all light-duty vehicles sold in Manitoba were cars, and 57.1 per cent were trucks. By comparison, of all light-duty vehicles sold in Québec in 2007, 63 per cent were cars and 37 per cent were trucks.

A market analysis conducted by the University of Winnipeg Centre for Sustainable Transportation on behalf of the VSAB indicated the following vehicle purchase trends in Manitoba between 1990 and 2006:

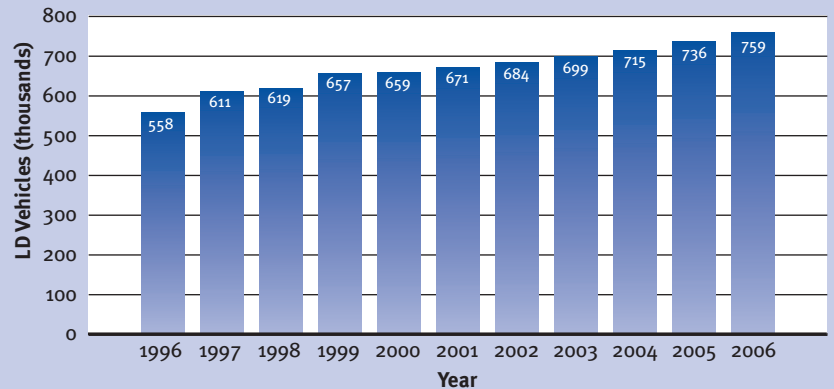
- Declining purchases of **subcompact cars** in urban areas, and significant increases in rural areas;
- Significant decrease in the purchase of **compact cars** in urban areas, and a small increase in rural areas;
- A general decrease in the purchase of **midsize and large cars** in both urban and rural areas;
- A medium increase in **small vans** in urban areas, and a large increase in rural areas;
- A dramatic increase in **sport utility vehicles** in both rural and urban areas.

## Analysis of Manitoba's Existing Light-duty Vehicle Fleet

Despite growth in provincial median income that is consistent with the national average of 3.7 per cent<sup>15</sup>, the number of light-duty passenger vehicles (cars, trucks, small vans and SUVs) registered in Manitoba increased by 37 per cent over the ten-year period between 1996 and 2006.

During this time the total number of light-duty gasoline cars on Manitoba roads remained relatively flat, increasing from 344,415 units to 373,047 units. Over the same time period, light-duty gasoline trucks, SUVs and small vans increased from 185,829 units to 349,097 units, an increase of 88 per cent over a ten-year period. While light-duty diesel cars and trucks make up a small segment of the private provincial fleet, a similar trend can be observed, with cars increasing from 2,899 units to 3,617 units, and trucks increasing from 9,693 units to 17,809 units, between 1996 and 2006 respectively.

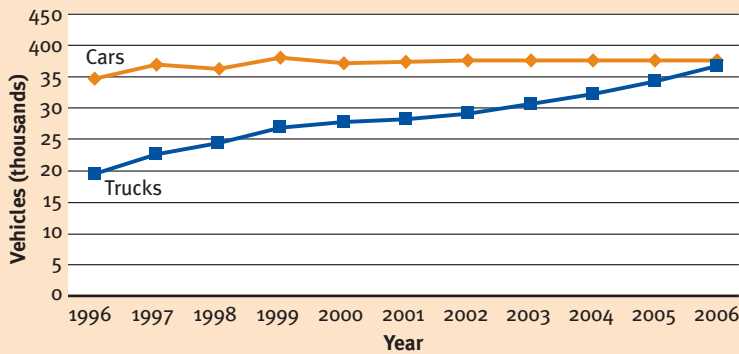
**FIGURE 4:**  
Total Stock of Light-duty Vehicles in Manitoba (1996-2006)



Source: The University of Winnipeg, Centre for Sustainable Transportation, presentation to Manitoba Vehicle Standards Advisory Board, October 28, 2008.

