

THE RISE OF LIGHT-DUTY TRUCK IN CANADA: REVERSING THE TREND

SYNTHESIS

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FINANCIAL SUPPORT

To conduct this research, Équiterre received funding from the Contributions Program for Non-profit Consumer and Voluntary Organizations. The views expressed in the report are not necessarily those of Innovation, Science, and Economic Development Canada or the Government of Canada.

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LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

\$B	Billion dollars
\$	Canadian dollars
4WD	Four-wheel drive
ASC	Advertising Standards Canada
AWD	All-wheel drive
CO ₂	Carbon dioxide
CVS	Canadian Vehicle Specifications
CUV	Crossover utility vehicle(s)
ECCC	Environment and Climate Change Canada
EPA	Environmental Protection Agency
EV	Electric vehicle(s)
FWD	Front-wheel drive
GDP	Gross domestic product
GHG	Greenhouse gas
GVWR	Gross vehicle weight rating
IEA	International Energy Agency
IIHS	Insurance Institute for Highway Safety
kg	Kilogram(s)
km	Kilometer(s)
km/h	Kilometer(s) per hour
KtCO ₂ e	Kilotons of CO ₂ -equivalent
MDDELCC	<i>Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques</i>
MY	Model year
NRCAN	Natural Resources Canada
OECD	Organisation for Economic Co-operation and Development (OECD)
OQLF	<i>L'Office québécois de la langue française</i>
PHEV	Plug-in hybrid electric vehicle(s)
R&D	Research and development
SAAQ	<i>Société de l'assurance automobile du Québec</i>
SUV	Sport utility vehicle(s)
ZEV	Zero-emission vehicle(s)

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ABOUT ÉQUITERRE

Équiterre seeks to make the necessary collective transitions towards an equitable and environmentally sound future more tangible, accessible and inspiring. Deeply concerned about climate change, Équiterre has developed significant expertise in public policy aimed at reducing greenhouse gas (GHG) emissions over the years.

Through demonstration, education, awareness-raising, research, coaching and mobilization projects, Équiterre rallies citizens, social groups, businesses, public organizations, municipalities, researchers and elected officials in the fields of food, transportation, fair trade, sustainable energy, consumption and the fight against climate change.

Given the disproportionate share of GHG emissions due to the transportation sector in Quebec and Canada, Équiterre quickly identified collective and individual mobility choices as well as land-use planning practices as key priorities for action to reduce society's fuel consumption.

Équiterre has 25,000 members and over 130,000 supporters who participate in its actions. The organization, which celebrated its 25th anniversary in 2018, is one of the leading environmental organizations in Québec.

ABOUT THIS RESEARCH PROJECT

Conducted by Équiterre in collaboration with Polytechnique Montréal and the CIRANO research group, the goal of the study entitled "The Rise of Light-Duty Trucks in Canada: Reversing the Trend" is to understand the Canadian public's growing preference for oversized and fuel-inefficient vehicles in order to come up with possible solutions. The goal of this project is to identify:

- The historic and socioeconomic factors that explain the phenomenon;
- Their motivations that lead to vehicle purchases;
- The most effective messages for discouraging the purchase of oversized and fuel-inefficient vehicles;
- The automotive industry advertising practices and strategies; and
- The regulatory framework governing automotive advertising.

An in-depth understanding of these various elements led to the identification of action levers adapted to the Canadian situation in order to slow down and ultimately reverse the trend towards increased sales of light-duty trucks in Canada. The results of this research guided the development of public policy recommendations regarding certain practices.

EXECUTIVE SUMMARY

At a time when we are seeing rising GHG emissions from Canada's transportation sector, this report synthesizes the various components of the Équiterre study "*Comprendre la hausse des camions légers au Canada afin de renverser la tendance*" [The Rise of Light-Duty Trucks in Canada: Reversing the Trend]. It explores the causes of the proliferation of fuel-inefficient and oversized vehicles in Canada, as well as examining the consequences associated with this phenomenon. The end objective of this research project is to issue a series of solutions adapted to Canadian realities with a view to reversing this alarming trend.

Context

The increase in light-duty trucks is not peculiar to Canada; indeed, it is a global phenomenon. It is one of the two (2) main impediments to the decarbonization of the light-duty vehicle sector and to the Canadian government's electrification efforts. This contextual approach gave rise to the following research question: "Why do Canadians prefer light-duty trucks and how can we reverse this trend in order to help Canada meet its GHG reduction objectives?" The research sub-questions guided the development of the various components of the study. Exploratory interviews were conducted to identify the main causes of the increase in fuel-inefficient vehicles in Canada and to obtain preliminary responses to the research questions.

The report also highlights the myriad consequences of the transformation of Canada's automobile fleet. This transformation has had major negative impacts on:

- Canada's GHG emissions;
- The environment and air quality;
- Public safety;
- Road traffic and public space occupation; and
- Household indebtedness.

Methodology

The analyses used to respond to the research questions were led by Équiterre, the Mobility Chair of Polytechnique Montréal, CIRANO (in collaboration with HEC Montréal), and Horizon Advisors. The first order of business was to review the definitions of light-duty trucks and the existing classification systems within the automobile industry and government, as well as analyze the changing supply of light-duty trucks in Canada. This exploration of the transformation of Canada's automobile fleet was rounded out by an analysis of the changing demand for light-duty trucks and a thorough analysis of the factors behind this phenomenon. An in-depth analysis of the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations was carried out to identify the flaws contributing to the proliferation of these vehicles.

The motivations for buying light-duty trucks and consumer perceptions of these vehicles were examined in a Canada-wide survey and a series of individual interviews. The role of advertising in these vehicles' growing popularity was assessed with the help of focus groups, an analysis of light-duty trucks ad content and an analysis of the regulatory framework governing the advertising practices of the automobile industry. This latter component included a review of international best practices. Lastly, trial messages aimed at reducing the appeal of sport utility vehicles (SUVs) and other light-duty trucks were tested to provide fodder for potential campaigns to discourage the public from purchasing large vehicles.

The impacts of light trucks in Canada and Quebec on the environment, the road network, public safety and household finances were studied through a review of the North American literature prepared by Équiterre and an analysis of the transformation of the light vehicle fleet in Quebec conducted by the Mobility Chair of Polytechnique Montreal

Results

Inconsistencies were found in vehicle definitions and classification even within the automobile industry itself, within the various levels of government and between governments and the industry. The vehicle classification system used to establish GHG emission standards for light-duty vehicles was also found to be obsolete, since these vehicles now form a continuum, notably with the arrival on the market of crossover utility vehicles (CUV).

In terms of the supply of vehicles sold in Canada, the results indicate that:

- The average dimensions (height, width, length) of light-duty trucks and cars continue to increase, thereby transforming the entire automobile fleet;
- The diversification of light-duty truck models and versions is one of the main drivers of large vehicles' popularity.

When it comes to demand, we see that the number of light-duty trucks on Canadian roads has more than tripled since 1990, but there are key differences between the provinces. The historical analysis confirms that the introduction of a smaller model of SUV, the CUV, accelerated Canadians' change in vehicle preference. From an economic standpoint, the increase in household income generates an increase in spending on light-duty trucks. In addition, the increasingly diversified supply of SUV models, the fact that Canada's economic structure is conducive to vehicle-related expenses, easier access to low credit rates on automobile loans and the automobile sector's prominent place in Canada's economy are factors that have helped drive up sales of large vehicles. From a political standpoint, the design of fuel efficiency standards for light-duty vehicles, Canadian trade deals protecting North American products (including light-duty trucks), monetary and non-monetary government support for the automobile industry and land-use policies encouraging urban sprawl are the main factors. Psychological and sociological factors include certain personality traits associated with owners of large vehicles: it seems that these individuals have relatively weak environmental values and like driving their vehicles over short distances. The perception of safety associated with large vehicles and the cohort effect, which normalizes their ownership, are more psychosocial factors behind the popularity of light-duty trucks.

The analysis of factors motivating people to buy light-duty trucks and of consumer perceptions of these vehicles shows that the profile of the typical SUV owner has evolved over time: middle-aged female suburbanites who live with someone, have kids and a relatively high income have increasingly become the face of the typical light-duty truck owner. Previously, it was mainly older men with a high income. Nevertheless, family income is strongly related to intent to purchase an SUV, and this relationship only increases with each successive income bracket.

Personal psychological factors indicate that individuals with a strong environmental identity are less likely to buy an SUV. Among the factors related to vehicles and driving, the results show that owning an SUV increases the likelihood that the next vehicle purchased will also be an SUV. The main reasons for choosing an SUV are: safety in terms of impact, safety in terms of weather conditions (bad weather, winter) and the purchase price, hence the automobile industry's emphasis on financing options in car advertisements.

Also, SUV owners are more likely to incur debt to purchase their vehicle than sedan owners. As for the external environment, descriptive social norms constitute the factor behind the highest likelihood of purchasing an SUV, which means that others' approval greatly influences individuals' decision-making. The results also reveal significant media influence on the choice of an SUV as one's next vehicle.

The ad content analysis indicates that 79% of ads are for light-duty trucks. The key findings about advertisements promoting this type of vehicle are as follows:

- Domination of the environment is often depicted, with off-road vehicles in natural settings;
- The vast majority uses nature or nature-related elements to sell light-duty trucks;
- SUVs are shown in a variety of places, suggesting that they are versatile; the fact that the public is bombarded with this advertising really brings home this message;
- Sale prices and product scarcity are often front and centre through seasonal or special sales events;
- Vehicle safety, especially in the case of crossovers and SUVs, is frequently played up in a variety of ways in the same advertisement;
- Attractive financing terms are very often touted (announcement of a special offer, regular instalment amounts, down payments, low- or zero-interest rates, deferred payments, etc.);
- The vehicle's technological features are often trumpeted;
- Some ads underscore the vehicle's fuel efficiency without offering information on its fuel consumption;
- Vans almost never appear in ads, indicating that SUVs have supplanted them on the market;

- None of the ads mentions fuel consumption or GHG emissions, and fewer than half show the vehicle's retail price.

An assessment of Canada's regulatory framework for automobile advertising indicates that in Canada, there is/are no:

- Requirements to display the vehicle's fuel consumption or polluting emissions, nor the retail price;
- Prohibition on showing large fuel-inefficient vehicles in certain environments;
- Rules governing the use of environmental arguments for selling a product; and
- Standards referencing the protection of nature and the environment.

Nevertheless, it is clear that advertising standards and legislation, both federal and provincial, are evolving in line with public health issues and emerging social debates, but that environmental concerns have yet to be integrated into these tools. According to the focus group participants, automobile advertising feeds the emotional attachment to these vehicles, financing options are key and can sometimes be deceptive, and including raw information on the vehicle's polluting emissions would be pointless, since the general public would be unable to make sense of it.

Recommendations

In light of the results of these analyses, various recommendations were developed to reverse the trend and help Canada meet its climate targets. The first step is to recognize that the increase in large vehicles on our roads is a public health/safety issue. Such recognition paves the way for measures that can quickly reverse the trend. An independent advisory committee and an automatic, universal classification system for light-duty vehicles should also figure among the first measures to be rolled out.

Next, the reform of the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations and the addition of "green conditions" when the government offers support to the automobile industry are recommended to lower the supply of large vehicles in Canada. From a demand standpoint, multiple solutions can be considered: introducing a self-funding feebate system, maintaining the carbon pricing system, implementing per-kilometre pricing and putting in place a plan to retire older, polluting vehicles across the country.

Advertising practices can also be better regulated to bring them in line with the Canadian government's objective of net-zero emissions. To that end, several actions must be taken: systematically archiving automobile advertisements and collecting data on industry investments, putting in place a Canadian automobile advertising code complete with ad content guidelines, assessing ads before they run, and promoting a greater number of sustainable vehicles. Another promising measure would be to roll out campaigns promoting sustainable mobility and supporting individuals in their vehicle purchasing decision-making.

INTRODUCTION

In Canada, the transportation sector is responsible for nearly one third of GHG emissions, with more than half of those emissions coming from light-duty trucks. The popularity of these vehicles must therefore be made a priority area for action in the fight against climate change. Canada is the second-highest emitter of CO₂ per capita among the G20 countries (OECD 2021).

In the spring of 2021, Canada committed to reducing its GHG emissions by at least 40% from 2005 levels by 2030 and to reach net zero by 2050. In June 2021, it also committed to ending the sale of new gasoline-powered vehicles, beginning in 2035.

Against this background, it is appropriate to question the reasons for the trend toward oversized, energy-inefficient vehicles that has been observed for more than a decade. In fact, many automotive writers have gone so far as to predict the demise of the standard car within a few years. The numbers are consistent with this prediction: in 2020, four (4) out of five (5) new vehicles sold in Canada were light-duty trucks, while electric vehicles (EVs) for their part accounted for only 3.5% of new vehicle sales in Canada.

These various observations have set the stage for this report, which provides a synthesis of the study entitled "*Comprendre la hausse des camions légers au Canada afin de renverser la tendance*" [The Rise of Light-Duty Trucks in Canada: Reversing the Trend] that was carried out by Équiterre between 2019 and 2021. It begins by providing background on the proliferation of large vehicles, followed by the methodology used to understand Canadians' growing preference for these vehicles. Preliminary considerations, based on a series of exploratory interviews, and an overview of the primary impacts associated with the transformation of the vehicle fleet are then presented.

The results are divided into five (5) chapters that address:

- The definitions and classifications of light-duty vehicles;
- The evolution in the supply of light-duty vehicles;
- The evolution in the demand for light-duty trucks and the factors that explain this demand;
- The motivations for purchasing light-duty trucks; and
- The role that advertising plays.

Finally, a series of recommendations specific to the Canadian context is presented.

1. LIGHT-DUTY TRUCKS—A TREND THAT SHOWS NO SIGNS OF SLOWING DOWN

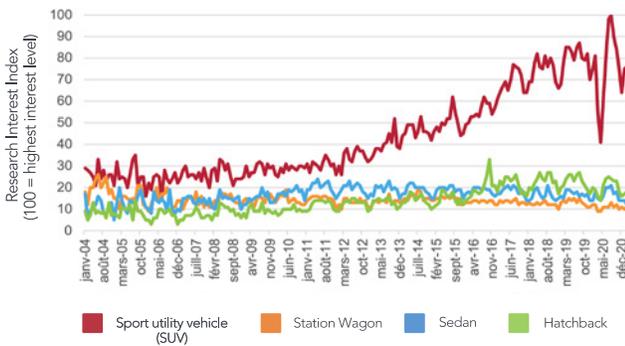
In the last decade, the number of light-duty trucks in Canada has seen a sharp increase with numerous consequences (see chapter 4). In 2020, this segment's market share reached 79.9% in Canada (DesRosiers Automotive Consultant 2021).

1.1 A worldwide increase

The rise in the number of light-duty trucks on the road is universal. While gasoline-powered vehicles account for nearly a quarter of global oil demand, SUVs have been responsible for a growth in that demand between 2010 and 2018 in contrast to other types of cars whose oil consumption fell slightly. Indeed, although the world oil market saw sales decline in 2018 and 2019, falling by about 2% in 2018, the number of SUVs jumped by 60% between 2010 and 2019, rising from 35 million to 200 million. (Cozzi and Petropoulos 2019)

In fact, a recent analysis by the Mobility Chair at Polytechnique Montréal (2021a) confirms this trend. Using the Google Trends application to observe global data, the Chair illustrates the increase in popularity of certain search terms related to light-duty trucks. Since the mid-2000s, a strong growth in search interest can be observed compared to other car-related terms.

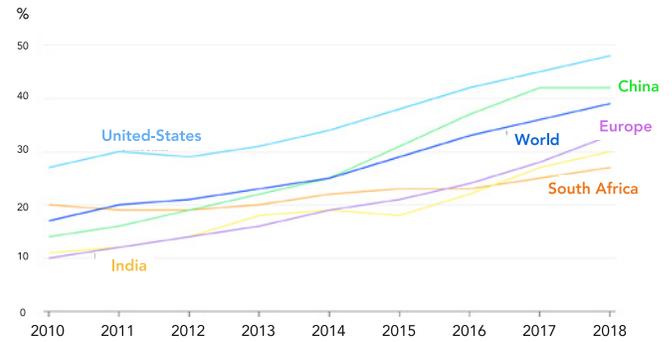
Figure 1. Index of public interest in different types of car bodies around the world, 2004-2021



Source: Morency et al. (2021a)

According to the Mobility Chair (Morency et al. 2021, 12), "research interest in SUVs was significantly greater in Canada and the United States in 2006. In 2019, there was a marked increase in interest in Asia, at the expense of sedans, as well as in Europe, at the expense of station wagons."

Figure 2. SUV share of total auto sales, 2010-2018



Source: Cozzi and Petropoulos (2019).

As a result, since 2010, SUVs have accounted for the second-largest source of global CO₂ emissions, after the energy sector, but ahead of heavy industry and aviation. Because SUVs and other light-duty trucks are worse gas guzzlers than standard automobiles, if demand for this type of vehicle continues to grow at the same pace that it has over the past ten (10) years, they would increase worldwide demand for oil by 2 million barrels per day by 2040, offsetting the fuel savings of nearly 150 million EVs. (Cozzi and Petropoulos 2019)

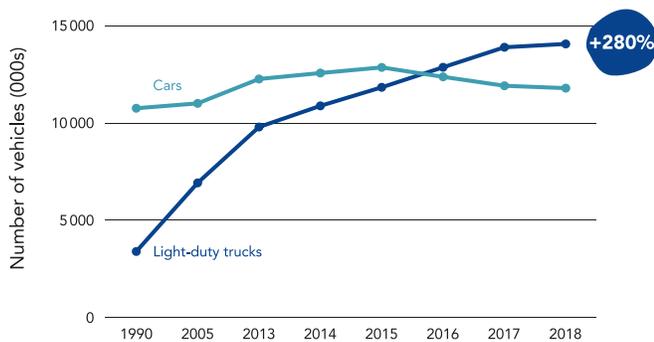
DURING THE EARLY MONTHS OF THE COVID-19 PANDEMIC, THE SUV SECTOR IS THE ONLY ONE WHOSE GES EMISSIONS CONTINUED TO GROW.

In 2020, while global energy-related CO₂ emissions declined due to the impact of the COVID-19 pandemic, the SUV sector was the only one that saw an increase in emissions. In fact, global energy-related emissions fell by 7%, but CO₂ emissions from SUVs reportedly rose slightly, by 0.5%. In addition, despite the effects of the pandemic on vehicle use, SUVs consumed more oil than in 2019. (Cozzi and Petropoulos 2021)

1.2 A global trend to which Canada is no exception

The number of light-duty trucks grew by 280% between 1990 and 2018, and by 86% between 2005 and 2018, compared to 10% and 7% for standard cars over the same periods ([ECCC] 2018).