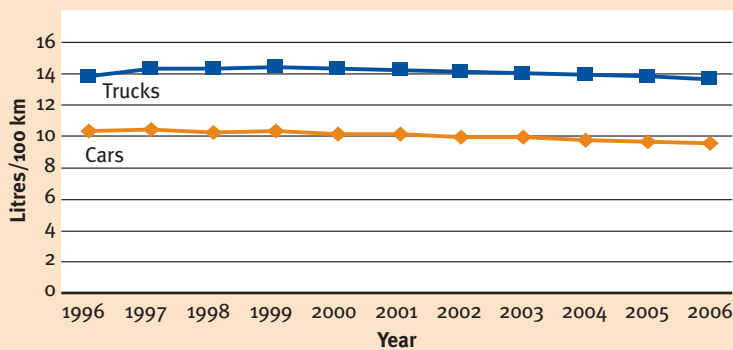


**FIGURE 5:**  
Number of Light-duty Cars and Trucks in Manitoba  
(1996-2006, Gasoline and Diesel Combined)



Source: The University of Winnipeg, Centre for Sustainable Transportation, presentation to Manitoba Vehicle Standards Advisory Board, October 28, 2008.

**Figure 6 -**  
Fuel Consumption by Light-duty Cars and Trucks in Manitoba (1996 to 2006)



Source: The University of Winnipeg, Centre for Sustainable Transportation, presentation to Manitoba Vehicle Standards Advisory Board, October 28, 2008.

## Light-duty Vehicle Use & Fuel Economy Trends in Manitoba

Between 1996 and 2006 the fuel economy of Manitoba's private fleet of light-duty gasoline cars improved from 10.33 litres/100km to 9.61 litres/100km; an average fuel economy improvement of 7.5 per cent.

Over the four year period (1996 to 1999 inclusive) the average fuel economy of Manitoba's private light-duty gasoline truck fleet declined by 5 per cent. This was followed by annual incremental improvements from 2000 to 2006. By 2006 the fuel economy of Manitoba's fleet of light-duty gasoline trucks (including SUVs and small vans) had rebounded slightly, improving by approximately 1 per cent over 1996 levels.<sup>16</sup>

The average age of the existing stock of passenger cars in use in Manitoba is 8 years. The average age of the inventory of light-duty and SUVs in use is closer to 12 years.<sup>17</sup> Between 1996 and 2006, average vehicle kilometres traveled by light-duty gasoline cars declined from 16,344 km to 13,813 km; a 15.5 per cent reduction. Over the same period, average vehicle kilometres traveled by light-duty gasoline trucks (including SUVs and small vans) also declined by 15.5 per cent (from 18,762 km to 15,857 km).<sup>18</sup> Despite the trend toward declining average kilometres (per light-duty vehicle) in Manitoba, total annual light-duty vehicle kilometres travelled in the province continue to increase due to the growing number of light-duty vehicles on our roads.

## PART 2 – Summary of Vehicle Efficiency Standards

### United States

In 1975, the United States government introduced the first Corporate Average Fuel Efficiency standards (CAFE) program in response to the energy crisis of 1973. Its objective was to reduce energy consumption by increasing the fuel economy of cars and light trucks. The CAFE program is regulated by the National Highway Traffic Standards Administration (NHTSA).

In addition, the emission standards are administered by the U.S. Department of Transportation based on U.S. Environmental Protection Agency (EPA) procedures.

Implementation of the CAFE program led to a substantial increase in fuel efficiency between 1978 and 1985, and slower increases until a peak in 1987. Since then, improvements in vehicle technology have focused on horsepower over fuel efficiency. By 2004, fuel efficiency had declined from 1987 levels. In March 2006, reformed CAFE standards were announced for trucks, based on the “vehicle footprint”. Fuel economy targets were set for each footprint category, and each manufacturer must meet or exceed that set level to achieve compliance.<sup>19</sup> In December 2007, the Energy Independence and Security Act was passed establishing new CAFE standards that will require overall fleet efficiency of 35 mpg for the combined fleet of cars and light trucks by model year 2020. Starting model year 2011, all manufacturers will be required to comply with a reformed CAFE standard.

### California

The California Air Resources Board (CARB) was created to respond to serious air quality and smog issues, especially in greater Los Angeles. The Clean Air Act (1966) authorizes states to impose stronger air protection laws than those imposed by the EPA, but only with an EPA waiver. CARB has imposed numerous improvements in emission levels. Auto makers have been able to reach those standards with modifications to regular vehicles destined for California and other states that adopted the California standards. The combination of legislation and technology allowed California to become a leader and a testing ground for many clean air quality and emissions reduction innovations that have since become standard.