Figure 3. Evolution of the light truck and car fleet in Canada, 1990-2018



Source : ECCC 2018

As a signing party to the Paris Agreement, Canada is committed to contributing to the global effort to keep global warming to 1.5 Celsius degrees. As such, the country has committed to reducing its emissions by at least 40% by 2030 from 2005 levels and to reaching net-zero emissions by 2050. However, the numbers indicate that the government needs to step up its game to reduce its GHG emissions. As of 2018, they were down only 0.1% from 2005 levels (ECCC 2020).

1.3 A Canadian trend to which Québec is no exception

The growing popularity of passenger light-duty trucks is not specific to one type of population or region. In Quebec, between 2014 and 2019, the number of light duty trucks on the road increased by 36.9% in Montreal and 33.9% in the Capitale-Nationale, figures that compete with those in less densely populated regions. Indeed, over the same period, the number of light duty trucks increased by 25.3% in the Gaspésie-Îles-de-la-Madeleine region and by 22.3% in the Saguenay-Lac-Saint-Jean region. Similarly, the urban and peri-urban regions of Montérégie, Lanaudière and Laurentides also saw an increase in the number of light duty trucks ranging from 30.4% to 34%. (SAAQ 2020). It must be noted that the phenomenon is relatively uniform across the province.

1.4 Main research question and sub-questions

In light of these findings, this study sought to understand the growing popularity of light trucks in the eyes of Canadians from several perspectives. The main research question is as follows:

Why do Canadians prefer light-duty trucks and how can we reverse this trend in order to help Canada meet its GHG reduction objectives?

1. What is a light-duty truck and what are its defining characteristics?
2. How has the supply of light-duty vehicles changed over the past century?
3. What factors (historical, economic, political, and social) are contributing to the increase in sales of fuel-inefficient vehicles in Canada?
4. What are the motivations for purchasing light-duty trucks and the perceptions of these vehicles?
5. How does advertising influence light-duty vehicle purchase decisions?
6. What role can the Canadian government play in encouraging sustainable individual mobility practices?
7. How can the Canadian government reverse the trend and help Canada meet its GHG reduction targets?

The next sections are set in this context. The methodological plan that was deployed to complete this study is presented in chapter 2. Complementing the sections exploring the causes of the upward trend in light-duty trucks, chapter 4 assesses the literature and analyzes the consequences of the phenomenon in a number of areas.

Chapters 5 to 9 form the core of the analysis and identify several factors that have contributed to the growth of large vehicles in Canada. The report concludes with a series of recommendations to government bodies, primarily the Government of Canada.

2. METHODOLOGY

This section lays out the methodological process for responding to the primary research question and the various other research questions

Figure 4. Research ecosystem



Source: Équiterre

2.1 Exploratory interviews

To kick off the research, a series of eight (8) 30-to-45-minute semi-directed interviews was carried out with experts over a one-month period to properly identify the causes of the increase in fuel-inefficient vehicles in Canada and explore possible responses to all the research questions. Chosen for their close connections to (or extensive knowledge of) the automobile industry, the interviewees are academics, professionals working in dealerships, manufacturers and policy advisers. The elements presented in this subsection are from interviews that were recorded and then transcribed and analyzed via a qualitative approach with the help of a software program. If these elements are included here, it is because they came up again and again in the various interviews and are relevant to the research, and because they were useful in formulating responses to the primary research question. This exercise enabled us to confirm the relevance of the issue and to identify four (4) analytical perspectives from which to examine it.

2.2 Consequences of Canada's transformed automobile fleet

Prepared by Équiterre concurrently with the other components of the study and with newly issued reports and articles on light-duty trucks, this part of the research provides an overview of the main

documented impacts of large vehicles. The key findings are detailed in chapter 4.

It is followed by an assessment of the impacts of the transformation of Québec's automobile fleet on climate and GHG emissions, road traffic, use of space and parking capacity, road safety and personal household finances. This documentation is mainly based on a study carried out by the Mobility Chair at Polytechnique Montréal, which used both the results of the literature and estimates constructed from available databases (SAAQ, Montréal Origin-Destination Survey, Institut de la statistique du Québec, CAA, Statistics Canada, open data from the City of Montréal), as well as methodological approaches developed by the research team, particularly with regard to traffic impacts. Due to data availability, some of the study's estimates could only be produced for the Montréal region; GHG emissions data were thus supplemented by the report "L'État de l'énergie au Québec 2021" from the Chair in Energy Sector Management at HEC Montréal.

2.3 Defining and categorizing light-duty trucks

This part of the research, which was carried out by the Mobility Chair of Polytechnique Montréal, presents, first, the semantics and nomenclature used by the automotive industry to describe and classify vehicles. Indeed, the information it presents is taken from the websites of automobile manufacturers and their associations, from recognized automotive consultants (e.g. Edmunds, and Desrosiers Automotive) and from specialized automotive magazines (e.g. Car and Driver, Motor Trend, Autoweek, Hemmings Motor News, and Drive!).

Next, government definitions of vehicles were retrieved from the Canadian Legal Information Institute (CanLII) and other public domain websites (e.g. gc.ca). The search terms used were "light truck", "camion léger", "véhicule utilitaire sport", "sport utility vehicle" and "familiale" [station wagon], in both singular and plural. The government classification referenced is from the U.S. Environmental Protection Agency (EPA), since Canada is aligned with its southern neighbour in terms of GHG emission standards for light-duty vehicles under the *Clean Air Act*. The results of this analysis are presented in subsection 7.5.3.

2.4 Analysis of the light-duty truck supply

To answer the second sub-question, Équiterre also partnered with the Mobility Chair of Polytechnique

Montréal, which observed the evolution of vehicle supply and financing through a review of annual industry reports and special-interest blogs. The descriptive analyses presented were conducted using Transport Canada's Canadian Vehicle Specifications (CVS) database, which contains a list of specifications on 20,613 vehicles. However, only records for which all twelve (12) variables were available were retained, representing a total of 18,371 vehicles, or 89.1% of all vehicles in the CVS database.

To begin, a systematic analysis of the evolution of the various characteristics of the vehicles listed in the CVS database was conducted. With data covering the period from 1994 to 2019, it was possible for the research team to observe the evolution in the distribution of the various properties describing the vehicles offered for sale in Canada.

The analysis of specific vehicle models and of the identified SUV subcategories was also made possible with the help of the CVS database and by a literature review of specialized automotive industry magazines. The results of this analysis are presented in chapter 6.

2.5 Analysis of the factors that drive the growing demand for light-duty trucks

To answer the third sub-question, which focuses on factors that have contributed to the rising demand for fuel-inefficient vehicles in Canada, Équiterre also collaborated with the Mobility Chair of Polytechnique Montréal. This section was conducted in two (2) phases.

Initial research has indicated that the transformation of the vehicle fleet is attributable to the loosening of the household budget constraint, the decreasing price of light trucks, the increase in the price of light truck substitutes (cars) and/or changing preferences. The analytical framework used was based on consumption theory. From this, an analysis grid was developed to present the impacts of the different factors identified as potential causes of the growing popularity of light trucks

2.5.1 Analysis of the light-duty truck demand

First, an empirical trend analysis of light-truck demand across Canada was conducted using data from Natural Resources Canada (NRCAN), the Google Trends application and Statistics Canada.

The first source provides information on the current vehicle fleet, new vehicle sales, fuel consumption and kilometres travelled at the federal and

provincial levels. It has provided an understanding of the transformation in Canada's vehicle fleet and a comparison of the various provinces. The second database presents data on internet search interest for certain terms over time in Canada, which has provided a picture of how the interests of vehicle buyers have evolved across the country. Finally, the third database contains the results of Statistics Canada's Survey of Household Spending, which provides a statistical profile of SUV owners in Canada and their changing socio-demographics.

The subsection on the province of Quebec provides a detailed analysis of the light passenger vehicles on the road in the province. SAAQ micro data covering the period 1990-2019 were merged with the CVS database in order to perform this analysis.

2.5.2 Analysis of the factors driving this demand

An analysis of historical, economic, social and political factors as well as automobile industry practices was almost exclusively carried out through a review of the scientific literature and practices observed in the field.

First, a historical analysis of the automobile's development in North America was done, starting in the early 1900s. Second, in the area of economics, the Chair analyzed:

- The changing economic fundamentals (household incomes, interest rates, fuel prices, etc.);
- The evolution of vehicle ownership and operating costs; and
- The automobile industry practices (financing).

Third, the policy analysis was used to assess the role of auto sector subsidies and other public policies on the increase in the number of light-duty trucks in Canada. This was done through a review of the grey literature (industry reports to government), but also through an analysis of regulatory changes and existing legislation.

Finally, analyzing the psychological and sociological factors allowed the research team to paint a picture of the light-duty truck buyer, assess the role that large vehicles play in achieving social status or their ability to meet current needs and provide a sense of security, and estimate the importance of social norms. This fourth assessment was also completed through a review of the scientific literature. The results of this multidimensional analysis of the demand are shown in chapter 7.

2.6 Analysis of motivations driving the purchase of light-duty trucks

Équiterre partnered with CIRANO and HEC Montréal to conduct an analysis of the motivations behind the purchase of SUVs and other light-duty trucks in Canada. As part of this analysis, a Canada-wide survey was developed with an outside firm. A questionnaire was developed following a systematic review of the literature. The survey ran from October 27 to November 30, 2020, and was completed by 1,515 individuals who (1) have at least one vehicle in their household, (2) use their vehicle on a regular basis (i.e., at least once a week), and (3) were involved in the decision to purchase or lease the vehicle. The sample was representative of Canadian consumers; criteria such as gender, age and province of residence allowed for reliable data and differentiated analyses. This quantitative approach allowed the research team to assess the motivations, influences and criteria driving vehicle purchases, and to develop the profile of a typical SUV owner in 2020. The operationalization of the survey variables is presented in Annex 1.

Two (2) additional components, individual interviews and focus groups, were completed by the CIRANO research group and HEC Montréal. These subsequent qualitative steps made it possible to delve deeper into certain results from the online survey and to analyze the respondents' perceptions of the survey's highlights, in addition to analyzing the influence exerted by marketing and advertising on SUV purchase intentions. Individual interviews were conducted with 20 individuals who indicated their interest in the questionnaire. The results of the survey and individual interviews are presented in chapter 8.

Finally, five (5) focus groups, which included a total of 13 participants, were held following the interviews to better understand the role of advertising in shaping people's attitudes towards fuel-inefficient vehicles. Divided into three (3) parts, these focus groups aimed to assess reactions to various types of advertising and to the inclusion of information about the vehicle's price or GHG emissions. The discussions were divided into three (3) parts. First, participants were asked to recall SUV ads without any visual support. Second, they were shown existing SUV advertisements to evaluate what struck them in terms of visual content. The final part assessed participants' reactions to existing advertisements showing SUVs in the wild and highlighting the vehicle's safety, comfort or financing options. The results of the focus groups are presented at the end of chapter 9.

2.7 Analysis of automotive industry advertising practices and their regulatory framework in Canada

To shed light on the arguments presented in ads for light-duty trucks in Canada, Équiterre conducted a qualitative analysis of the content of ads for light-duty trucks. With attention to both the textual and visual elements, the objective of this analysis was to identify the reasons that prompt consumers to buy this type of vehicle as the most recurring messages and ideas. Through a literature review, it also provided an overview of the automotive industry's investment in advertising.

A collection of 132 ads taken from Canadian newspapers and magazines published between January 1, 2019 and May 1, 2020 was assembled. Ads from national and provincial automotive brands were included in the sample, while ads created by dealerships were excluded. The analysis strategy for these ads consisted of three (3) steps:

- Design a multi-variable analysis grid with a code guide;
- Code the content of the ads; and
- Analyze these results using R software.

Concurrent with this content analysis, a review of Canadian government and legal documents was conducted to examine the current situation with respect to automobile advertising regulations. An overview of the practices from jurisdictions that provide a stricter framework for automobile advertising was also carried out in order to formulate recommendations applicable to Canada, based on the results from the analysis of the content of the ads. The findings from these two components on automotive advertising in Canada are presented in Section 9.

2.8 Experimentation with deterrent messages

As part of an experimental phase, Équiterre once again collaborated with the CIRANO research group and HEC Montréal to carry out empirical tests of messages aimed at dissuading the public from buying light-duty trucks. This was developed based on the results of qualitative analyses and relevant literature for each of the three segments included: (1) the identity and the factors that threaten it, (2) the role of social norms and (3) future considerations. These tests employing various communication approaches can be used as tools in possible future social marketing campaigns intended to reduce the appeal of large

vehicles. The recommendations resulting from this experimental phase are presented in subsection 10.7.

2.9 Analysis of the regulatory framework governing GHG emissions from light-duty vehicles in Canada

To complete this part of the research, Équiterre commissioned Horizon Advisors to conduct a survey of public policies and the regulatory framework that have favoured the sale and purchase of light-duty trucks. The findings raised in this first part of the analysis were linked with those raised by Polytechnique Montréal in its analysis of the explanatory factors of an economic or political nature, or those stemming from automobile industry practices. Based on a review of the literature, recommendations were formulated to tighten the regulatory framework and curb the proliferation of light-duty trucks. To this end, specific actions are suggested to improve the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*. Broader complementary actions are also proposed to reverse the increasing trend toward larger vehicles.

The results of the public policy analysis can be found in subsection 7.5.3 of this report. The recommendations are presented in chapter 10.

3. PRELIMINARY CONSIDERATIONS

This chapter summarizes the information gathered from the exploratory interviews.

3.1 A recognized problem

In general, the interviewees consider that the increase in fuel-inefficient vehicles around the world, but especially in Canada, is a relatively problematic phenomenon. These vehicles contribute greatly to GHG emissions, because light-duty trucks are the least fuel-efficient light-duty vehicles. Because their sales are rising at the expense of more fuel-efficient vehicles, the GHG emissions from this sector are rising as a direct consequence.

3.2 Economic considerations and manufacturing practices

As for the economic issues associated with this trend toward large vehicles in Canada, the interviewees are of two minds. On the one hand, 80% of domestic automobile manufacturing is destined for the US market, which inevitably creates jobs and strengthens the national economy. On the other hand, since Canada produces little in the way of truck-type vehicles, its competitiveness is relatively weaker; thus, it depends on other countries for imports. Another significant economic impact: Canadian households spend a considerable portion of their income on the purchase or lease of this type of vehicle.

One economic argument was raised by all the interviewees regarding motivations from the auto industry: fuel-inefficient vehicles offer a higher profit margin than regular vehicles, and are therefore favoured by manufacturers as part of their sales strategies.

They plan their production cycles over five (5) years or so. The favoured vehicle type is dictated by a series of factors, including forecasts of changing public demand, population size, sales estimates, compliance with environmental standards and other manufacturers' offerings. According to the experts, production planning is therefore greatly influenced by consumer demand. And the consensus seems to be that this higher demand is responsible for the increased output of light-duty trucks.

The increased manufacture and sale of light-duty trucks in Canada are linked to the strong integration of the North American automobile market. So if Americans buy fuel-inefficient vehicles and Canada

does not produce any, Canada is passing up a huge economic opportunity. This makes Canada dependent on the US market in this regard.

3.3 Role of dealerships

Dealerships' responsibility in the rise of fuel-inefficient vehicles is unclear. Their staff employ client tracking systems and conduct internal analyses to estimate future automobile demand. These data are then used to order products from the manufacturer. Aided by its own analysis, the manufacturer ships the models they feel will sell best, and reserves the right to change the product shipped, in particular when hoping to promote a new model. Case in point: with the demand for EVs rising in Quebec, dealerships are hoping to receive more, but the parent companies do not seem receptive to this.

Nevertheless, dealerships still have an economic stake in the rise of gas-powered oversized vehicles. For one thing, the profit margin is larger, as indicated earlier. Between the sale of an electric or regular vehicle and that of a light-duty truck, it is more profitable to sell the latter. And for another, some of the experts interviewed raised the fact that most dealerships also service their vehicles. An EV requires significantly fewer visits to the garage for repairs, servicing or maintenance than an internal combustion vehicle. Consequently, selling EVs costs the dealership in terms of lost client loyalty. When dealerships do not sell heavy-duty fuel-inefficient vehicles, they forego an economic gain in the immediate term, i.e. at the time of the sale, and over the long term, i.e. during the vehicle maintenance period.

3.4 Motivations for purchasing light-duty trucks

A number of reasons for the increased popularity of light-duty trucks in Canada were raised. First, in terms of purchase motivations, people travelling in a large vehicle feel safer. The experts truly believe that these vehicles are in fact safer, but only in comparison to smaller vehicles. And since Canada's automobile fleet is becoming more and more uniform with large vehicles increasingly taking the place of regular ones, the safety aspect is becoming increasingly illusory.

Viewed as versatile vehicles, light-duty trucks appeal to families and to Canada's ageing population. The latter like the comfort offered by larger vehicles. And since gas is relatively inexpensive across the country, consumers do not factor in long-term expenses such as added gas costs, especially since light-duty trucks

consume less gas than they did 10 years ago. Lastly, these vehicles are financially accessible to the vast majority of Canadians nowadays.

While none of the interviewees has expertise in this field, the idea that advertising plays a core role in building up demand was raised. However, advertising does not in and of itself shape consumer demand. It was suggested that automobile manufacturers would not spend money on a product that the public does not want.

3.5 Role of advertising

While none of the interviewees has expertise in this field, the idea that advertising plays a core role in building up demand was raised. However, advertising does not in and of itself shape consumer demand. It was suggested that automobile manufacturers would not spend money on a product that the public does not want.

Ads for fuel-inefficient vehicles sell a certain lifestyle that appeals to consumers. All the interviewees mentioned that these advertisements include an outdoors component (mountains, snow, river, etc.) and a multipurpose vehicle (room for bulky boxes, sports equipment or bags filled with groceries, transport of a boat, etc.). Automobile companies invest in advertising for light-duty trucks because these ads offer a good return on their investment. In short, the exploratory interviews confirmed the need to further explore the role of advertising in consumers' decision-making process.

3.6 Synthesis

Table 1 summarizes the elements identified in the exploratory interviews.