In 2004, California enacted the Pavley bill which set standards for carbon dioxide emissions from vehicles, effective 2009. California applied to the United States EPA for a waiver, which has so far been denied. The U.S. EPA claimed that carbon dioxide was not a regulated emission, and asserted that the agency did not have a compelling reason to issue the waiver. This legislation currently faces federal and state court challenges by automakers and some California car dealers. Nevertheless, a total of 18 states, representing roughly half of the US vehicle market, and two Canadian Provinces have signalled their intent to adopt the California standard if the waiver is granted. The new U.S. administration recently requested that the U.S. Environment Protection Agency review the rationale behind the waiver denial. It is expected that the review will be completed in 2009, following which there is a probability that the waiver may be granted.

## Key Comparisons Between CARB and CAFE

The original 1970's Corporate Average Fuel Efficiency (CAFE) program set two standards - one for cars and one for trucks. Although the overall effect was very positive, the classification system produced unintended effects. Station wagons were popular but inefficient cars, while vans and SUVs were classified as trucks. Although station wagons were more efficient than minivans, by moving away from station wagons and encouraging small vans and SUVs, the automakers improved their performance in both categories, to the detriment of fleet wide average fuel efficiency.

Under the new reformed CAFE standards each manufacturer's required CAFE standard would be based on targets for each footprint category and product mix. This allows manufacturers to meet their required fleet averages, while providing different mixes of vehicles to different markets. The policy enables wider consumer choice by providing manufacturers with flexibility in determining how to meet the specified fuel economy levels.

The CAFE program gives manufacturers considerably more time to implement the technologies necessary to meet the standards. This also means that the benefits in fuel savings and greenhouse gas emissions will be realized at a slower pace.

The reformed CAFE is an attribute based approach using the "vehicle footprint" rather than two distinct weight classes. This approach is favoured in the United States by the National Academy of Science, and in Canada, by Transport Canada and Pollution Probe.

In September 2004, CARB adopted regulations to reduce GHG emissions from passenger cars, small trucks and SUVs; and large trucks and SUVs. This fuel emissions regulation is based on a fleet average that is flexible and allows for credit trading between passenger cars and light duty trucks and between manufacturers. Under the plan, carmakers must meet increasingly stringent standards that phase in between 2009 and 2016. CARB standards include two fleet average GHG requirements:

- a) for passenger car/light-duty truck below 3,750 lbs (PC/LDT1) category; and
- b) for light-duty truck (LDT2) categories; including light trucks between 3,751 lbs-8,500 lbs gross vehicle weight (GVW).<sup>20</sup>

Proponents of the legislation, which is intended to address the effects of global warming, assert that California is leading the nation and that the legislation is in step with scientists' views from around the world.

From 1991 to 2007, automobile manufacturers made steady improvements in the efficiency of drive trains. Considerable improvements in fuel efficiency were easily available. However, North American fuel efficiency remained static, as the improvements were directed to producing higher horsepower to enhance performance and power larger vehicles. CARB officials believe that more aggressive targets are achievable, and if less aggressive targets are set, some technology improvements will continue to be directed toward enhancing horsepower and vehicle size rather than improving efficiency and reducing emissions.

It would appear that the reformed CAFE methodology combined with the more aggressive CARB targets would be the most desirable way forward.

## Canada

Canada, to date, has not regulated fuel efficiency standards federally. From 1978 to 2005 the Canadian government relied on voluntary measures by the industry to meet or exceed US federal CAFE regulations. This led to the adoption in Canada of new fuel economy and efficiency technologies, particularly during the first decade of its inception. However, despite overall positive results in some areas, Canadian government documents indicate a substantial increase in fuel consumption and GHG emissions in the last two decades. In 2005 the Government of Canada entered into a Memorandum of Understanding (MOU) with automobile manufacturers to achieve voluntarily certain GHG reduction goals. This will expire in 2011, when mandatory targets were expected to come into force.



In 2007, Canada proclaimed *The Motor Vehicle Fuel Consumption Standards Act (MVFCSA)*. The Act empowers Transport Canada to set fuel economy standards for new vehicles sold in Canada. The program is similar in scope to the mandatory Corporate Average Fuel Economy (CAFE) program existing in the United States.

To give manufacturers sufficient time to meet the standards, the MVFCSA required regulations to be published by the end of the third year before the model year to be regulated. The first year to be regulated was 2011, corresponding with the new National Highway Traffic Safety Administration CAFE standards. However, the government failed to publish regulations before the end of 2008, so it cannot legally regulate the 2011 model year, creating further uncertainty among automakers. The reason given for this failure was the uncertainty about direction in the U.S. under the new administration. (Note: Since the board concluded, Canada announced the intent to regulate vehicle standards under the Canadian Environmental Protection Act (CEPA) effective 2011.)