Table 1. Summary of exploratory interview findings

Points to consider	
Economic considerations and automobile industry practices	<ul style="list-style-type: none"> • Strong integration of North American automobile market leads to: <ul style="list-style-type: none"> ◦ Job creation in Canada, where the lion's share of vehicles manufactured are for the US market; ◦ Low competitiveness on the part of Canada, which depends on its neighbour to the south. • Light-duty trucks have a higher profit margin than regular or electric vehicles, for manufacturers and dealerships alike; • Light-duty trucks are : <ul style="list-style-type: none"> ◦ Seen by dealerships as a means of ensuring repeat customers for their garage operations (as opposed to EVs); ◦ A major source of household expenditure. • Automobile production planning is greatly influenced by demand; • Manufacturers have the last word on which models to sell in dealership showrooms; • They invest in advertising for light-duty trucks, because these offer them a major return on their investment.
Motivations for purchasing light-duty trucks	<ul style="list-style-type: none"> • The perception of safety; • The perception of versatility; • Comfort; • Low fuel costs; and • The perception of vehicle affordability.
Role of advertising	<ul style="list-style-type: none"> • It plays a fundamental role in building up demand, but in and of itself does not shape this demand; • Ads for fuel-inefficient vehicles sell a lifestyle that appeals to consumers (the idea of exploring and overcoming nature, family bonding thanks to a multipurpose vehicle); • The role of advertising needs to be examined further.

Source : Équiterre

4. WIDE-RANGING CONSEQUENCES

The growing preference of Canadians for oversized, fuel-inefficient vehicles has numerous environmental and social impacts. This section summarizes these impacts.

4.1 Environmental and climate impacts

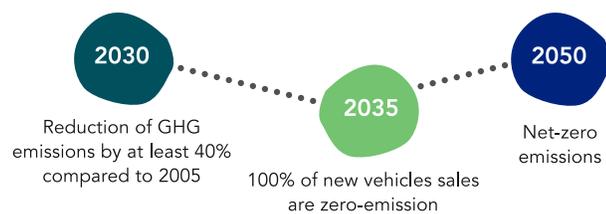
This first subsection brings together the different impacts of large vehicles on the environment and climate change.

4.1.1 An obstacle to achieving climate targets

As a signatory to the Paris Agreement, Canada is committed to contributing to the global effort to keep global warming to 1.5 Celsius degrees. The country has committed to reducing its GHG emissions by at least 40% by 2030 from 2005 levels and to reaching net-zero emissions by 2050. However, the numbers indicate that the government needs to step up its game. In 2018, Canada's GHG emissions were down only 0.1% from 2005 levels (ECCC 2020).

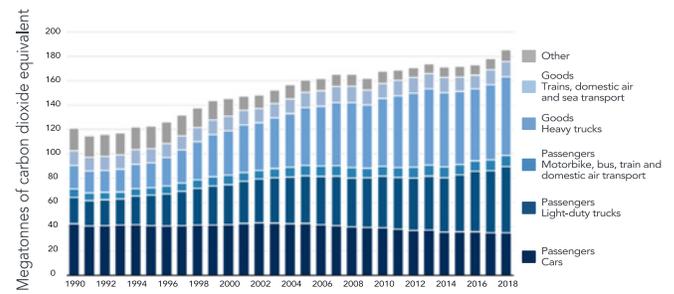
The need for action to mitigate the effects of climate change is felt from a financial standpoint: natural disasters are occurring with increasing regularity in Canada, and their costs are rising exponentially. The average cost per disaster has gone from \$8.3 million in the 1970s to \$112 million between 2010 and 2019, for an increase of 1250% (Canadian Institute for Climate Choices 2020). Since 1990, emissions from this sector have increased by 49% and currently account for 30% of Canada's GHG emissions. (ECCC 2020; ECCC 2018) As shown in Figure 6, this increase is primarily attributable to light-duty trucks and freight transportation.

Figure 5. Selected climate targets in Canada



Source: Équiterre

Figure 6. GHG emissions from the transportation sector in Canada in 2018



Source: ECCC (2020)

Specifically, in 2018, light-duty trucks emitted on average 31% more GHGs per kilometre than standard cars. Additionally, their emissions rose by 156% between 1990 and 2018, and by 36% between 2005 and 2018. (ECCC 2018) These findings are inconsistent with government climate targets.

Moreover, Canada's vehicles guzzle more gas and emit more CO₂ per km driven than those of any other country in the world, in addition to being the largest and second heaviest in the world (IEA 2019; Shaffer 2019).

There is no denying that light-duty trucks are a significant – and growing – source of GHG emissions in Canada. In short, if the country is to achieve its climate targets, rapid decarbonization on the part of the transportation sector will be required. More precisely, Canadians' growing preference for fuel-inefficient vehicles needs to abate, and low-carbon modes of personal transportation need to be adopted more rapidly.

4.1.2 An obstacle to electrification efforts

The rise in the number of fuel-inefficient vehicles is undercutting the benefits of achieving the zero-emission (ZEV) sales targets established by Ottawa and some of the provincial governments. Canada has set graduated targets for light-duty vehicle electrification: ZEVs are to represent 10% of new light-duty vehicle sales by 2025, 30% by 2030 and 100% by 2040 (Natural Resources Canada 2020). In June 2020, the 2040 deadline was advanced by five (5) years: the Canadian government wants to end the sale of new gasoline vehicles in 2035, following the example of Québec (Léveillé 2021).

As with the case for the GHG reduction targets, Canada is not on track to meet its ZEV targets, far less to benefit from the improved air quality and

Provincial electrification targets

Four (4) provinces have ZEV sales targets. In 2016, Québec was the first province to adopt a ZEV standard with the *Act to increase the number of zero-emission motor vehicles in Québec to reduce greenhouse gas emissions and other pollutant emissions* (the ZEV Act). The purpose of the Act is “to reduce the quantity of [GHGs] and other pollutants emitted into the atmosphere by motor vehicles travelling on Québec roads, to reduce their harmful effects on the environment” (ZEV Act). The ZEV Act gives the Québec government the authority to require automakers to sell a minimum number of ZEVs on an annual basis. These quotas vary based on the size of each manufacturer and are intended to drive the supply of these vehicles to improve access to such vehicles (MDDELCC 2021).

Québec

In its 2015-2020 Transportation Electrification Action Plan, Québec had a registration target of 100,000 EVs and plug-in hybrids (PHEVs) for the year 2020, as well as more ambitious targets of 300,000 vehicles on the road in 2026 and one million in 2030, representing 20% of all light-duty vehicles (Transports Québec 2015). As of June 2020, Québec had only 76,503 EVs or PHEVs on the road, but was a major contributor to the then 168,000 EVs in Canada (AVÉQ 2020), to the tune of nearly 46% of these vehicles.

The Québec government’s most recent climate plan has set a new target for 2030. It effectively aims to have 1.5 million ZEVs in Québec’s automobile fleet by 2030 and to prohibit the sale of new gasoline vehicles by 2035 in its 2030 Plan for a Green Economy (Government of Québec 2020).

British Columbia

For its part, British Columbia has a ZEV target of 10% of light-duty vehicle sales by 2025, 30% by 2030 and 100% by 2040. These targets have even been enshrined in the *Zero-Emission Vehicles Act*, adopted in May 2019. This legislation aims to allow for greater accessibility to more affordable ZEVs, as well as provide regulatory support to ensure the province’s GHG emission reduction targets are met (Government of British Columbia).

New Brunswick

In another example, in Eastern Canada, New Brunswick adopted a ZEV target in its 2016 Climate Change Action Plan. The government has committed to reaching 2,500 EVs on the road by 2020 and 20,000 by 2030 (Government of New Brunswick 2016). Several other provinces do not have specific targets for EV sales, but are committed to increasing their share through various means.

reduced sound pollution that would come with their achievement. According to Transport Canada (2020), with no additional measures to help decarbonize light-duty vehicles, sales of ZEVs in Canada could represent 4 to 6% of all new vehicles by 2025, and 5 to 10% by 2030. The adoption of ambitious public policies encouraging consumers to make better personal transportation choices towards sustainable alternatives is therefore crucially important. Canada must increase the supply of and demand for ZEVs to slow the rise of oversized and fuel-inefficient vehicles on Canadian roads in parallel with the adoption of a comprehensive strategy to reduce motorization rates.

Clearly, the increase in light-duty trucks on Canadian roads is making the federal and provincial ZEV sales targets obsolete. Government efforts to reduce gasoline demand are being offset by the rising number of light-duty trucks in Canada. As mentioned, the proliferation of these vehicles in recent years has caused an increase in GHG emissions from the road transportation sector, rather than the desired reduction (ECCC 2018). Thus, in addition to the efforts to meet the ZEV sales targets, steps must be taken to curb the growth in vehicle size and, more broadly, the growth in the automobile fleet as a whole to reduce the GHG emissions from the road transportation sector.

4.1.3 Overconsumption of natural resources

In addition to climate-related issues, the challenges associated with responsible and sustainable resource management are unavoidable in a context of ecological transition. As such, according to the data from the Carbon Counter tool on the lifecycle carbon footprint of vehicles, in Canada, a typical electric SUV represents a 20% increase in median emissions compared to a typical EV (MIT 2021). Thus, electrifying light trucks is not the most effective way to reduce GHG emissions in Canada; instead, we need to reduce the share of sales of these vehicles in this country, whether they are electric or not, and focus on material efficiency.

4.2 Health impacts

The increase in the number of light-duty trucks also contributes to air pollution in Canada, which significantly impacts human health. In effect, a number of human activities contribute to air pollution: these include transportation, the use of fuels for electricity and heating, various industrial activities, including processes related to oil and gas production, and certain products, such as paint and solvents. (Natural Resources Canada 2020)

Exposure to air pollution is a major cause of death and disease worldwide. In Canada, according to a recent study by American and British researchers, approximately 13.6% of deaths among people aged 14 years and over are attributable to fossil fuel-related pollution (Vohra and al. 2021). This air pollution can also lead to eye, nose and throat irritation, shortness of breath, the exacerbation of respiratory disorders and allergies, chronic obstructive pulmonary disease, asthma, and cardiovascular disease (Natural Resources Canada 2020). Environmental Defence (2020) also points out that more than 3,000 premature deaths are linked to air pollution in the Greater Toronto and Hamilton Area.

A number of studies have already demonstrated the health risks associated with road traffic. On major highways, traffic congestion can increase health risks for motorists, and people living near such roads are also at greater risk (Zhang and Batterman 2013). Thus, the increase in gasoline-powered vehicles in Canada, coupled with the conversion of the vehicle fleet to increasingly larger vehicles, poses a threat to public well-being, once again justifying the need to shift to more sustainable modes of transportation.

4.3 Socio-economic consequences

Along with these environmental and health consequences, the increasing number of light-duty trucks on Canadian highways is a public safety issue that also exacerbates traffic congestion and its impacts on the Canadian economy, in addition to contributing to household debt throughout the country.

4.3.1 A public safety issue

Numerous studies have demonstrated the increased danger that light-duty trucks pose to other vehicles and their occupants, as well as to other road users.

Collisions between large vehicles and small vehicles

First, a recent study by AXA Switzerland's accident research branch, which conducted a series of crash tests, revealed that accidents caused by SUVs are nearly 10% more frequent than those caused by other light vehicles, a phenomenon that can be explained by the self-confidence that drivers of this type of vehicle have. In the case of large SUVs - those weighing between 2,155 and 3,500 kg - collisions are 27% more frequent, compared to other cars, which means that the heavier the SUV, the greater the frequency of collisions (Banholzer 2020).

Not only are there more accidents caused by SUVs and pickup trucks, but they are also more dangerous to others. While advances have been made in recent years to reduce the risk to occupants of other cars involved in a collision with a light-duty truck, this type of vehicle remains more dangerous. From 2013 to 2016, pickup trucks and SUVs were 158% and 28% more likely, respectively, to result in the death of the person driving the other vehicle compared to standard cars. For pickup trucks, this result represents a gain of only one percentage point from the 1989-1992 period. (Monfort and Nolan 2019)

A second study, this time by the University of Buffalo, comes to a number of conclusions that are equally disturbing. It found that a driver in a standard car is four (4) times more likely to die in a collision with an SUV, even if the car has a higher safety rating. The chances of dying in a crash would be ten (10) times greater if the SUV has a superior safety rating. According to the study, the SUV tends to «mount» the smaller vehicle, due to the difference in bumper heights. (Goldbaum 2013) As a result, the heavier weight of electric SUV models is therefore likely to constitute a major concern in the coming years.

Indeed, according to the Insurance Institute for Highway Safety (IIHS) (2021), a U.S.-based organization, EVs offer a higher level of safety for their occupants than their gasoline-powered counterparts because of their greater weight. However, the opposite is also true: if a light truck collides with a much lighter vehicle, its occupants are at greater risk. In addition, the growing preference of North Americans for larger vehicle types has the appearance of an «arms race,» according to several mobility columnists and experts.

Other studies show similar conclusions. For example, light trucks, specifically SUVs and pickup trucks, are reportedly almost two (2) times more likely to be involved in fatal crashes in which the vehicle rolls over than standard cars in Alabama (Islam et al. 2016).

Collisions between large vehicles and pedestrians

As far as other road users are concerned, SUVs cause pedestrian injuries that are much more severe than do other types of vehicles. The IIHS (2020) notes that the number of people killed in traffic collisions has decreased between 2009 and 2018, but that the number of pedestrians who died in vehicle-related collisions rose by 53%, in line with the increase in the proportion of light-duty trucks. Over the past

decade, the number of pedestrians killed by SUVs has increased more than any other vehicle type in the United States: between 2009 and 2016, fatal crashes involving SUVs striking pedestrians increased by 81% (Monfort and Mueller 2020).

Since the vehicles sold in the U.S. and Canada are much the same given the highly integrated nature of the North American automotive market, the results of the IIHS study are alarming. An analysis of 79 crashes in three (3) urban areas in Michigan, where the climate is similar to parts of Canada, indicates that, at high speeds - between 30 km/h and 60 km/h - 30% of collisions involving a pedestrian and an SUV resulted in the death of the person struck compared to 23% for conventional cars, and at speeds in excess of 60 km/h, 100% of crashes involving an SUV resulted in the death of the pedestrian compared to 54% for other vehicles. (IIHS 2020)

IIHS (2020) also indicates that some results from the Michigan case study are consistent with other studies: SUVs are more likely to throw pedestrians forward than cars (46% versus 26%). Also, pedestrians struck by SUVs are nearly twice as likely to suffer hip or leg injuries, compared to those struck by conventional cars, results explained by the height of certain components (headlights, grille, and bumper). In addition, 16% of conventional car crashes result in serious, severe, critical, or fatal injuries while 24% of all SUV crashes result in this level of injury to pedestrians (Monfort and Mueller 2020).

At a time when more and more models of small SUVs are coming onto the market, with features that increasingly resemble those of automobiles, the IIHS (2020) also points out that the «truck-like» front end of the vehicle ensures that light trucks continue to pose a greater danger to pedestrians than standard automobiles. The literature is clear: light-duty trucks, more particularly SUVs and large trucks, pose a greater threat to public safety than standard cars for Canadian communities. In addition, the larger size of these vehicles brings a whole host of negative consequences and replacing them with equivalent electric models is not a viable alternative.

4.3.2 An issue leading to more traffic and economic loss

The higher size and weight of light-duty trucks are also concerning since they lead to early wear and tear on highway infrastructure, interfere with traffic flow and reduce the available space in urban areas.

Because they take up more space on the highway and in parking lots, especially on curbsides, light-duty trucks exacerbate road congestion. In addition to negatively impacting the well-being of the population, this phenomenon is responsible for monumental economic losses. In 2015, they were estimated at \$7 billion (\$B) for Toronto and \$1.4B in Vancouver (HDR Inc. 2008; HDR Inc. 2015). These economic losses appear to be enhanced by the increasing number and volume of light-duty trucks, a finding confirmed by a model produced by the Mobility Chair of Polytechnique Montréal and presented in subsection 4.4.3.

Chapter 6 explores in more detail the transformation of the Canadian vehicle fleet: the main properties (height, width, length) of the entire vehicle fleet are increasing. A phenomenon called "road obesity" by the Mobility Chair (Morency et al. 2021) is observed in Canada.

The new F-150 Lightning, the electric version of North America's top-selling pickup truck, weighs 6,500 pounds, 35% more than the gasoline version because of the battery, which by itself weighs 1,800 pounds. The electric Hummer will weigh over 9,000 pounds, also because of the battery. This type of vehicle will cause the road infrastructure to wear more quickly, counteract some of the air quality improvements resulting from electrification, and continue to pose a danger to vulnerable users. Indeed, one article states that heavy EVs pollute the air through brake and tire wear, road wear and the «resuspension of road dust». The massive arrival of electric light trucks onto the market will allow more studies to be conducted and their impact to be quantified in a more optimal way. (Grabar 2021)

4.3.3 An issue for household finances

The growing popularity of large light-duty vehicles is problematic in terms of Canadian household indebtedness, because they cost more than the other types of light-duty vehicles. In 2000, Canadian households had a level of indebtedness corresponding on average to 108% of their disposable income. By 2008, this ratio had climbed to 150% and by 2018 175% (Gellatly and Richards 2019). What is more, transportation already represents a major share of household spending: Statistics Canada's Survey of Household Spending (2018) states that transportation accounted for nearly 20% of their total spending in 2017, trailing only housing.

According to Polytechnique Montréal's Mobility Chair (Morency et al. 2021a, 18), "between 1981 and 2019, average household expenditures went from \$6,730 to \$10,476 in 2012 dollars (excluding inflation). Some 65% of the increase is attributable to the money spent on purchasing new light-duty trucks (trucks, pickups and SUVs)." The Mobility Chair (Morency et al. 2021a, 18) adds that an energy rebound effect could play a role in this: "The improved energy efficiency of vehicles may have been offset by an increase in driving and in the purchase of light-duty trucks."

The Financial Consumer Agency of Canada (FCAC) was already sounding the alarm in 2016, stating that long-term auto loans were encouraging consumers to buy more expensive automobiles than their budget allowed. Between 2010 and 2015, the average transaction price for a new vehicle in Canada went up by about 14%, reaching \$34,190 (FCAC 2016).

On average, light-duty trucks cost \$10,000 more than a regular car in Canada (Statistics Canada 2021). A comparison between some of the best-selling SUV models in the country and their equivalent standard vehicle models shows the price differences between these two (2) categories of vehicles. For example, the Honda CR-V compact SUV starts at \$29,805, while the equivalent compact car model in terms of vehicle length, the Honda Civic, goes for \$25,490, a difference of 14%. As for subcompact SUVs and cars, the Toyota CH-R SUV costs \$23,650, while the Toyota Yaris starts at \$17,890, for a difference of 24%. As for midsize SUVs and cars, the Honda Pilot starts at \$42,290, while the Honda Accord costs \$28,490, making the SUV 33% more expensive (Guide de l'auto, 2021). In light of these figures, it is fair to say that these fuel-inefficient vehicles represent an additional financial burden on Canadian households, the latter being fuelled by long-term financing arrangements.

4.4 In Québec

Like the rest of Canada, Québec is also experiencing a shift in its fleet mix, with light trucks now accounting for the majority of vehicle sales. However, this growing preference for larger vehicles, which are becoming more expensive, bigger and more fuel-intensive overall, is exacerbating a number of existing problems, including Québec's delay in meeting its climate and electrification targets, road safety, congestion, use of space and parking capacity, and household debt. The data presented below is taken from the study "Les camions légers: Impacts de la transformation du parc de véhicules légers au Québec" ("Light-Duty

Trucks: Impacts of the Transformation of the Light Vehicle Fleet in Québec”) by the Mobility Chair at Polytechnique Montréal, with the exception of the impacts on GHG emissions, which are also gleaned from the report entitled “État de l’énergie au Québec 2021” by the Chair in Energy Sector Management at HEC Montréal.

4.4.1 Climate and environmental impacts

The growing popularity of light trucks is inconsistent with Québec’s efforts to electrify transportation and reduce GHG emissions. In 2019, light trucks accounted for 69% of the market, compared to 6% for electric vehicles (EVs): for every EV sold, about 11 light trucks were sold (Whitmore and Pineau 2021).

While the average fuel consumption for light trucks decreased between 1990 and 2018 (-14%), they still consumed 20% more fuel to travel 100 km, 10.5 litres (l) versus 8.4 l, and covered 13% more mileage (16,005 km versus 13,867 km) than cars in 2018. According to the HEC Montréal Chair in Energy Sector Management, these figures, coupled with a sharp increase in the number of light trucks (+306%) and their sales (+256%) for the 1990-2018 period, largely explain the increase in GHG emissions recorded in Québec since 2014. In addition, GHG emissions from gasoline-powered light trucks increased by 161% (3,580 to 9,338 kilotons of CO₂ equivalent), significantly more than car emissions, which fell by 9% (10,649 kt to 9,664 kt of CO₂ equivalent) between 1990 and 2018. (Whitmore and Pineau 2021)

Due to improvements in vehicle fuel efficiency, this rebound effect, which encourages drivers to increase rather than reduce mileage, gasoline consumption and GHG emissions, can also be observed for the entire fleet of light vehicles. Between 2008 and 2018, for the number of vehicles owned in the Greater Montréal area, there was a marked increase in the number of kilometres travelled daily by car (+32.4%) and, not surprisingly, in the number of tons of GHGs emitted on an average weekday (+22.6%), reaching a total of 4.5 million tons of GHGs in 2018 (Morency et al. 2021b).

The Mobility Chair sought to determine what level of reduction in GHG emissions could have been achieved if households in the region had opted for the ten (10) most fuel-efficient vehicles. It is estimated that while, in 2008, the fleet generated 44.1% more GHGs than if it were made up of the most fuel efficient vehicles, this gap jumps to 60.7% when compared to 2019.

This indicates that the fleet of owned vehicles, with the share of light trucks steadily rising, is “increasingly moving away from the most fuel-efficient vehicles, and that the losses in GHG savings are even greater” (Morency et al. 2021b).

4.4.2 Impacts on road safety

Québec’s road safety record has improved considerably since the early 2000s, with a steady annual decrease in deaths and serious injuries for all categories of road users. This development can be attributed to several factors: new regulations, road investments, urban developments, new technologies, awareness campaigns, etc. (Morency et al. 2021b).

However, the literature indicates that the larger a vehicle, the higher the frequency of collisions and the greater the risk of death for those involved in a collision. According to 2019 SAAQ data, SUVs are 2.5 times more likely to be involved in collisions with pedestrians than other types of vehicles. In addition, the severity of pedestrian injuries appears to be strongly impacted by the type of vehicle involved in a collision: more pedestrians are seriously injured by light trucks (10.6%) than by other types of vehicles (6.7%). In addition, individuals struck by pickup trucks or minivans are twice as likely to die as those struck by other types of vehicles.

Yet, despite these findings, available data indicates that insurance companies charge lower premiums to light truck owners. This differential in insurance costs contributes to the affordability of light trucks, as do auto financing strategies (Morency et al. 2021b).

4.4.3 Traffic impacts

The increase in the average size of the vehicle fleet also affects the flow of traffic. According to the Mobility Chair (Morency et al. 2021b), “[t]he increased presence of longer vehicles results in an accelerated deterioration of traffic conditions, as congestion thresholds are reached with fewer vehicles.” These thresholds are reached when the speed at which the vehicle is travelling is 70% of the posted speed.

For a road segment with a capacity of 4,000 vehicles per hour, it would take 8,667 Smart Fortwos, 5,177 Honda Civics or 4,407 Ford F-150s to reach the congestion threshold. Likewise, the time required to travel five (5) km on a highway of equal capacity is 1.4 times longer for a fleet of 6,000 Ford F-150s (7.4 minutes) than for an equivalent amount of Honda Civics (5.3 minutes), and up to 2.2 times longer in the case of Smart Fortwos (3.3 minutes).

Still based on the same theoretical estimates and on findings from the literature, the transformation of the vehicle fleet implies an additional increase in the number of hours of traffic delays per hour of network use. For example, if 6,000 standard vehicles use this same five (5) km highway segment for one hour, we record 103.3 hours of time lost to congestion (for each hour of use) compared to 153.6 hours and 203.8 hours of time lost for the 2019 fleet in Montréal in sunny and rainy conditions, respectively (Morency et al. 2021b).

4.4.4 Impacts on use of space and parking capacity

While the use of space and parking capacity are already major issues in the Montréal region, the increase in the number of light trucks since 2000 has not helped the situation. In almost 20 years, the total space occupied by passenger vehicles in the region has increased by 45.5%, from 1,338 to 1,948 hectares, under the combined effect of a rise in the number of vehicles per household and the increased presence of larger vehicles in the fleet. The greater the average length of the vehicle fleet, the more on-street parking capacity is reduced: an increase in vehicle length from 5 to 5.5 metres would result in an average 10% loss of parking capacity for five (5) Montréal boroughs, representing 24,427 parking spaces. This is a significant decrease, considering that vehicles spend almost all of their time parked and that finding a parking space is already a major factor in congestion. (Morency et al. 2021b)

4.4.5 Impacts on household finances

In 2019, Québec households spent \$35.4B on the use and ownership of motor vehicles. While the household transportation budget has remained relatively stable over the past few years, average spending on private vehicle ownership and use has risen sharply (+\$3,608 in 2012 constant dollars, an increase of 58%). This significant increase in spending is attributable to the rise in the number of vehicles per household, but mainly to the size of the vehicles purchased. (Morency et al. 2021b)

According to CAA, for equal goods (size and mass), vehicles on the market today are less expensive than in the past in constant dollars. As such, a household that had not changed its consumption habits over time would have saved money in recent years.

However, thanks to longer financing terms, in 2010, the average vehicle with a monthly payment of \$450 measured 6.74 square metres (m²), compared to 7.13 m² in 2021 for the same amount. This sales strategy of making vehicles appear less expensive than they really are is commonly used for light trucks, whose average purchase price is \$10,000 higher than that of a standard car, which encourages households to purchase these vehicles. Financing a vehicle beyond the average term of 60 months would also imply higher interest as well as an increased risk of financial loss and indebtedness for households. (Morency et al. 2021b)

Due to the higher cost of ownership and use (maintenance, fuel) for light trucks, it is estimated that households could save between \$1,000 and \$3,000 annually by considering the purchase of a car of equivalent volume instead, and up to \$4,000 by opting for the smallest model available on the market. Overall, light trucks consistently have a higher opportunity cost than a standard car. For example, by foregoing the purchase of a Toyota RAV4 and investing each month the amount that would have been spent at a rate of 1% for 10 years, the total opportunity cost would be \$74,818, compared to \$67,479 for a Toyota Corolla, a difference of \$7,339. Over 25 years, at a rate of 2.5%, the difference between a RAV4 and a Corolla reaches \$22,377 (Morency et al. 2021b). At the same time, there's a paradox among households seeking to save on housing expenses by moving away from urban areas, as they find themselves with much higher transportation expenses.

Key facts and issues

Climate and environment

Light-duty trucks:

- Have increased their GHG emissions by 156% in Canada and 161% in Québec between 1990 and 2018;
- Reverse the GHG emission reductions associated with the increase in the number of ZEVs on the road and thus undermine government efforts to electrify transportation;
- Consume more natural resources to manufacture and more energy to operate than standard cars;
- Contribute to air pollution.

Traffic, space use and parking capacity

- The proliferation of light trucks in Canada is leading to an increase in the number of hours of congestion per vehicle, which exacerbates the annual economic losses already caused by traffic congestion (\$7B in Toronto and \$1.4B in Vancouver).
- The greater the average length of the vehicles making up the vehicle fleet, the more the conditions of the road network deteriorate: it takes about half the vehicles to reach the congestion threshold and 2.2 times longer to travel 5 kilometres if all vehicles in circulation are Ford F-150s rather than Smart Fortwos.
- The higher weight of light trucks causes early wear and tear on road infrastructure, an even greater issue with electric light trucks because of the battery that adds significant weight to the vehicle.
- In nearly 20 years, the total space occupied by the vehicle fleet in the Greater Montréal area has climbed by 45.5%, from 1,338 to 1,948 hectares.
- Increasing vehicle length from 5 to 5.5 metres would result in an average loss of parking capacity of 10% in Montréal, which represents 24,427 parking spaces.

Road safety

- The heavier an SUV, the higher the frequency of collisions and the higher the risk of death: compared to standard cars, accidents caused by pickup trucks and SUVs are respectively 27% and 10% more frequent and 158% and 28% more fatal for the person driving the other vehicle.
- In Québec, SUVs are 2.5 times more often involved in collisions with pedestrians than other types of vehicles.
- A greater proportion of pedestrians is seriously injured by light trucks (+3.5%) than by other types of vehicles.
- Individuals struck by pickup trucks or minivans are twice as likely to die from collision-related injuries as those struck by other types of vehicles

Household finances

- Long-term car loans encourage the public to buy light trucks that are more expensive than their budgets allow, in addition to incurring higher interest and increased risk of financial loss and debt distress.
- Between 1981 and 2019, average household spending on vehicles increased from \$6,730 to \$10,476, and 65% of the increase was due to the purchase of new light trucks.
- The average light-duty truck costs \$10,000 more than a standard car in Canada.



Solution

The increase in light-duty trucks in Canada must be recognized as a public health and safety issue in order to reverse the trend.

5. ISSUES OF DEFINITION AND CLASSIFICATION

The information in this chapter is taken from the report "*Les camions légers : Définitions and évolution de l'offre*" ["Light-duty trucks: Definitions and changes in supply"] prepared by the Mobility Chair of Polytechnique Montréal.

It explores the very definition of a light-duty truck, at a time when the industry and various levels of government seem to be struggling to categorize the plethora of vehicle lines and models. Light-duty trucks are increasingly difficult to distinguish from other vehicles brought to market, raising several issues involving vehicle classification in general and the regulations stemming from this classification.

First of all, the confusion and ambiguity surrounding the definition and, by extension, classification of these vehicles is real, and the automobile industry benefits from this lack of clarity. This has given rise to a variety of classification systems based on body type, vehicle line and transmission. From a government standpoint, classification system disparities exist not only between the federal and provincial governments, but within the federal government itself. Finally, the fact that the responsibilities of each level of government towards the automotive industry are unclear makes the governance of light-duty vehicles all the more complex.

5.1 Industry terminology and nomenclature

Most of the terms used to describe and classify the vehicles are determined by the automobile industry, which does not provide a clear definition of SUVs and other light-duty trucks. Consequently, various forms of classification are noted. Maintaining this ambiguity benefits the automobile industry, as it allows for various marketing tactics.

5.1.1 Classification according to body type

According to James Riswick, a columnist with Car and Driver, the easiest way to define a vehicle is by its appearance. But that has not always been the case, since all vehicles used to look alike in the early days of automotive design. The Mobility Chair of Polytechnique Montréal explains "[that] they were basically composed of an engine and tires attached to a chassis" (Morency et al. 2021) and that the market gradually diversified with the emergence of scientific techniques of work organization, new methods of automotive design, purchasing on credit

and economic prosperity (dealt with in Chapter 7). Manufacturers began to offer different lines of vehicles with a variety of car bodies, chassis and engines. In the process, body type became "one of the key elements in automobile marketing and market segmentation" (Morency et al. 2021).

According to the Mobility Chair, "nearly all body categories contain exceptions," which demonstrates "the limits of this terminology in defining vehicles when their features are changing so rapidly" (Morency et al. 2021). Furthermore, "certain vehicles that gradually appeared on the market became a new industry standard. In the 1990s, crossovers were an exception within the SUV category. Today, they have a ubiquitous presence on the market, and it is increasingly difficult to ignore their similarities with cars in different categories" (Morency et al. 2021)

5.1.2 Classification by vehicle line

Most body styles are available in a range of vehicles. The concept of range refers to different criteria such as weight, interior volume or other features. The Mobility Chair of Polytechnique Montréal has identified two (2) types of range classifications. Car and Driver identifies three (3) categories of SUV, while Edmunds, one of the oldest automotive information companies, identifies 14 categories. (Morency et al. 2021) These different categorizations demonstrate the variability within a given classification system.

Table 2. Car and Driver (2020) body classification system

Category	Definition
Small SUV <i>Nissan Rogue</i> <i>Hyundai Tucson</i>	It is easy to maneuver and park like a car. 6Mini-SUVs also fall into this category.
Intermediate SUV <i>Toyota Highlander</i>	This category includes vehicles built on automobile platforms and other vehicles whose attributes are closer to those of a compact or midsize pickup truck.
Large SUV <i>Cadillac Escalade</i> <i>GMC Yukon</i>	This category includes luxury models and those with all-terrain capabilities.

Source : Morency et al. (2020)

Table 3. Edmunds (2020) body classification system

Catégorie	Définition
Very small Mazda CX-30 Hyundai Kona Kia Soul Honda HR-V Kia Seltos Subaru Crosstrek	This type of vehicle includes subcompact models that are essentially raised hatchbacks.
Small Honda CR-V Mazda CX-5 Jeep Wrangler Ford Bronco	Known as compact SUVs, they are said to be the cornerstone of the current market. Almost every automaker has its own version of a small SUV. They are said to have replaced sedans and mid-size cars among small families and commuters.
Small, three-row Kia Sorento Volkswagen Tiguan Mitsubishi Outlander	This type of SUV offers more passenger seating at the expense of comfort.
Intermediate Toyota 4Runner Jeep Grand Cherokee Honda Passport	This class offers more space for people and for cargo, and a more powerful engine. Most of these SUVs come equipped with a four-cylinder turbo, but some have a V6. This type of vehicle also offers greater towing capacity than the smaller SUV. It can have modest to exceptional off-road capabilities.
Intermediate, three-row Toyota Highlander Hyundai Palisade Mazda CX-9	Designed for long-distance travel and large families who don't want a minivan, this type of SUV most often comes equipped with a V6 engine or a four-cylinder turbo engine. Despite its size, this vehicle is quite easy to drive in the city since its design is similar to that of a car.
Large Ford Expedition Chevrolet Suburban GMC Yukon Chevrolet Tahoe	With a massive interior and robust towing capabilities, this type of vehicle is relatively bulky. Its interior space is compromised by the truck-like platform.

Source : Morency et al. (2020)

In short, the industry's classification criteria to inform consumers about their buying options are relatively variable and subjective according to the source consulted. In addition to body type and vehicle line, transmission type is another way to classify light-duty trucks. The ambiguity around classification allows the automobile industry to develop marketing tactics by playing with the words used to describe the vehicles.

5.2 Government terminology and nomenclature

After examining industry definitions and classification systems, which are found to be relatively imprecise, variable and subjective, the same exercise was conducted with government agencies to assess how they describe and categorize light trucks, and where there is convergence and divergence with industry. Since the government classification system forms the basis of the regulations on light-duty vehicle

emissions and fuel consumption, among other things, it is critically important in meeting Canada's climate targets.

5.2.1 Government definitions

First, the Mobility Chair of Polytechnique Montréal explored the various definitions of the concepts of "light-duty vehicles" and "light-duty trucks" within government authorities.

Each public authority defines vehicles according to its own objectives, which leads to inconsistencies.

They may specify the weight, physical characteristics, mechanical components, uses or the number of passengers in order to categorize a vehicle. Some definitions also give examples of the types of vehicles included or excluded in a category. For the Mobility Chair of Polytechnique Montréal, "the most comprehensive, but also the most complex, definition of a light-duty truck is found in the federal *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations [...]*" (Morency et al. 2021) There, a light-duty truck is defined as a vehicle:

1. "... that has four-wheel drive or [a gross vehicle weight rating (GVWR)] of more than 2,722 kg (6,000 pounds) and that has at least four of the following characteristics calculated when the automobile is at curb weight, on a level surface, with the front wheels parallel to the automobile's longitudinal centreline and the tires inflated to the manufacturer's recommended pressure:

- approach angle of not less than 28 degrees,
- break-over angle of not less than 14 degrees,
- departure angle of not less than 20 degrees,
- running clearance of not less than 20 centimetres,
- front and rear axle clearances of not less than 18 centimetres, or

2. that is designed to perform at least one of the following functions:

- transport more than 10 persons;
- provide temporary living quarters;
- transport property on an open bed;
- provide greater cargo-carrying than passenger-carrying volume, the cargo-carrying volume of a vehicle sold with a second-row seat being determined with that seat installed, regardless

of whether or not the manufacturer has described that seat as optional;

- permit expanded use of the automobile for cargo-carrying purposes through the removal or stowing of seats to create a flat surface extending from the forwardmost point of installation of those seats to the rear of the automobile's interior, with automobiles of the 2012 and subsequent model years being equipped with at least three rows of designated seating positions as standard equipment. (light truck)." (Morency et al. 2021).

The concept of what is a truck is becoming increasingly blurred: light vehicles now form a continuum.