## British Columbia

In May 2008, British Columbia enacted legislation to regulate vehicle emissions based on the CARB standards and methodology. The regulation is still being finalized, but is contingent upon the approval of CARB standards in the United States. British Columbia projects that reductions resulting from CARB standards would be 30 per cent by 2016 and beyond. B.C. has projected that annual reductions achieved through the CARB standards would be 600,000 tonnes greater than reductions achieved through the new CAFE standard.

## Québec

The Province of Québec has passed legislation and developed regulations similar to that in British Columbia, and also contingent on the approval of CARB standards in the United States. By 2010, it is expected that all new cars and trucks sold in Québec must comply with the California standards. Implementation of California standards in Québec is expected to result in a 25 per cent reduction in greenhouse gas emissions for the new vehicle fleet.

Research to assess the economic impacts of adopting CARB was undertaken by Québec's Ministère du développement durable, de l'environnement et des parcs. They found that the anticipated regulations would have very little impact on the local automobile industry. Expected economic impacts would most likely result from market restructuring and/or from the impact of already enacted regulations. Adoption of California's regulations will benefit consumers through reductions in fuel consumption and overall fuel costs.

## International Vehicle Efficiency Standards

Strategic energy considerations, land use policies and cultural values have caused Europe and Japan to have more stringent fuel emission standards for new vehicles than North America. It is projected that Japanese standards will achieve the lowest fleet average greenhouse gas emissions for new passenger vehicles in the world.<sup>21</sup> European auto makers produce a significant number of very fuel efficient cars, but in recent years most European vehicles sold in North America have tended to be high end luxury vehicles that are not very efficient. However, European manufacturers do have vehicle models that could be imported to assist North America in achieving more stringent standards. China's rapidly growing market for new passenger vehicles led to standards being implemented in two phases, 2005 and 2008. China has revised its taxation of motor vehicles to strengthen incentives for smaller more efficient vehicles, while taxing larger vehicles.<sup>22</sup> Taiwan, Australia (voluntary) and South Korea also have standards in place.



## PART 3 – Choosing a Vehicle Emission Standard Suitable to Manitoba

The board observes that adoption of any particular vehicle standard, however rigorous, on its own will have limited impact on the reduction of greenhouse gas emissions as long as Manitobans continue driving more kilometres annually.

Accordingly, vehicle emission and fuel consumption standards must be accompanied by effective complementary measures that enable Manitobans to reduce their overall vehicle kilometres travelled without compromising their mobility.

Vehicle standards have positively affected consumer choice by requiring vehicle manufacturers to offer technologies that reduce fuel consumption, and air pollution. However, Manitoba comprises less than 3 per cent of the Canadian automobile market and about .26 of 1 per cent of the North American automobile market. Board members agreed that manufacturers will not build vehicles specific to any unique standard developed for the Manitoba market alone. A unique Manitoba standard could limit the choice of new vehicles available for sale in Manitoba and require restrictions on new and previously owned vehicles brought into the province.

The board recognizes that the California standard, the U.S. CAFE, and the current Canadian Average Fuel Consumption (CAFC) standard as implemented through the voluntary Memorandum of Understanding (MOU) all have inherent strengths and weaknesses. However, based on expert presentations made to the Board and a review of technical literature, the Board has concluded that the California standard will achieve deeper greenhouse gas reductions earlier and will provide greater fuel savings to consumers than either CAFE or CAFC through the voluntary Memorandum of Understanding. As such, CARB is best suited to helping achieve the 2012 target established in legislation under *The Manitoba's Climate Change and Emissions Reductions Act*.

There are many U.S. states and provinces that have indicated that they will enact the California standard if a waiver is granted from the U.S. Environmental Protection Agency. U.S. President Obama has recently directed the U.S. Environmental Protection Agency to review why the waiver was denied and it is expected that the review will be completed in 2009, at which point it appears likely that the waiver may be granted.