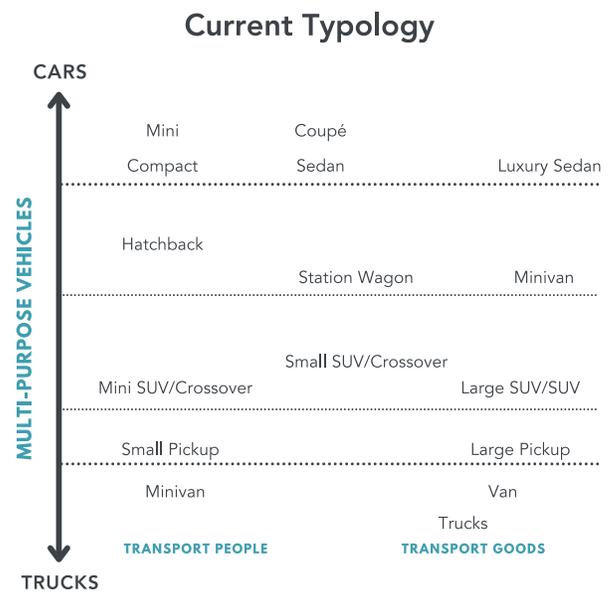
Also, according to the Mobility Chair of Polytechnique Montréal, light vehicles are classified according to their weight. In line with the previous observation, the indicator used by the federal government to distinguish between light and heavy vehicles is the 4,536 kg threshold. As explained in the following chapter, vehicles on the road are growing in size and weight. As such, according to the Mobility Chair (2021), "SUVs, which actually started out as lighter trucks, with a chassis and drivetrain capable of off-road driving and pulling loads, are becoming increasingly diverse in their size and design methods. Many SUVs, except for their truck-like height, now have mechanical characteristics and dimensions more akin to sedans, minivans or even hatchbacks¹. The concept of what is a truck is therefore becoming more and more confusing. "

THE NOTION OF A TRUCK IS BECOMING INCREASINGLY CONFUSING..

In fact, as can be seen from Figure 7, vehicles form a continuum, both in their physical and mechanical characteristics. It should therefore be possible to establish a universal classification system (Morency et al. 2021).

1 The Office québécois de la langue française defines a hatchback vehicle as follows: « A two-volume motor vehicle whose body profile has a step at the base of the windshield, but not at the rear. » (OQLF)

Figure 7. Illustration of the body continuum and product lines



Source : Morency et al. (2020)

There is confusion in the terms used from one jurisdiction to another.

- In Quebec, the term "passenger vehicle" is translated by "véhicule de promenade" and refers to vehicles licensed and owned by individuals for personal use;
- In Quebec, the term "vehicle for professional, commercial or institutional use" is used to refer to the commercial vehicle. (Morency et al. 2021)

There is a lack of uniformity between English and French translations.

- "Passenger vehicle" is sometimes translated as a vehicle used to transport "passengers" for personal or commercial purposes, and sometimes as a "travel" vehicle used strictly for personal purposes and for which capital cost allowance deductions are limited within the meaning of the Canadian tax system.
- "Utilitarian vehicles" are sometimes translated as "utility vehicle", that is, a vehicle with a capacity to transport cargo or goods, or as "commercial vehicle", that is a vehicle used for commercial purposes without necessarily having any particular mechanical capacity.
- The terms "car," "vehicle" and "automobile" are sometimes used as synonyms and sometimes

as separate objects. A car is an automobile, which is itself a vehicle, but the reverse is not necessarily true, depending on the definition. A vehicle is not necessarily an automobile, which, in itself, is not necessarily a car.

The variations in definitions make it difficult to make comparisons between provinces.

The Mobility Chair analysis reveals that at the federal level, a light vehicle is typically defined as a vehicle weighing 4,536 kg or less (10,000 pounds), sometimes rounded up to 4.5 tons in some definitions. The threshold used in Quebec is 3,000 kg.

In addition, the categories of "cars" and "light trucks", where they exist in the databases, are rarely defined in detail. It is often impossible to tell whether different public agencies, even at the same level of government (e.g., Transport Canada and NRCAN), use the same definition (for *light truck*) in their vehicle classifications. (Morency et al. 2021)

In short, government definitions of light trucks vary as much as those of the automotive industry. There are differences between levels of government using them for their respective regulatory purposes, between jurisdictions, between English and French translations, and between provinces.

5.2.2 Government classifications

The Government of Canada uses the EPA classification that establishes the GHG emission standards under the US Clean Air Act.

The EPA classifies cars according to their interior volume, while trucks are classified according to their weight. But this classification, initially designed to accommodate the automobile industry, no longer applies today for a variety of reasons:

1. CUVs' fuel economy is similar to that of a car; and
2. Certain SUVs and minivans can have a cargo capacity similar to that of sedans, hatchbacks and station wagons.

Furthermore, it is often automakers that determine the vehicle weight and features that form the basis of the classification, which is to their benefit when a CUV is similar to a car, since they can classify it in the light-duty truck category. The fact that its weight is lighter than that of certain SUV models means that it can be classified as a small light-duty truck rather than as a large car, which would have taken account of its interior volume.

As a general rule, the EPA uses subcontractors to compile certification files and to contact manufacturers to identify the appropriate classification, so the automobile industry enjoys a certain latitude when it comes to vehicle classification (Morency et al. 2021). This all points up how closely integrated the North American automobile market is. The impacts of this categorization system on GHG emissions from light-duty vehicles are explored in chapter 7.

The categories of cars are identical to those that were in place in the late 1970s, while the truck categories have evolved significantly.

More specifically, the threshold for small pickup trucks has been raised from 4,500 lbs. to 6,000 lbs., and new categories have been added for SUVs, minivans, and vans. These vehicles, which used to be less popular, had been classified as special-purpose vehicles. These various additions reflect the evolution of the light truck offering. (Morency et al. 2021)

To summarize, the information reviewed indicates that there is no formal definition or consensus on the elements to be used to describe and classify vehicles across Canada or even across the continent. Light trucks are an ill-defined object under Canadian regulations. It is clear that governments are struggling to adapt the regulatory and legal framework to market trends.

5.2.3 The division of responsibility for transportation in Canada

There is also a certain degree of confusion regarding the authority of various jurisdictions to regulate transportation. Indeed, "*The Constitution Act, 1867* does not establish a separate jurisdiction over the transportation of persons by road. Both the federal government and the provinces may legislate based on which area of the Constitution comes closest to the core element of the legislation or regulation to be enacted. Thus, although the North American market tends towards a certain homogeneity for both practical and economic reasons, the legislative and fiscal framework for motor vehicles varies from one province to another." (Morency et al. 2021). This reality makes the governance of the automobile sector all the more complex.

5.3 Overview

In addition to the fact that classification systems vary within the automotive industry, it is clear that

government classifications are no longer relevant to the trends in vehicles being purchased today. In addition, they vary between the various governments, between French and English versions, and between provinces. This also causes inconsistencies within the industry, which relies primarily on body style when describing vehicles, and the government, which primarily ranks vehicles by weight, in the case of light trucks, and by interior volume, in the case of automobiles.

The confusion surrounding light trucks needs to be eliminated in order to improve how they are governed in Canada and, ultimately, to better regulate them, especially when it comes to GHG emissions. Any potential future classification system must therefore take into account the evolving nature of the automotive marketplace.

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Key facts and issues

Inconsistencies are found:

- Between the definitions and classifications used by the automotive industry and by governments;
- In the terminology and nomenclature used by the automotive industry:
 - The body, range, and transmission of the vehicle that can be used to classify light-duty vehicles.
 - The differences between the categories of light-duty vehicles are becoming increasingly blurred.
- Between federal and provincial definitions and classifications:
 - Definitions of "light-duty truck" and "SUV" vary between the federal and some provincial governments.

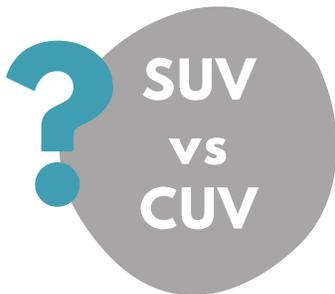
In addition, the EPA classifies cars by interior volume and light-duty trucks by weight. This classification, on which Canada's light-duty vehicle GHG emission regulations are based, is outdated and does not reflect current market trends.

Also, the terms used to refer to light-duty vehicles are not consistent in English and French.

Finally, the integration of the North American automotive market makes it difficult to make changes to the regulations without involving the United States.

Solutions

1. Establish a consensus on the official definitions of the different types of vehicles;
2. Adopt an automatic and universal classification system for light-duty vehicles that :
 - Reflects the transformation of the vehicle fleet;
 - Would be used by the automotive industry, the federal government, Canadian provinces and, ideally, the United States.



6. UNDERSTANDING THE TREND IN THE SUPPLY OF LIGHT-DUTY TRUCKS

The information in this chapter is taken from the report "Les camions légers: Définitions et évolution de l'offre" ["Light-Duty Trucks: Definitions and How the Supply Has Evolved"] prepared by the Mobility Chair of Polytechnique Montréal. Bridging the gap with the previous section, this chapter provides a portrait of the evolving characteristics of light vehicles sold in Canada. The limits of the definitions with respect to the increasing complexity of models marketed by manufacturers are illustrated. This helps identify one of the potential causes of the growing popularity of SUVs: the diversification of vehicle features.

6.1 Canadian light-duty vehicles: longer, taller and wider

A global analysis of the changing vehicle characteristics over time shows that their dimensions are constantly increasing. We are now seeing a real issue throughout the light-vehicle sector of «highway obesity» because of this phenomenon. The graph below shows the key characteristics that have changed over the past decade.

Figure 8. Changes in average property size of light-duty vehicles sold in Canada, 1994-2019



Source: Morency et al. (2021)

The Mobility Chair of Polytechnique Montréal highlights the fact that the automotive industry's offerings have changed over time, and this has impacted the makeup of the current vehicle fleet. The Chair adds that "certain properties of vehicles have evolved, such as mass, front-door height, or floor space, and [some] of these are critical in exacerbating certain negative impacts associated with the extensive use of automobiles in everyday travel." (Morency et al. 2021)

Here are a number of findings from the analysis of key vehicle properties:

- There has been an increase in the total footprint for almost all vehicle categories, most notably in pickup trucks;
- A significant selection of small vehicles has disappeared from the market in all categories, especially among sedans, where distribution has become much narrower;
- The distributions of sedans and SUVs/CUVs are relatively similar in terms of footprint;
- Sedans are increasing in size significantly and approaching that of mid-size SUVs, which are showing a smaller and smaller footprint.
- Sedans and hatchbacks are being differentiated more and more based on their respective sizes.

The data indicate a significant diversification in the SUV offering since the early 2000s, in terms of size, mechanical characteristics and range. (Morency et al. 2021) In other words, there are SUVs for every taste, every need and every budget.

6.1.1 Changes in vehicle characteristics in Québec

As shown in the previous subsection, vehicle characteristics are increasing, including net mass, and this is not any different in Quebec. The results from the Mobility Chair (Morency et al. 2021) show that the vehicles' median mass has increased each year from 1990 to 2019. The same is true for the length of all vehicles on the road, as well as their height.

6.1.2 Average characteristics of specific models

The changing characteristics of models that are well known to the general public and are among the top sellers in their categories have also been analyzed by the Mobility Chair at Polytechnique Montréal. They show how a particular vehicle model has evolved overtime.

A convergence of characteristics among vehicle models that were previously non-comparable is seen. For example, "the Honda CR-V, which is classified as a crossover, is similar in length to the Honda Civic. For the 2019 model year, it is even slightly shorter than the sedan version. This is partly due to the fact that the length of the Honda Civic has increased by 23 centimeters over the past 25 years." (Morency et al. 2021)

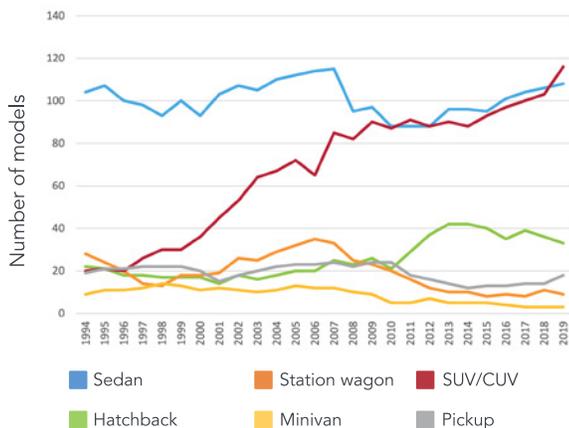
If sedans are now comparable to SUVs or CUVs in terms of size, this confirms that they are becoming

longer, wider and heavier, again illustrating the growing phenomenon of “highway obesity”. This is further confirmed by the analysis of the evolution of specific models, which reveals an increase in length, width, height and weight for almost all the models examined. Conversely, a CUV model such as the Honda CR-V, which is claimed to offer a spacious cargo area, is experiencing a decrease in cargo area length, which calls into question the usefulness of its large size when compared to other light truck models.

6.2 Growth in the number of SUV models available

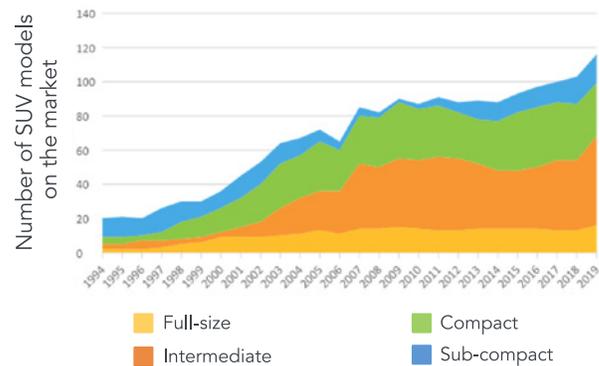
As shown by Figure 9, the SUV supply has exploded over the past two decades. In short, in addition to the proliferation of versions of the same model, there has also been a proliferation of models per se. In addition, it is primarily the smaller SUV models (midsize, compact and subcompact) that have mushroomed, as illustrated by Figure 10.

Figure 9. Number of light-duty vehicle models marketed in Canada by body type, MY 1994-2019



Source: Chaire Mobilité of Polytechnique Montréal (2021)

Figure 10. Number of SUV models marketed by subcategory, MY 1994-2019



Source: Chaire Mobilité of Polytechnique Montréal (2021)

6.2.1 A single model in several versions in the same year

The same model of vehicle can also be offered in different versions during the same year, further confirming the diversification of the light-duty truck offer. This type of practice allows automakers to reach an ever-expanding customer base.

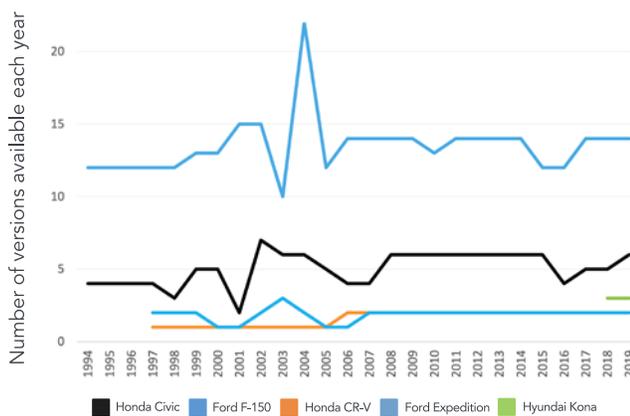
Automakers release different versions of the same model each year, allowing consumers to customize their vehicles to meet their particular needs. "The differences between versions may be in the powertrain (e.g., transmission, engine size), number of doors, number of seats, cargo box size, and other equipment options (e.g., air conditioning, automatic windows, heated seats, etc.)." (Morency et al. 2021) Here are the highlights from the analysis of specific models:

- The Honda Civic is available in three (3) body styles: sedan, coupe and hatchback.
- First introduced in 1996 as part of the 1997 model year (MY), the Honda CR-V is a crossover vehicle (small SUV). Since that year, consumers have been able to choose between two (2) versions: one with all-wheel drive (AWD) and the other with front-wheel drive (FWD).
- The Ford Expedition was also introduced in 1996, but falls into the large SUV category. A new, larger version (MAX) has been available since MY 2007. All versions have four-wheel drive (4WD).

- The Hyundai Kona belongs to an entirely new line of vehicles, the compact crossovers (very small SUVs), which hit the North American market in 2017. It is offered with either AWD or FWD. An electric version is also available.
- The Ford F-150 has been Canada's best-selling pickup truck for decades. Offering a single cab (three-persons) or double cab (six-persons) version, it is available with 4X2 or 4X4 drive, a V6 or V8 engine, and a 5.5-, 6.5-, or 8.0-foot cargo box. (Morency et al. 2021)

Finally, again according to the Mobility Chair of Polytechnique Montreal, "for the 2019 MY, including sports cars, the Canadian public had a choice of 383 different models, compared to 278 models for the 1994 MY, for an increase of 42%. The number of versions jumped from 556 to 889, an increase of 60%. (Morency et al. 2021) Manufacturers therefore seem to be concentrating on a reduced offer that is highly tailored to the different needs of their clientele, who are now able to personalize their vehicles. The wide range of available versions of the same model therefore makes it possible to reach a broad spectrum of individuals. The proliferation of these versions is illustrated in the following figure.

Figure 11. Number of versions available in Canada, specific models, MY 1994-2019



Source: Chaire Mobilité of Polytechnique Montréal (2021)

6.3 Difficulty in classifying SUVs and CUVs

Based on the foregoing, it is clear that the arrival of CUVs, "a range of very small utility vehicles" (Morency et al. 2021), in the market could be one of the factors explaining the popularity of light-duty trucks in Canada.

According to the Mobility Chair of Polytechnique Montreal, "CUVs are smaller, more fuel-efficient and more economical than traditional SUVs. They raise more and more classification issues." (Morency et al. 2021, 32) It is therefore vitally important to distinguish them from SUVs and qualify them in order to understand their role in the evolution of the supply of and demand for larger vehicles.

However, in the analysis conducted by the research chair, the CUVs could not be adequately identified, neither in the CVS database nor in the NRCAN database. In fact, since most of them were identified as SUVs, they were classified according to their body style, a classification used by the automobile industry.

As the automotive magazine *Car and Driver* has proposed a list of the "top" models by subcategory, the Mobility Chair was able to compare their characteristics to those of the overall market.

Table 4. Top models of SUV/CUVs

Subcategory of SUV	Top models according to Car and Driver
Sub-compact	Ford Ecosport, Chevrolet Trax, Toyota C-HR, Fiat 500X, Mazda CX-3, Honda HR-V, Jeep Renegade, Buick Encore, Kia Niro, Subaru Crosstrek, Nissan Kicks, Kia Soul, Hyundai Kona, Kia Seltos
Compact	Hyundai Nexo, Jeep Compass, Jeep Cherokee, Mitsubishi Eclipse, Mitsubishi Outlander, Nissan Rogue, Nissan Terrain, Chevrolet Equinox, Ford Escape, Hyundai Tucson, Kia Sportage, Toyota RAV4, Subaru Forester, Volkswagen Tiguan, Honda CR-V, Mazda CX-5
Intermediate	Nissan Murano, Honda Passport, Jeep Grand Cherokee, Ford Edge, Kia Sorento, Subaru Outback, Chevrolet Blazer, Kia Santa Fe
Full-size	Ford Expedition, Chevrolet Suburban, GMC Yukon, Chevrolet Tahoe, Nissan Armada, Toyota Sequoia

Source: Chaire Mobilité of Polytechnique Montréal (2021)

There is therefore a need to review how vehicles are defined and classified in order to more formally include CUVs and reduce the confusion associated with this new type of vehicle.

6.3.1 Inconsistencies in current system of vehicle classification

This subsection identifies more of the mismatches in vehicle classification caused by the growth in the size of the overall vehicle fleet and the introduction of CUVs onto the market.

Very different vehicles are classified under the same category.

According to the Mobility Chair, "[t]he SUVs designated among the best of the sub-compact, compact and mid-size ranges, as defined by the industry, are quite distinct from full-size SUVs. Full-size SUVs are more similar in size to pickup trucks. Some subcompact SUVs are significantly closer in size to hatchbacks than to other SUVs.» (Morency et al. 2021)

THUS, THE TERM SUV NOW REFERS TO VEHICLES AS SMALL AS THE HYUNDAI KONA AND AS LARGE AS THE LINCOLN NAVIGATOR.

Same-sized vehicles are classified in different categories.

"While there is a relatively clear distinction between trucks and cars of roughly 150 cm in height, there is also some overlap. It is therefore possible to find vehicles of almost identical size on the market, but which belong to four different body types (sedan, hatchback, station wagon and SUV) and two vehicle types (car and light-duty truck)." (Morency et al. 2021) And drawing a clear line as to which vehicle should be included in which category is not a trivial matter, given the different standards that exist for cars and light-duty trucks.

6.4 Perspectives regarding the definitions and classification of light-duty vehicles

The SUV has emerged as a distinct consumer product that sits between the truck and the car. Over the decades, however, especially beginning in the 1990s, the term SUV has slowly transformed away from its original character. Today, it encompasses a wider range of high-riding vehicles, whose features form a progressive continuum from hatchback to pickup truck. SUVs meet the needs of an increasingly diverse clientele. Unlike the older station wagons, utility vehicles are very well represented in the more upscale ranges and are increasingly available in hybrid and electric versions.

As a result of this evolution, there is no consensus on the terminology used to describe vehicle types within the industry or within government at either the federal or provincial level. While definitions and classification systems are essential to legislate and hold the automotive industry accountable, it is important for the federal government to ensure that a clear and universal definition of light-duty trucks, including SUVs and CUVs, is brought forward, and that the vehicle's unique characteristics are established. This step is crucial to ensuring appropriate regulation of GHG emissions from light-duty vehicles and effectively working towards Canada's climate targets.

Key facts and issues

Changes in light-duty vehicle properties

All types of light-duty vehicles have transformed in recent years:

- Cars and light-duty trucks are getting wider, longer and heavier, a phenomenon called "highway obesity" by the Mobility Chair of Polytechnique Montreal;
- Almost all categories of vehicles have seen an increase in their average footprint, most notably pickup trucks.

The characteristics in terms of vehicle size are increasingly similar:

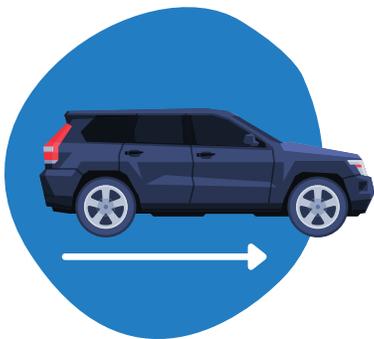
- Light-duty trucks of all sizes are growing in numbers;
- "Subcompact" SUVs have a similar footprint to hatchbacks;
- Sedans are increasing significantly in size and approaching the size of midsize SUVs, which are decreasing in footprint; and
- Sedans and hatchbacks are increasingly differentiated by their respective size.

Changes in the supply of light-duty trucks

- The models and versions of light-duty trucks continue to grow.
- The emergence of a line of small utility vehicles, CUVs, may partly explain the popularity of light-duty trucks.
- The confusion surrounding the concept of light-duty truck makes it difficult to draw a clear line as to which vehicles should be included in this category:
 - Very different vehicles are now classified in the same category.
 - Vehicles of identical size are classified in different categories.
- When it comes to categorizing vehicles, their purpose should no longer be a factor, since light-duty trucks are now vastly used for personal rather than commercial activities.

Solutions

1. Recognize that light vehicles now form a continuum;
2. End the binary categorization of light-duty vehicles with regards to GHG emission standards;
3. Establish a typology based on the government's regulatory objectives: road safety for others, GHG emission reduction or congestion reduction.



7. UNDERSTANDING THE DEMAND FOR LIGHT-DUTY TRUCKS

The information in this chapter is taken from the report "*Les camions légers: Facteurs ayant contribué à la transformation du parc de camions légers au Canada*" ["Light-duty trucks: Factors behind the transformation of Canada's light-duty vehicle fleet"] prepared by the Mobility Chair of Polytechnique Montréal.

More than any other previous vehicle type, the ubiquitous SUV has made the transformation of Canada's light-duty vehicle fleet increasingly obvious. To take stock of the situation, this chapter examines the growing demand for light-duty trucks across Canada, as well as the various factors that can help explain it.

7.1 Analytical framework: consumption theory

The consumption theory helps us explore and understand the change in consumer purchasing habits that has been observed. This theory posits that the vehicle fleet transformation could be attributable to one or more of the following causes:

- Easing of household budget constraints (increase in household financial capacity);
- Decrease in light-duty truck prices;
- Increase in the price of alternatives to light-duty trucks (cars); and/or
- A change in preferences (more willingness to spend).

7.1.1 Principles of consumption theory

Certain consumption theory principles were used by the Mobility Chair of Polytechnique Montréal to analyze the demand.

First, the notion of utility refers to the satisfaction that consumption of a combination of goods and services offers an individual. Individuals are assumed to be rational and thus capable of saying that they prefer one combination of goods over another. Typically, identification of preferences is consistent over time.

Next, elasticity of demand is an economic concept used to measure demand sensitivity to a change in price of the good in question (price elasticity), a change in price of a substitute good (cross price elasticity), a change in income (income elasticity) or a change in time (time elasticity). Demand sensitivity depends on a variety of factors.

The easing of household budget constraints is another principle. It is built on the consumption theory base model that predicts that an individual chooses the combination of goods and services which will maximize its utility within their budget. If an individual experiences increased purchasing power, they will consume more of all goods and services, but the goods they consume will change and diversify. For example, the following factors may have helped transform the vehicle fleet in the face of an easing of budget constraints:

- Increase in real income (beyond inflation levels);
- Easier access to credit.

The principle of lower costs for the ownership or use of a good, in this case an SUV or some other light-duty truck, also helps explain the change in demand. For example, since the use of personal vehicles requires a number of complementary goods and services, any change in the price of one of these complementary items could produce a change in vehicle demand. Thus, if the price change affects cars asymmetrically in relation to light-duty trucks, the substitution effect would be significant. The following factors may have helped transform the vehicle fleet by producing a change in vehicle price or costs:

- Improved design methods or technologies (lower production costs and sale prices);
- Subsidies, trade deals or other public policies influencing methods, production costs or sale prices;
- A change in the price of complementary vehicle items.

The rebound effect produces effects similar to a decrease in the price of a good, but applies more specifically to the context of improved energy efficiency. When a vehicle becomes more energy efficient, individuals tend to use it more and, thus, increase their fuel expenses. In the process, any gains in energy efficiency are wiped out. This phenomenon is amplified if society views the product in a favourable light.

Last, the change in preferences could be attributable to marketing, advertising, urban planning, lifestyles, persistence of vehicle use and ownership habits and transfer of consumption habits.

7.2 Analysis of demand

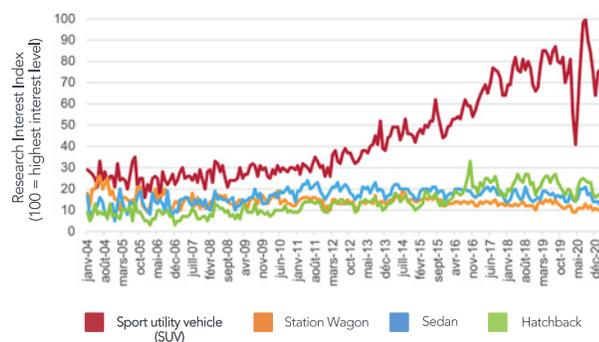
This subsection provides a sociodemographic and economic profile of light-duty truck buyers. As mentioned in chapter 1, international data reveal that interest in SUVs is growing throughout the world.

This part of the report shows that this growth in interest is particularly pronounced in Canada. It also presents certain differences among the provinces as well as a deeper analysis of the characteristics of the sociodemographic groups interested in light-duty trucks in Québec.

7.2.1 Growing interest in light-duty trucks in Canada

Figure 12 illustrates the growing interest in SUVs on the part of buyers: they account now for over half of website hits.

Figure 12. Index of consumer interest in various automobile body types in Canada, 2004-2021



Source : Morency et al. (2021a)

7.2.2 Changes in expenses for privately used vehicles

According to the Mobility Chair of Polytechnique Montréal, the number of light-duty vehicles in circulation went from 14.9 to 25.7 million in Canada from 1990 to 2017². Over the same period, "The number of light-duty trucks for passengers increased by a factor of 3.5 (253% increase)." (Morency et al. 2021)

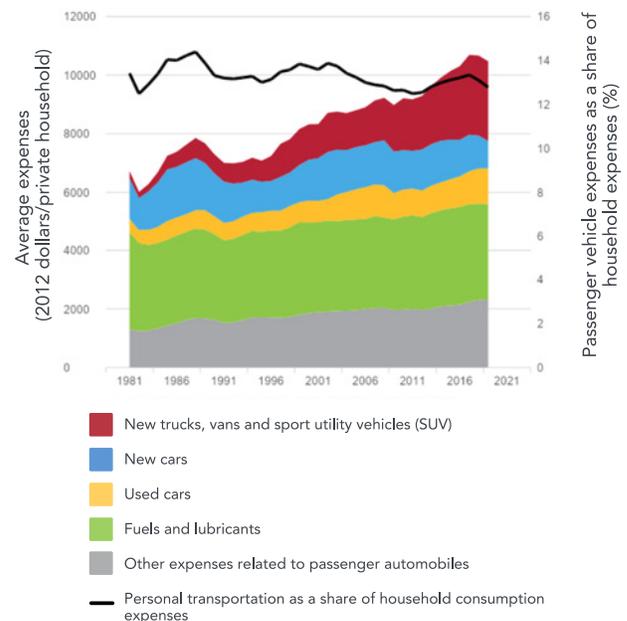
Figure 13 presents the changes in household average expenses associated with owning and driving automobiles for personal use. From 1981 to 2019, they went from \$6,730 to \$10,476 (not accounting for inflation). According to the Mobility Chair, some 65% of the increase is attributable to expenses for the purchase of new light-duty trucks (trucks, vans and SUVs).

² According to Statistics Canada, there were 22.7 million light on-road vehicles (under 4500 kg) on the road in 2017.

These results are consistent with the rebound effect theory: "[the improvement] in the fuel efficiency of vehicles may have been offset by an increase in motorization and the purchase of light trucks" (Morency et al. 2021a). Moreover, the share of private transportation in households has remained relatively constant over the observed period (Morency et al. 2021a), which supports this theory.

In conclusion, the data indicate that money spent on light-duty trucks increases with household income.

Figure 13. Changes in household consumption expenses for personal transportation by expense category, in constant 2012 dollars, Canada, 1990-2017



Source : Morency et al. (2021a)

7.3 Comparisons among Canadian provinces

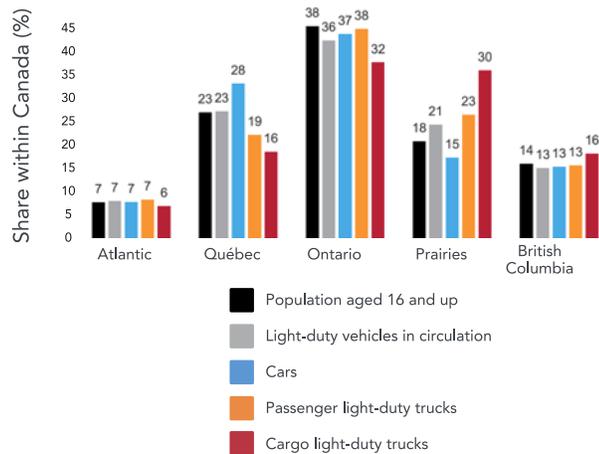
This section presents the provincial tendencies and disparities in the distribution of light-duty trucks. Their growing but differentiated popularity can be explained in part by the existence of certain public policies in the provinces. (Morency et al. 2021a)

7.3.1 Distribution of light-duty vehicles

According to the Mobility Chair of Polytechnique Montréal, distribution of light-duty trucks across the provinces should follow the provinces' demographic weight. As illustrated in Figure 16, however, the number of vehicles surpasses the number of driving-age persons (+3%) in the Prairie provinces, and the share of light-duty trucks in relation to the number of driving-age persons is significantly higher in this part

of the country than the rest of Canada. In Ontario, the number of vehicles is lower than the number of driving-age persons (-2%). Quebec has the highest proportion of cars in relation to the number of driving-age persons. Thus, light-duty trucks remain relatively less popular for the time being, but to the detriment of car ownership.

Figure 14. Distribution of light-duty vehicles relative to provincial demographic weight in 2017

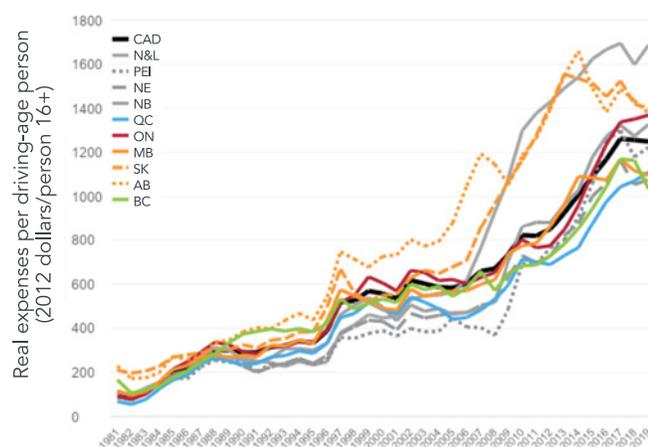


Source : Morency et al. (2021a)

7.3.2 Changes in household expenses and their distribution

Figure 15 indicates that the expenses associated with purchasing light-duty trucks rose significantly in all the provinces from 1981 to 2019.

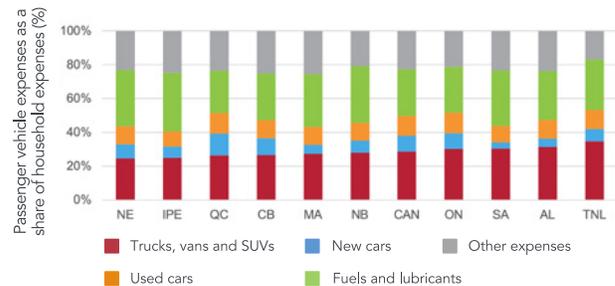
Figure 15. Expenses for purchasing light-duty trucks per driving-age person in constant 2012 dollars, 1981-2019



Source : Morency et al. (2021a)

On the other hand, Figure 16 notes differences in the expenses for private automobiles in the provinces. The Mobility Chair has this to say: “the Atlantic and Prairie provinces have spent above the Canadian average since 2008, but for different reasons. [...] Expenses associated with vehicle operation (fuel and so forth) are higher in the Atlantic provinces, while purchase-related expenses are higher in the Prairies. These differences can indicate disparities with regard to the ownership and use of vehicles by households, but also with regard to public policies in place.” (Morency et al. 2021a)

Figure 16. Distribution of household expenses for private automobiles in 2019



Source : Morency et al. (2021a)

The cost differences among the provinces is attributable in part to insurance costs, which are lower in Quebec than in the rest of Canada. Also, fuel costs vary from one region to the next due to fuel acquisition costs, the gasoline excise tax, sales taxes and carbon charges. Quebec has the highest fuel taxes of all the provinces, accounting for some 30% of the price of fuel, versus 21% in Alberta. “Two provinces, Quebec and British Columbia, have rates that vary by region. In Quebec, the base rate is 19.2 cents per litre. Some regions have a higher rate to help pay for public transit (in Montreal, the base rate is 22.2 cents per litre), while others have a reduced rate (e.g. border towns). In British Columbia, the Vancouver (27 cents per litre) and Victoria (20 cents per litre) regions have higher rates.” (Morency et al. 2021a)

In Quebec and the Maritimes, taxes on the purchase of vehicles are the highest in Canada. British Columbia imposes a progressive sales tax on luxury vehicle prices over \$125,000. Quebec has the highest vehicle license and registration fees in the country (\$275), along with Newfoundland (Saskatchewan has the lowest, at \$68). Quebec also charges a tax on luxury vehicles valued at more than \$75,000, as well as an additional registration fee on large-engine (3.95-litre or higher) vehicles.” (Morency et al. 2021a)

7.3.3 Summary of provincial differences

Interprovincial differences can be explained by various factors. Quebec has the lowest number of light-duty trucks per driving-age person (16 years and up) of any of the provinces, which can be explained by the fact that it has the highest ownership costs, due primarily to its sales taxes.

According to the Mobility Chair, “economic indicators, particularly personal income, seem to play an important role in Quebec” (Morency et al. 2021a). A contrast can be drawn with the Atlantic provinces, which sell a lot of light-duty trucks despite relatively weak economic indicators. The prices charged there for light-duty trucks are lower than the Canadian average.

In the Prairie provinces, the situation is the reverse of that of Quebec. In British Columbia and Ontario, public policies and insurance costs seem to play a role in dampening light-duty truck ownership for individuals. When disincentives are in place, automobile buyers may opt for other types of vehicles than SUVs.” (Morency et al. 2021)

A summary of the provincial differences is presented in Annex 1.

7.4 Quebec: growth of demand

This section offers an overview of the changing sociodemographic profile of light-duty vehicle owners in Quebec and of the changes in the characteristics of their vehicles.