States and provinces currently supportive of the California standard comprise 46 per cent of the North American vehicle market. If Manitoba opts to join this group, regulating the California standard in Manitoba may be possible

While the California standard is the preferred option in terms of greenhouse gas reductions, the board did not recommend immediately adopting the California standard through legislation for the following reasons:

- The U.S. presidential administration has recently changed and the status of the California and CAFE standard are in a political flux, with the Obama administration reviewing whether to overturn the U.S. EPA waiver denial.
- The Obama administration is working swiftly to require manufacturers to meet new fuel economy standards as early as the 2011 model year; this will impact how the Canadian government proceeds with its vehicle standard.
- If the Canadian government opts not to enact the more stringent California standard, there would very likely be implications if Manitoba subsequently adopts it unilaterally. There could also be implications if Manitoba and a few geographically diverse provinces adopt the California standard. Potential implications include; limited vehicle model availability for sale in Manitoba, and a requirement for restrictions on new and previously owned vehicles brought into the province. Such restrictions would impact residents as well as new and used vehicle dealers in Manitoba.

The board concluded that the matter of regulating standards for the production of new vehicles is far more efficiently dealt with at a national or North American level. However, the board also concluded that this is not a certain outcome of the current situation. The board foresees the possibility that the U.S. administration could allow the California waiver while establishing its own CAFE standard and leaving decisions on how to proceed in the hands of the manufacturers. This presents a significant challenge for Manitoba, given the small population and geographic isolation from other larger states and provinces with a stated commitment to California standards. It was in this context that the board recommendations were developed.

## Board Recommendations on Emission Standards and Conditions for Implementation

The practicality of adopting the CARB standard is influenced by a number of unresolved factors, many of which cannot be locally regulated. The board recommends that a final decision on Manitoba vehicle standards be deferred until the U.S. EPA position on the CARB standard has been clarified. In light of these circumstances, the board recommends the following sequence of options:

- 1 Manitoba should adopt the CARB standard if the U.S. EPA waiver is granted; even if Canada adopts CAFE or a different standard, provided that an economic analysis is conducted to ensure that Manitoba's adoption of CARB standards does not result in hardship for Manitoba businesses (vehicle dealerships) and consumers.
- 2 Manitoba should adopt the same vehicle standard as the government of Canada if Canada opts for CAFE or CAFV and the economic analysis referenced above determines that adoption of CARB by Manitoba would result in significant adverse business impacts that cannot be adequately ameliorated. As well, Manitoba should express its support for the development of a single dominant North American standard that incorporates the strengths of both the revised CAFE and the CARB methodologies and achieves greenhouse gas reductions equivalent to the California standard.

Further recommendations of the Vehicle Standards Advisory Board include the following:

- The board recommends that Manitoba support the adoption of the most stringent technologically and economically feasible standards at the national level.
- Based on its analysis of California, CAFE and CAFV standards, the board recommends that the government of Manitoba communicate a preference for the California Standard to Canada's federal government, including provincial and territorial ministers responsible for transportation and energy.
- The Manitoba government should set a strong example by ensuring that its own fleet meets or exceeds the California fuel emission standard.
- The Manitoba government should implement measures to encourage Manitobans to purchase vehicles that meet or exceed the California fuel emission standard.
- The Manitoba government should adopt California's new vehicle labelling program that provides a simple ranking system to help consumers choose the most environmentally friendly vehicle that meets their needs.
- The board recommends that whichever national standard is adopted, it should be implemented in a fashion that does not disadvantage Manitoba automobile dealers, or be disruptive to fleets that require specific vehicles for legitimate work-related functions.



## Recommended Complementary Programs and Measures

Statistics Canada's analysis of 1996-2006 census data indicates that the proportion of Canadians commuting to work by car (as drivers and passengers) dropped from 78.1 per cent to 76.8 per cent. In Winnipeg this proportion increased from 77.3 per cent to 78.7 per cent over the same period.<sup>23</sup> Among the 35 census metropolitan areas listed, only 7 areas experienced increases in the use of cars for commuting to work, with Winnipeg showing the single largest increase. Similarly, between 1996 and 2006, the number of Canadians using public transit to commute to work increased from 10.1 per cent to 11.0 per cent. While in Manitoba, this number declined from 9.8 per cent to 8.9 per cent.<sup>24</sup> Manitoba showed the largest decline among the provinces, and was one of only two provinces where the number of commuters using public transit declined.

Furthermore, trends observed across the private light-duty fleet include more vehicles on our roads, a shift to larger less efficient vehicles, and an increase in total annual vehicle kilometres driven in Manitoba that is significantly higher than the national average. Combined, these factors play an influential role in the upward trend in greenhouse gas emissions resulting from light-duty vehicles in Manitoba.

A stringent vehicle standard is an important greenhouse gas reduction tool that Manitoba should aggressively pursue. However, the board agreed that complementary programs should be given equal consideration. These should include targets, performance measures, and key indicators including (but not limited to) greenhouse gas emission reductions. The board recommends that a framework for reporting progress be developed; and that progress be reported annually.

The board recommends development and implementation of complementary measures and programs aimed at reducing greenhouse gas emissions from Manitoba's light-duty vehicle fleet as follows:

- 1. Enhance the efficiency of and reduce greenhouse gas emissions from Manitoba's existing light-duty vehicles through the following programs:**
  - Collaborate with Manitoba vehicle dealers and distributors to encourage motorists to reduce fuel consumption and improve fuel efficiency through regular vehicle maintenance, tire inflation and reduced vehicle idling.
  - Work with Manitoba fuel retailers to ensure the public has convenient access to on-site air compressors at all filling stations. Encourage government fleets to locate air compressors in parking areas for easy-access by staff.
  - Ensure that a robust green driver training program is integrated into driver training in Manitoba, and that green driving education materials are available at Manitoba dealerships and vehicle insurance broker offices.
  - Work with private, public and not-for-profit organizations to broaden programs that encourage scrapping of older, more polluting and often less fuel-efficient vehicles.
  - Limit the salvage auction of pre-1995 vehicles by Manitoba Public Insurance to vehicles for parts only, and consider that this policy and other legislated restrictions on pre-1995 vehicles be upwardly adjusted by model year on an annual basis.
  - Maintain and enforce current highway speed limits in Manitoba.
  - Improve the synchronization of traffic lights in urban centers.
  - Consider ways to develop voluntary mobile emissions testing programs as part of a broader green driver outreach program, and determine if some form of cost effective emissions testing can be integrated into vehicle safety inspections.

**2. Enhance the efficiency of and reduce greenhouse gas emissions from Manitoba's new light-duty vehicles through the following programs:**

- Develop a greenhouse gas reduction-based vehicle rebate program that replaces the two-year hybrid rebate program. The program should provide larger rebates for low-emitting vehicles while attaching a surcharge to high-emitting vehicles. Financial incentives and/or annual vehicle registration fees linked to GHG emission ratings of existing vehicles should be considered.
- Develop consumer awareness programs in collaboration with Manitoba vehicle dealers and distributors to encourage consumers to select the right vehicle based on intended purpose. This could include improved fuel economy labelling on vehicles. This should also include a framework for data collection so that new vehicle purchase trends can be monitored, benchmarks and targets established, and progress measured.

**3. Reduce total annual vehicle kilometres travelled in Manitoba through infrastructure improvements and new programs:**

- Expand active transportation infrastructure throughout Manitoba.
- Develop rapid transit in Winnipeg, improve comfort, reliability and convenience of existing transit services, and expand transit services in Brandon, the Manitoba Capital Region, and Northern Manitoba.
- Promote transportation demand management (TDM) strategies such as car-pooling, cycling and workplace incentives to shift toward more environmentally friendly modes of transportation.
- Starting with the public sector, the province should require large employers to develop and offer mandatory workplace TDM programs.

- Encourage Manitoba student organizations to develop options for integrating discounted bus passes into annual student fees in conjunction with Winnipeg Transit.
- Promote health benefits and cost savings associated with active and sustainable transportation.

**4. Research, develop and demonstrate vehicle and fuel advancements:**

- Evaluate new and emerging vehicle technology such as plug-in hybrid electric vehicles, electric vehicles, and vehicle-to-grid technology
- Provide support to light-duty fleets to test new technologies and measure the impact on greenhouse gas emissions.
- Continue to promote the production and use of alternative fuels, such as ethanol, biodiesel and other renewable diesels, especially using small local production and distribution, as well as encourage the development of second generation feed stocks (non-food based).



### Views of experts, academics and advocates on fuel efficiency and emission reductions

In accordance with *The Climate Change and Emissions Reductions Act* (CCERA), the Vehicle Standards Advisory Board was to gather information from stakeholders, experts and other jurisdictions to recommend appropriate fuel efficiency standards for new private vehicles in Manitoba. Through its deliberations, the Board evaluated the environmental impact associated with the production and use of motor vehicles, analyzed prevailing fuel emission, consumption standards and regulations, and considered the views of experts and advocates. The following presents the name of the speaker, title of the presentation, and organization represented.