7.4.1 Changes in buyers’ sociodemographic profile

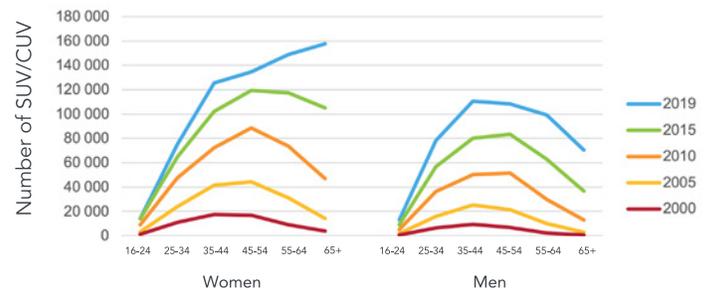
Regarding changes in the age of vehicle purchasers over time, “the proportion of those aged 65 and over and of those aged 55 to 64 increased significantly between 1999 and 2019, while all age categories between 25 and 54 decreased.” (Morency et al. 2021) Also noted was a higher vehicle ownership rate among those aged 55 and up.

The number of female vehicle owners highlights the persistence of vehicle use and ownership habits phenomenon across all ages. Furthermore, the older the woman, the higher the rate of SUV ownership.

In 1990, light-duty trucks (SUVs/CUVs, pickup trucks and vans) together accounted for 14% of owned vehicles in circulation. In 2019, this proportion was 43%. “[As shown in Figure 17,] the number of SUVs and CUVs has been rising a great deal across all

sociodemographic groups, especially men over the age of 45.” (Morency et al. 2021)

Figure 17. Changes in the number of vehicles owned by age and gender of owner in Quebec, SUV/CUV and other types of light-duty passenger vehicles, 2000-2019



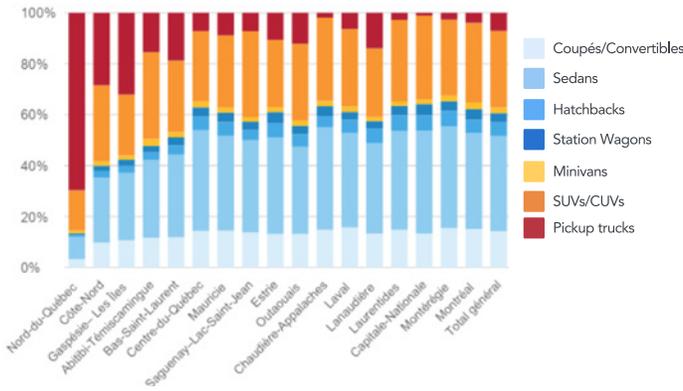
Source : Morency et al. (2021a)

“SUV market share by purchaser age and gender is growing rapidly among all groups, especially those aged 65 and up and among women. Women’s purchasing behaviours are becoming increasingly similar to men’s. In fact, women between the ages of 35 and 44 boasted the highest market share in 2019: 35%.” (Morency et al. 2021) These findings make it clear that ownership of light-duty trucks has now been expanded to a population segment that used to be less interested in this vehicle type.

7.4.2 Regional profile of vehicle owners in Quebec

“Light-duty trucks represent some 40% of passenger vehicles in circulation in most regions, except for northern ones. In Northern Quebec, the proportion of light-duty trucks is 90%. The composition of the light-duty trucks category varies from one region to another, mainly due to the number of pickup trucks. The share of pickup trucks in Montreal and the surrounding area is lower than in the rest of the province.” (Morency et al. 2021a) Nevertheless, as mentioned in chapter 1, an increase in the share of light-duty trucks is observed in all regions of Quebec. Figure 18 shows the main differences among the Quebec regions.

Figure 18. Share of the various light-duty passenger vehicles by body type in the administrative regions of Quebec in 2019



Source : Morency et al. (2021a)

7.5 The factors behind the growth in demand

This subsection presents the historic, economic, policy and psychosocial factors, identified in research by the Mobility Chair of Polytechnique Montréal, that have played a role in driving up the number of light-duty trucks on Canadian roads.

7.5.1 Historic factors

Offering an overview of the history of the automobile to highlight the key moments leading to the current proliferation of light-duty trucks, this first part situates the advent of the first SUVs and CUVs in the 20th century. Figure 19 presents a timeline for the growth of this vehicle class.

Viewing the SUV as the new family vehicle

According to Polytechnique Montréal's Mobility Chair, advertising for the SUV has targeted the typical family ever since the 1950s. Prior to that, it was targeted more at business owners and executives, which shows how the vocation of these vehicles has changed. The advertising trumpets the versatility of these vehicles, the ease of driving and its transport capabilities, similar to those of a station wagon. The versatility appeals to customers who feel they need this feature more and more on a daily basis. But isn't a car versatile? This perception of versatility peculiar to SUVs and CUVs, fed by advertising and the collective imagination, explains the trend in recent years toward purchasing larger vehicles.

Figure 19. Advent and growth of light-duty trucks in North America

1904-1918 The advent of the automobile

In the beginning, all vehicles looked alike. There was nothing to distinguish a car from a light-duty truck. Vehicle ownership was only for the well-off, who were captivated by the speed, luxury and feeling of freedom offered by the automobile.

1918-1945 The democratization of the automobile

After the First World War, the automobile went from being a luxury item to a mass consumer item. Marketing segmentation practices were born, and different vehicle lines were introduced (variations in chassis, engines and bodywork).

The distinction between cars and trucks occurred in the 1930s. Light-duty trucks were initially designed for commercial and institutional purposes (army, police, fire department, cargo transport).

1946-1972 The development of the automobile culture

For nearly 40 years, the station wagon was seen as the car for the average American family.

1973-1979 Oil price shocks and the introduction of GHG emissions standards for light duty vehicles in North America

The oil price shocks and the attendant spike in the cost of gasoline at the pump were responsible for the very first regulations governing GHG emissions and fuel consumption for light-duty vehicles. From that point on, light-duty trucks enjoyed laxer standards and were thus the preferred choice of vehicle manufacturers.

At the same time, the weight of a vehicle became an important feature because lighter vehicles meant less fuel consumption. And so the public turned to more energy efficient models built in Europe and Japan. To help North American automobile manufacturers to adapt their models to reflect best practices employed elsewhere, governments provided them with financial support.

1980-2000 Light-duty trucks make their appearance as a passenger transport niche

Trade deals limiting imports of foreign vehicles were added to the new GHG emission standards and government subsidies supported the North American automotive industry. Utility trucks were now adapted to passenger transport, and consumers began to shift away from cars. A rebound effect was also noted: because of improved vehicle energy efficiency, there was a tendency towards the purchase of larger models.

In 1984, the minivan was the best-selling vehicle in North America. It had become the new go to car for the typical North American family.

2001-2007 Diversification of the light-duty truck market and the advent of crossover utility vehicles (CUV)

Petits et économiques pour le contexte urbain, puissants et sportifs pour le plein air, spacieux et sécuritaires pour les familles, luxueux et prestigieux pour les ménages aisés : il y a maintenant un modèle de VUS pour tout le monde. Confirmant sa popularité marquée et croissante, le VUS est le véhicule le plus vendu au Canada en 2004.

Small and economical for city dwellers, powerful and sporty for outdoor enthusiasts, spacious and safe for families, luxurious and prestigious for the wealthy: there was now an SUV for everyone. Befitting its strong and growing popularity, the SUV was the highest selling vehicle in Canada in 2004.

The year 2007 marked the arrival of CUVs on the market, a turning point in the dominance achieved by light-duty trucks in Canada's vehicle fleet. Offering features similar to those found in cars, they consume less fuel than traditional SUVs.

CUV's popularity was evident when the cost of gasoline went up: consumers opted for smaller versions of the same category of vehicle they owned.

2008 to today Increased popularity of SUVs and CUVs

In the wake of the economic crisis of 2008, the Canadian government offered the North American automobile industry financial support for the economic recovery. Meanwhile, the financialization of the automotive industry has become more and more pronounced.

Source : Morency et al. (2021a)

Outlook on the CUV

Debuting in the early 2000s, “CUVs have the same body type as SUVs, but not necessarily their mechanical capacities. Unlike traditional SUVs, which are built on a truck chassis, crossovers typically have the unibody frame and powertrain of a car. [...] Therefore, the distinction between an SUV and a CUV is not so clear, since most models offer optional all-wheel drive. [...] Smaller, easier to drive, cheaper to buy and more fuel efficient, CUVs quickly became more attractive than first-generation SUVs.” (Morency et al. 2021a)

“The brand new [...] ‘mini-SUVs’ boast features that are closer to those of a car than a light-duty truck. [Thus,] in the event of an economic slowdown or higher gas prices, these vehicles could be a good alternative to the larger SUV models. [...] Thus, the proportion of the vehicle fleet made up by light-duty trucks could remain stable or even rise.” (Morency et al. 2021a)

The fact that they are designed for every taste, every need and every income category contributes, to be sure, to the diversification of socioeconomic and demographic profiles of light-duty truck owners. And yet, CUVs cost more than cars on average, as well as contributing to the phenomenon of road obesity described in subsection 6.1.

7.5.2 Economic factors

Canada’s economic conditions and structure are conducive to household spending on vehicles. An increase in their income impacts consumption choices regarding passenger vehicles. The price of fuel is another major factor, particularly for governments in developing public policies and for consumers in their daily lives. Lastly, automobile financing has been made easier thanks to a drop in credit rates, which encourages households to obtain vehicles for which they might not have otherwise opted.

Automobile industry plays a dominant role in Canadian economy.

The Mobility Chair cited the opinion issued by the OECD, which explains that the automobile industry has a very significant influence on economic growth. “[It] therefore occupies a central place in public policy deliberations, particularly when it comes to trade deals. For the same reason, automobile manufacturers often receive financial support during economic recessions.” (Morency et al. 2021a)

According to the Mobility Chair (2021a), although it is difficult to determine the influence that exchange rates may have had on the increase in popularity of light-duty trucks, they have definitely had a significant influence on vehicle production and, logically, their price. In practical terms, the more valuable the Canadian currency becomes, the more foreign consumers want to buy what Canada is selling.

Oil prices have a major influence on vehicle supply and demand.

Oil prices influence mobility behaviours (demand), vehicle production (supply) and public policy, which influences oil prices. Simply put, these two elements are interdependent.

First, “in Canada and the United States, two thirds of the oil supply is used for the transportation of persons and goods. [...] Fluctuations in the price of oil have broad impacts on employment, consumer prices in general, pension plans, exchange rates, pooled investment funds and share values, and have short-, medium- and long-term effects on ownership and use of personal vehicles.” (Morency et al. 2021a)

In the next few years, several structural factors could pull oil prices down as well as up: “Fossil fuel extraction techniques, particularly shale gas, continue to evolve and, as a result, reduce production costs. Strong growth in EVs could also lead to a significant decrease in [the] price of light-duty trucks.” (Morency et al. 2021a).

Second, public policy impacts vehicle supply and demand in turn, as well as oil price fluctuations. According to the Mobility Chair (Morency et al. 2021a), “governments put in place various measures to minimize the impacts of oil price fluctuations on the national economy, including rationing policies and strategies for diversifying supply, including the creation of national oil companies (Petro-Canada), as well as standards and financial support for the automobile industry to make vehicles more energy efficient.”

The appearance on the market of mini-SUVs could change substitution behaviours in the future. The Mobility Chair (Morency et al. 2021a) cited the data from a survey, indicating that:

- 36.4% of light-duty truck owner respondents would not change their vehicle choices even if confronted with a spike in gas prices;

- 20.6% would consider a smaller light-duty truck;
- 20.0% would consider an electric light-duty truck;
- 19.9% would consider a car.

In short, even during an unfavourable economy, the diverse supply of vehicles will ensure the same demand as during a normal economy. Thus, economic policies do not discourage consumers from purchasing these polluting vehicles.

Rising household incomes lead to increased spending on vehicles

In addition to fluctuations in fuel prices, consumers' interests in different types of vehicles are also driven by fluctuations in their purchasing power or, in other words, their income. In an economic downturn, this second factor is partially neutralized in Canada, because governments implement various measures and assistance programs. Indeed, while consumers would be more likely to turn to smaller cars, but within the same category or range of vehicles, in order to balance their budgets when the unemployment rate rises, this type of government support, together with consumer credit, would allow Canadian households to continue to spend, despite a temporary drop in their income. (Morency et al. 2021a)

More generally speaking, income has a significant effect on household use of automobiles. The Mobility Chair (Morency et al. 2021) reports that a 10% increase in household income leads to a 17% increase in vehicle demand. The literature on the attributes of vehicle owners also indicates that higher-income households have a greater propensity to purchase light-duty trucks.

The credit rate on car loans encourages the purchase of larger vehicles and higher debt levels among Canadians.

The fact that the government has little control over financing conditions can be seen as non-monetary support for the industry. Dealers are able to finance the purchase of a vehicle in a variety of ways, making it much easier to access them, especially the more expensive models. This reality leads to increased household debt levels, which can be attributed to a number of factors, including rising house prices, financial innovation, low interest rates, and a shift in preferred patterns of credit use, particularly among the most recent age groups, towards immediate consumption (Morency et al. 2021a).

According to the Mobility Chair (Morency et al. 2021), Canadian auto loan rates are following a trend similar to that of the United States, which is steadily downward: "For most Canadians, a car is the second most important asset they own, after their home. In 2014, auto loans accounted for about 15% of consumer credit and home equity lines of credit accounted for 40%. In recent years, the growth of consumer debt in the area of auto loans has outpaced any other form of household credit, including mortgages."

Indeed, the Mobility Chair (Morency et al. 2021) adds that "[in 1950] just 29.3 % of new personal vehicles purchases were financed. The following year, borrowing had made a significant jump with 36.6 % of vehicle purchases being financed. In 2013, data from Quebec shows that 88.3% of new vehicles were financed, either through leases (19.7%) or loans (68.6%)." At the same time, in 2014, there were 2.5 credit cards for every person aged 18 and over, representing approximately 72 million cards in circulation in Canada.

7.5.3 Political factors

This subsection explores the public policies that have contributed to the growth in demand for light-duty trucks, including international trade agreements, financial support for the industry, and land-use policies.

The Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations has played a key role in the proliferation of light-duty trucks in Canada.

The light-duty vehicle segment could be doing a lot more to help Canada meet its emissions reduction goals if the regulations establishing the vehicle fuel consumption standards had been designed differently. The requirements for light-duty trucks are laxer than they are for cars: they authorize about a third more emissions than for cars, due to their comparatively higher weight and fuel consumption.

In addition, the compliance crediting system and measures incentivizing technology adoption make it very easy for automakers to comply with emissions standards. In fact, automakers selling larger and higher-emitting vehicles will end their year with not only higher actual emissions, but higher authorized emissions (Morency et al. 2021a).

Objectives, operation and history of the Regulations

Introduced in 2010, the *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* were designed to help businesses meet the emissions standards for new light-duty vehicles, to encourage the adoption of new emissions reduction technologies (ECCC 2017) and to increase the number of low-emitting vehicles on Canada's roads.

Under the Regulations, automakers and automobile importers must meet their company's emissions standards. Increasingly stringent emissions targets were established for new light-duty vehicles of comparable size (measured by the vehicles' footprint) within each automaker's vehicle fleet.

These standards vary based on the size of the fleet and the proportion of cars and trucks sold. Automakers are required to calculate and report their fleet emissions average, including all cars and light-duty trucks sold over the course of the year, in order to gauge their compliance (Morency et al. 2021a).

In 2012, the federal government aligned Canada's fuel economy standards with those of the EPA in the United States. However, the American standards are more stringent for cars than for light-duty trucks. According to the Mobility Chair of Polytechnique Montréal, there are two reasons for this decision:

- There was fear that making vehicles lighter to improve fuel efficiency would reduce on-board safety.
- Since light-duty trucks were considered to be business vehicles, regulators did not want to burden them with tougher standards for fear that this would undermine these businesses' competitiveness.

Today, however, most light-duty trucks (70-90%) are owned and operated by individuals (Morency et al. 2021a). In 2014, a series of amendments were introduced to provide the automobile industry with additional flexibility and to allow it to design cost-effective compliance strategies (Government of Canada 2014). Thus, it became easier for automakers to meet emissions standards with the help of compliance credits, which can be purchased or traded, and to obtain advanced technology multipliers for vehicle fuel efficiency.

A number of flaws are apparent in the Regulations. First, the compliance crediting system and measures incentivizing technology adoption make it very easy for automakers to comply with emissions standards. Automakers can:

- Bank credits for use in future years or to offset a previous deficit;
- Use advanced technology multipliers; and
- Obtain "off-cycle" credits for air conditioning efficiency improvements. These are the three main distortions in the Regulations.

The first distortion dissuades the industry from making additional efforts to improve the fuel efficiency of light-duty vehicles. The second enables automakers to over-represent low-emitting vehicles in their compliance report and thereby bank more credits. And the third incentivizes the industry to use less-advanced technologies, which also happen to be less expensive. In short, while the Regulations are supposed to encourage innovation, the opposite has been observed. The stringency of the current emissions standards, the distortions generated by the compliance crediting flexibilities and the deficiency of the incentives to adopt fuel efficiency innovations are flaws that must be corrected quickly to maximize the Regulations' potential (Rous 2019).

Trade agreements and vehicle production in Canada have favoured light-duty trucks.

The overall effect of trade agreements has been to protect North American manufactured goods from foreign competition, particularly light-duty trucks, an area in which North America specializes. Lower tariffs between Canada, the United States and Mexico have apparently reduced the cost of producing domestic goods. Conversely, customs tariffs and regional content requirements imposed on foreign manufacturers have increased production costs. (Morency et al. 2021a)

Taken together, these two (2) measures therefore reduced "the price differential between domestic (largely light-duty trucks) and foreign (largely cars) products, at least until the 1990s." (Morency et al. 2021a) Nevertheless, Japanese manufacturers first conquered the car segment, but they too expanded their light-duty truck offerings (mostly CUVs), starting in 1995. (Morency et al. 2021a)

The Mobility Chair of Polytechnique Montréal (Morency et al. 2021a) reports that Canada is the tenth-largest automotive producer in the world, producing nearly two (2) million vehicles per year. "The automotive industry generates 130,000 direct jobs (95% of which are located in Ontario) and another 400,000 indirectly in the after-sales service sector and dealer networks. It accounts for 12.5% of the value of Canada's manufacturing gross domestic product (GDP) as well as 20% of the Ontario economy."

The automotive industry receives significant monetary and non-monetary support from governments.

The Mobility Chair (Morency et al. 2021a) explains that support for industry can take the form of grants or tax credits for research and development (R&D) activities, financial loans in times of economic recession, tax or duty holidays (customs, electricity, environmental standards), or expedited approval processes.