#### Presenters (in order of appearance)

Mr. Arne Elias, Executive Director, the Centre for Sustainable Transportation, University of Winnipeg. [Light Duty Vehicles in Manitoba](#)

Dr. Paul Larson, Director, University of Manitoba Transport Institute. [Light-Duty Automotive Fuel Economy Trends: 1975–2008](#)

Jairo Viafara, University of Manitoba Transport Institute. [Fuel Efficiency and Emission Reductions: Overlapping or Complementary Approaches to Climate Change?](#)

Mr. David Adams, President, the *Association of International Automobile Manufacturers of Canada* (AIAMC).

Mr. Mark A. Nantais, President, *Canadian Vehicle Manufacturer's Association* (CVMA) - the national association representing Chrysler Canada Inc., Ford Motor Company of Canada, Limited, General Motors of Canada Limited and International Truck & Engine Corporation Canada.

Mr. Bill Arnold, President, the *Manitoba Motor Dealers Association* (MMDA). Represents all of the new vehicle franchised dealerships in Manitoba. [Comments](#)

Mr. Tom Cackette, Chief Deputy Executive Officer, *California Air Resources Board* (CARB). [California's Clean Passenger Vehicle Program](#)

Mr. Mike Millikin, Editor-in-Chief, Green Car Congress provides high-quality editorial about technologies, products, issues and policies related to sustainable mobility.<sup>25</sup> [North American Light-duty Vehicle Technologies, Standards, Policies and Consumers](#)

Mr. Bob Oliver, Executive Director, *Pollution Probe*, conducts research and contributes to the development of policies to reduce greenhouse gas emissions across Canada. [Considerations for the Development of Manitoba's Vehicle Standard to Reduce Emissions](#)

Ms. Brenda Hensler-Hobbs, Executive Director and Mr. Brian McGregor, Senior Policy Analyst, *Motor Vehicle Fuel Consumption Regulations Task Force*, Transport Canada, the federal department responsible for developing Canada's Motor Vehicle Fuel Consumption Standards. [Tele-conference](#)

Ms. Alison Bailie, Senior Technical and Policy Advisor, *The Pembina Institute*, a national non-profit organization working to create sustainable carbon neutral, climate change, and energy solutions to minimize the environmental impact of fossil fuel energy. [Taking Action on Climate Change – Vehicle Emission Standards](#)

Mr. Peter Miller, Chair Policy Committee, *Resource Conservation Board*, a community-based, non-profit organization dedicated to the promotion of ecological and environmental education; and to the advancement of applied sustainability (tabled submission). [Vehicle Standards and Beyond: Achieving Greenhouse Gas Reductions in Private Auto Sales – A Preliminary Analysis.](#)

Members of the Vehicle Standards Advisory Board actively engaged presenters in a respectful inquiry process. Members exchanged views, knowledge, and expertise while considering the views expressed by the invited experts. They also recognized that some perspectives may differ from those supported by the Government of Manitoba by virtue of its membership at the Western Climate Initiative, the Midwestern Governors Association, and provincial commitments to a green future beyond 2012.

## Board Support

*University of Manitoba Transport Institute*  
Doug Duncan, Research Coordinator  
Jairo Viafara, AICP M.ITE, Research Associate  
David Wolters, Researcher  
Angel Li, Researcher  
Stephen Wright, Researcher  
Allister Cucksey, Researcher

*University of Manitoba Faculty of Engineering*  
G. Paul Zanetel M.A. Sc., P. Eng

*International Institute for Sustainable Development*  
Philip Gass – Project Officer

*Manitoba Science, Technology, Energy and Mines*  
Neil Cunningham  
Denise Marcoux  
Ken Thomas



## Endnotes

- 1 EPA – Exhaust and Evaporative Emission Standards  
<http://www.epa.gov/OMS/cert/veh-cert/boooooi.pdf>
- 2 EPA – Exhaust and Evaporative Emission Standards  
<http://www.epa.gov/OMS/cert/veh-cert/boooooi.pdf>
- 3 California Air Resources Board – Glossary of Air Pollution Terms  
<http://www.arb.ca.gov/html/gloss.htm#C>
- 4 National Highway Traffic Safety Administration – CAFE Overview  
[http://www.nhtsa.dot.gov/portal/site/nhtsa/template.MAXIMIZE/menuitem.43ac99aefa80569eea57529cdbao46ao/?javax.portlet.tpst=f2d14277f710b755fco8d51090008aoc\\_ws\\_MX&javax.portlet.prp\\_f2d14277f710b755fco8d51090008aoc\\_viewID=detail\\_view&itemID=199b8facdcfa401oVgnVCM1000002c567798RCRD&viewType=standard#3](http://www.nhtsa.dot.gov/portal/site/nhtsa/template.MAXIMIZE/menuitem.43ac99aefa80569eea57529cdbao46ao/?javax.portlet.tpst=f2d14277f710b755fco8d51090008aoc_ws_MX&javax.portlet.prp_f2d14277f710b755fco8d51090008aoc_viewID=detail_view&itemID=199b8facdcfa401oVgnVCM1000002c567798RCRD&viewType=standard#3)
- 5 Transport Canada – Motor Vehicle Fuel Consumption Act  
<http://www.tc.gc.ca/mediaroom/releases/nat/2007/07/-h215e.htm>
- 6 Industry Canada – Fuel Economy Standards  
<http://www.ic.gc.ca/eic/site/autoauto.nsf/eng/amo12o6.html>
- 7 NHTSA Mission & Values  
<http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.416f74e861399238160103108aoc/>
- 8 <http://www.eia.doe.gov/bookshelf/brochures/greenhouse/Chapter1>
- 9 Statistics Canada; Canadian Vehicle Survey: Annual, 2007;  
Canadian Vehicle Survey: Annual, 2000
- 10 Environment Canada, National Inventory Report 1990-2006 (2008)
- 11 Ibid.
- 12 Ibid.
- 13 Statistics Canada, New Motor Vehicle Sales: 2007 in Review
- 14 New vehicle sales data for US obtained from Motor Intelligence, 2007,  
[http://www.motorintelligence.com/m\\_frameset.html](http://www.motorintelligence.com/m_frameset.html), retrieved January, 21 2009.
- 15 Statistics Canada, Median Total Income of economic families, Canada, Provinces and Territories, 2000 and 2005
- 16 University of Winnipeg Centre for Sustainable Transportation, presentation to Manitoba Vehicle Standards Advisory Board, October 28, 2008.
- 17 University of Winnipeg Centre for Sustainable Transportation, presentation to Manitoba Vehicle Standards Advisory Board, October 28, 2008.
- 18 Environment Canada data, cited by University of Winnipeg Centre for Sustainable Transportation, October 28, 2008.
- 19 Understanding Proposed CAFE Reforms for Light-Duty Trucks, Kratzke, Stephen, October 20, 2005



- <sup>20</sup> California: Cars: Greenhouse Gas Emissions, Diesel Net  
[http://www.dieselnet.com/standards/us/ca\\_ghg.php](http://www.dieselnet.com/standards/us/ca_ghg.php) Retrieved on February 1, 2009
- <sup>21</sup> Passenger Vehicle Greenhouse Gas and Fuel Economy Standards:  
A Global Update; International Council on Clean Transportation, July 2007.
- <sup>22</sup> Ibid.
- <sup>23</sup> Statistics Canada, 2006 Census, Table 11a Proportion of workers using a car to get to work, census metropolitan areas, 1996, 2001 and 2006;  
<http://www12.statcan.ca/english/censuso6/analysis/pow/tables/table11a.htm>;  
Retrieved January 26, 2009.
- <sup>24</sup> Statistics Canada, 2006 Census, Table 3b Proportion of workers using public transit to get to work and age groups, Canada, provinces and territories 1996, 2001 and 2006;  
<http://www12.statcan.ca/english/censuso6/analysis/pow/tables/table3b.htm>;  
Retrieved January 26, 2009.
- <sup>25</sup> Green Car Congress. Our Mission.  
<http://www.greencarcongress.com/about3.html> Retrieved on January 18, 2009







*This summary document has been printed on  
Astrolite PC 100, FSC (Forest Stewardship Council)  
certified paper from Unisource Canada.*

*This 100 per cent post-consumer waste  
recycled paper is processed chlorine free (PCF) and  
saves trees, energy, landfill space and water.*

**Manitoba Science, Technology, Energy and Mines  
Energy, Climate Change and Green Initiatives Branch  
Winnipeg, Manitoba Canada**

**Phone: 204-945-7382  
E-mail: [ccinfo@gov.mb.ca](mailto:ccinfo@gov.mb.ca)  
Website: [manitoba.ca](http://manitoba.ca)**