First, since the early 1990s, there has been a willingness to increase automotive industry R&D in Canada: "Specifically, an automotive technology centre and university engineering programs have been established with this objective. In 2018, the federal government announced a \$110 million investment to support 8,000 R&D jobs and develop new manufacturing platforms. Once completed, Canada will become the North American manufacturing hub for the RAV4 and home to Toyota's largest hybrid vehicle production line." (Morency et al. 2021a)

During the 2008 financial crisis, an impact study indicated that plant closures would result in thousands of job losses and significant social program expenditures. The federal and Ontario governments launched a number of initiatives to assist the industry, including interim financial assistance of C\$13.7B in 2009 and the establishment of the Automotive Innovation Fund (AIF). This fund was intended to support the development of innovative, greener and more fuel-efficient vehicles that would enhance the competitiveness of the Canadian automotive sector." (Morency et al. 2021) Confirming the critical role of this sector in the country's economy, this type of support favoured the manufacture of light-duty trucks, given North American expertise in this area.

The Canadian automotive industry is well positioned to deliver innovation. As such, the Ontario government has a \$190B investment program over 13 years to support the deployment of infrastructure supported by new and emerging technologies." (Morency et al. 2021a)

These examples demonstrate the pivotal role the auto industry plays in Canada's economic ecosystem. By bailing it out during financial crises without imposing significant "green" conditions, the federal and provincial governments continue to prop up the sector, which runs counter to the country's long-term goals which include achieving carbon neutrality by 2050. This reality has accelerated the diversification of the most profitable vehicle offering that reflects Canadian expertise: light-duty trucks. Subject to less stringent fuel economy standards than cars, they have been a major drag on Canada's GHG emission reduction efforts over the past two decades.

An early vehicle replacement program may have accelerated the growth in demand for light-duty trucks and the transformation of the vehicle fleet.

The research chair reports that at least one province in Canada has had such a program in place, British Columbia. However, even if the new vehicles do emit less polluting emissions than the vehicles that were replaced, the role of the financial incentive in this replacement is uncertain. Further analysis of this type of program is required to determine its contribution to the growth of light-duty truck demand in Canada.

Urban sprawl encourages the purchase of gas-guzzling vehicles.

"[A] higher proportion of energy-inefficient vehicles, including SUVs and pickup trucks, can be found in suburban and more remote areas. ...] The demand for relatively more fuel-inefficient vehicles ... tends to drop in urban environments offering a mix of different uses." (Morency et al. 2021a) Additionally, the Mobility Chair (Morency et al. 2021) notes a strong spatial correlation in the types of vehicles found in adjoining regions. Finally, a positive relationship is observed between sales of SUVs and the extent of the road network."

As a result, development that favours distance away from major urban centres undermines efforts to increase the supply of intermodal transportation networks and fuels dependence on large vehicles.

7.5.4 Psycho-social factors

The literature points to psychological and sociological causes that may explain the growing interest in light-duty trucks in addition to the other types of factors presented in the previous subsections.

Literature on the profile of the light-truck buyer

The choice of a vehicle seems to be strongly linked to the socio-demographic profile of individuals. In 1998, a wide-ranging study was conducted by the U.S. National Bureau of Economic Research (NBER). The following observations were noted with respect to vehicle choices made by individuals:

- More affluent households were more likely to opt for more expensive vehicles;
- Households with children were more likely to choose minivans;
- Households located in rural areas were more likely to choose pickup trucks or FWD vehicles;

Older households tended to choose larger and heavier vehicles with more safety features and accessories." (Morency et al. 2021a)

CIRANO's survey results on vehicle purchase trends and motivations provides more recent data in chapter 8. The figures from the literature review presented above nevertheless serve as a reference, as they allow one to see the evolution of consumer preferences.

Personality, lifestyle, attitudes and values of vehicle owners

Drawing on individuals' subjective perceptions of themselves, their mobility habits and preferences, the results of a survey of 1904 residents of the San Francisco area in the United States indicate significant differences between vehicle categories³:

- The owners of compact cars demonstrated higher environmental values, including support for urban intensification, and a relatively lower need for independence (ability to travel anywhere at any time) (predominantly single women 40 years of age or younger, with some education, low incomes, and in single-person households);
- The owners of large vehicles, on the other hand, displayed lower environmental values (mostly males and older individuals living in multi-vehicle households with relatively low levels of education);
- The owners of vans showed lower support for urban intensification, placed a high importance

on their work, and reported lower levels of life satisfaction (predominantly males, aged 40-64 with relatively lower levels of education, working full time, and in middle-class households of two (2) people);

- SUV owners expressed a strong need for independence and driving freedom, and enjoyed short-distance travel in their vehicles (mostly individuals 40 years or younger, with higher levels of education, and who are part of households with children. (Morency et al. 2021a)

Perception of highway safety issues

Regardless of the type of vehicle chosen, safety and reliability appear to be important purchasing motivations. Nevertheless, according to the Mobility Chair (Morency et al. 2021a), the importance of safety is relatively more often mentioned by SUV owners than by owners of other types of vehicles. The research chair added that "perceptions of safety could be related to the effects of advertising or to mechanical characteristics that give a real or perceived impression of strength and independence (e.g., in bad weather)". Safety issues become an even more important factor when children are involved.

In addition, literature shows that there is what is called the "SUV effect", i.e., higher risk-taking on the part of persons driving larger and higher vehicles. The results of a study conducted in Vienna indicate that male and female SUV drivers were overrepresented among those not wearing seat belts, using cell phones while driving, or disobeying traffic signals. The risk-taking could be explained by the height of the vehicle according to the Mobility Chair (Morency et al. 2021a), who also noted that the transformation of the vehicle fleet has been likened to an arms race, in which vehicle owners seem to be trying to protect themselves from others.

Cohort Effect and Legacy of Usage Patterns

While the target market for light-duty trucks used to be baby boomers, the literature review conducted by the Mobility Chair indicates that about 10 % of SUV owners chose their vehicle "simply because it is the class of vehicle that these individuals have always had." (Morency et al. 2021a). In a nutshell, the fact that more and more people now own SUVs and other types of light trucks is helping to normalize the phenomenon, causing subsequent generations to turn to these types of vehicles.

3 "Knowledge about personality, attitudes, and values is not in itself a factor that explains the growth in the number of light-duty trucks. However, it does offer insights into how manufacturers have adapted their light-duty truck offerings, by drawing on features of other vehicle categories (crossovers), in order to appeal to a more diverse pool of consumers." (Morency et al. 2021a)

Psychosocial rebound effect

Despite these findings, there could theoretically be a psychosocial rebound effect. The Mobility Chair (Morency et al. 2021a) has identified the idea that ownership of a vehicle, such as an EV, that is perceived as being energy-efficient, can be supported positively by family and friends and thus encourage greater use of that asset. Conversely, a vehicle perceived as harmful to the environment, such as an SUV, may be subject to social disapproval. This observation represents a possible communications approach to discouraging the purchase of large vehicles.

Highlights and issues

Across Canada, an increasingly diverse customer base is turning to SUVs and other light trucks.

Variation in vehicle demand between provinces

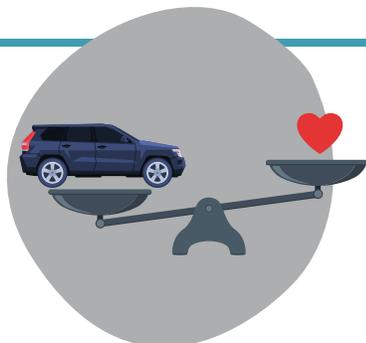
- It is partially explained by the existence of certain public policies in the provinces.
- The number of vehicles exceeds the number of people of driving age (+3%) in the Prairie provinces.
- The share of light trucks in relation to the number of people of driving age is significantly higher in this region than elsewhere in the country.
- In Ontario, the number of vehicles on the road is lower than the number of people of driving age (-2%).

Variation in expenditures on vehicle ownership and use between provinces

- Households are spending more on their vehicle(s) than ever before.
- Between 1981 and 2019, their spending increased from \$6,730 to \$10,476 (excluding the effect of inflation), and about 65% of the increase is attributable to spending on new light-duty trucks. These figures support the energy rebound effect theory.
- Vehicle operating expenses (fuel and other expenses) are higher in the Atlantic provinces.
- Vehicle purchase expenditures are highest in the Prairies.

Key factors driving the growth in demand for large vehicles in Canada

- Favourable economic conditions for increased vehicle spending at both the macro and household levels, including easier access to credit and auto loans;
- A less restrictive regulatory framework in terms of fuel efficiency for SUVs and other light-duty trucks, thus favouring their manufacture;
- The emergence of large vehicle models adapted to all budgets (CUVs);
- Land use planning that favours urban sprawl and, consequently, dependence on solo driving;
- Perceptions related to road safety;
- Social norms.



8. UNDERSTANDING THE MOTIVATIONS FOR PURCHASING LIGHT-DUTY TRUCKS

This chapter examines the motivations for purchasing light-duty trucks, more specifically SUVs, among Canadian consumers and explores their perceptions of these vehicles. It also assesses awareness and understanding of the environmental information available to assist in the purchase decision (e.g. safety, GHG emissions, financial implications, etc.).

As described in chapter 2, a Canada-wide survey was undertaken to explore individual characteristics (demographic, psychographic, knowledge), perceptions and motivations that are related to the preference and likelihood of purchasing an SUV. The survey was limited to owners of all types of vehicles, which allowed for a comparison of SUV owners to owners of other types of vehicles. 20 one-on-one interviews were then conducted in order to refine the quantitative analysis.

8.1 Factors influencing the purchase of an SUV: survey results

This first subsection presents the findings of the Canada-wide survey on SUV purchase motivations. It confirms the growing interest of the Canadian public in SUVs: it is the most popular vehicle type among respondents. These are the factors that play a role in the development of preferences for a given type of vehicle:

- Socio-demographic and contextual factors (location, lifestyle, age, household income);
- Personal psychological factors (values and attitudes);
- Vehicle- and driving-related factors (vehicle instrumentation, symbolic aspects and affective aspects); and
- The external environment (social norms, media and advertising).

First off, Canadians believe that vehicles, regardless of type, are indispensable (5.73 out of 7). Regardless, the more people see their vehicle as indispensable, the more likely they are to buy an SUV.

8.1.1 Socio-demographic and contextual factors

In 2020, the typical Canadian SUV owner is a suburban, middle-aged woman, in a couple, with children, and a relatively high income. The results also indicate that:

- Women (4.86 out of 7) showed a greater intention to purchase an SUV for their next vehicle than men (4.61 out of 7);
- The age group with the highest intent to purchase an SUV was the 25-34 year olds;
- Those living in rural areas were significantly more likely to purchase a pickup truck than those living in urban areas;
- There was no difference between those living in rural and urban areas regarding the likelihood of purchasing an SUV;
- Those who need to transport goods were more likely to buy an SUV (5.05 vs. 4.69) and even more likely to buy a pickup truck (4.03 vs. 2.78);
- The provinces with the highest rates of SUV ownership are Newfoundland and Labrador, New Brunswick, Alberta and Saskatchewan;
- The provinces with the highest rates of SUV ownership are Saskatchewan, Alberta and New Brunswick;
- There is a strong relationship between household income and the intention to purchase an SUV, with the intention to purchase increasing with each income level;
- The more people there are in a household, the more likely they are to purchase an SUV;
- The number of children in a household has a strong influence on the purchase of an SUV, and this type of vehicle is particularly popular among families with two (2) to three (3) children. For families with more than three (3) children, minivans are the most popular choice;
- The higher the family income, the newer the vehicle purchased (regardless of vehicle type) and the greater the intention to purchase an SUV;
- The likelihood of purchasing an SUV is much higher when one already owns an SUV;
- Education level does not influence the intention to purchase an SUV;
- As an individual's education level increases, the preference for a pickup truck decreases.

8.1.2 Psychological factors

With respect to psychological factors, which include values and attitudes, the majority of respondents claim to feel free and independent while driving and 56% say they enjoy driving. However, there are

significant differences in how vehicle owners respond to the psychological variables.

First, we find that those most likely to purchase an SUV have the strongest correlation with the Egoistic Values construct, which includes values such as ambition, social power, influence and authority. An image of prestige and power is therefore associated with SUVs. However, this construct is also positively correlated with the intention to purchase a pickup truck and the intention to purchase an EV. Conversely, the Environmental Values construct has the lowest correlation with the intention to purchase an SUV, but it is still positive and significant. Also, individuals who view vehicles as simply a means to get from point A to B (instrumental value) were less likely to purchase an SUV. Those likely to purchase SUVs reported that they like to drive.

Second, pickup truck owners are the most likely to view their vehicle as indispensable, and SUV owners are the most likely to be influenced by the media.

The knowledge-related questions (comparing perceptions with reality) showed that sedan owners overestimate the environmental impact of SUVs. In addition, the respondents' knowledge of the proportion of total energy used by the transportation sector that is attributable to personal vehicles correlates with their intention to purchase an SUV. Those who overestimated this proportion by more than 15% were significantly more likely to purchase an SUV (5.11 out of 7) than those who underestimate it (4.48 out of 7). Pickup truck owners provided the lowest estimate of their own vehicle's emissions.

Respondents' perceptions of the impact of individual, industry and government behaviours on climate change correlated with their vehicle choices:

- A negative relationship between the intention to purchase a pickup truck and the evaluation of the impacts of the various actors on climate change is identified. Thus, a higher evaluation of the impacts of the various actors on climate change translates into a lower intention to purchase a pickup truck.
- A positive and significant relationship between the intention to purchase an EV and the evaluation of individual actions' impact is observed. Therefore, a higher evaluation of the impact of individual actions translates into a greater intention to purchase an EV.

Finally, owning an SUV has a strong influence on the intention to buy another one in the future.

8.1.3 Vehicle-and driving-related factors

SUVs and sedans are the most commonly owned vehicles, with 38.2% of individuals reporting an SUV as their primary vehicle and 36.8% reporting a sedan as their primary vehicle. Pickup trucks and vans were the primary vehicle for 7% and 6% of households, respectively.

The SUV is also the vehicle with the highest level of overall appreciation. Also, the likelihood that the respondents' next vehicle purchase will be an SUV (4.74 out of 7) is higher than the likelihood that it will be a sedan (4.39 out of 7).

Of 21 vehicle purchase criteria, the three (3) most important are: impact safety, weather safety (adverse weather, winter) and price. Some features are significantly more important to current SUV owners: cargo capacity, comfort, weather safety, four-wheel drive, towing capacity, an elevated seating position and related functionalities.

The greater the importance the individual places on comfort, appearance, four-wheel drive, an elevated driving position and related features, the greater their intention to purchase an SUV. By contrast, the greater the importance placed on vehicle emissions by the purchaser, the less likely they will be to purchase an SUV.

Finally, generally speaking, 41% of respondents purchased their vehicle from personal savings and 38% through dealer financing. The financing options available have some influence: SUV owners are more likely to avail themselves of dealer financing, while car owners are more likely to use their personal savings.

8.1.4 External factors

The study reveals that different sources of information are used in the choice of a vehicle. Dealerships are the most recurrent source of information when it comes to choosing a vehicle, followed by friends and family, and dealer websites and reviews. On the other hand, as explained below, individual interviews reveal that the public has little confidence in dealerships. Thus, third-party websites and the opinions of others were found to have the greatest influence on vehicle selection.

Next, the media's influence on the choice of an SUV as an individual's next vehicle is significant. Individuals

who favour television and radio as sources of information would be more likely to purchase an SUV. Conversely, consideration could be given to using these media to reach these individuals and discourage the purchase of large vehicles. Respondents intending to purchase a pickup truck, on the other hand, strongly favoured social media as a source of information. When it comes to the intention to purchase a van, the strongest correlations are with social media, TV and radio ads, and magazine ads.

Advertisements in traditional media (TV and radio) and on social networks were found to have an impact on intentions to purchase light-duty trucks. Although they are more a source of information as part of passive research, ads and the information they contain increase the likelihood that the viewer will purchase an SUV. It is important to highlight these findings because, increasingly, ads are not part of active-search information sources, but being exposed to them has a noticeable impact. Indeed, SUV owners are more likely to agree that the media portray SUVs in a positive light.

When it comes to the intention to purchase an EV, the strongest correlations are with direct contacts and specialty magazines, which are, after all, objective sources of information. One's work network is also prioritized over one's personal network.

Impact of COVID-19 pandemic

8% of respondents interviewed indicated that they were more likely to purchase a vehicle than they were before the COVID-19 pandemic, primarily because they felt more protected in their own vehicle than in other forms of transport. However, 26% of the sample indicated that they were less likely to purchase a vehicle as a result of the pandemic.

8.2 Factors influencing the purchase of an SUV: results of individual interviews

This second subsection presents the findings from individual interviews that explored the survey results in greater depth. It has therefore been structured along similar lines, except for the socio-demographic factors, which were not directly addressed but were discussed in the course of the interviews. For example, having children and wanting a spacious vehicle is explained in subsection 8.2.2.

To begin with, respondents indicated that life without a vehicle has become unimaginable for them. One respondent even indicated that he would be unable

to function in his personal or work life if he did not own a vehicle. The lack of useful alternatives was cited by a number of respondents.

8.2.1 Psychological factors

Perception of SUVs: a polarizing vehicle

A dream vehicle for some, the SUV is vilified by others. Those who admire it feel that it meets all their needs and could not be more ideal. For those in the opposite camp, this vehicle leaves them cold, or even hostile. They don't see the need for it, and point out its gas-guzzling tendencies, needless size, high sticker price and the false sense of safety it offers.

When the interviewees were asked what is the first thing that comes to mind about an SUV, most mentioned the height and size, as well as its roominess and versatility.

8.2.2 Factors related to the vehicles and driving

Driving enjoyment

Beyond the basic need for a vehicle to be functional, the interviewees acknowledged the pleasure they derive from driving. The most common themes that came up in the research concern the freedom and autonomy that people get from driving. Driving enjoyment is also influenced by the type of vehicle and its features. For some, the very nature of the vehicle is what makes it fun to drive.

Perceived safety of SUVs in view of Canada's climate

The interviewees often referenced Canada's special climate conditions and the vehicle's features they view as synonymous with safety in these difficult conditions. The AWD feature, height and power are valued by the respondents when it comes to safe winter driving. Many feel that small cars make driving in snowy conditions more difficult.

High regard for certain SUV features

SUV owners are absolutely convinced of the vehicle's superiority. Cargo space is an important feature for SUV fans. Some say they need the space for their family life, while others like it for their work needs, a disability or day-to-day needs. Safety is another thing that people associate with an SUV. The vehicle's height (offering improved visibility), size, weight and power contribute to this perception of safety. SUV drivers feel better protected in case of an accident, because they feel in control of what is going on.

SUVs' comfort is also mentioned, thanks to the vehicle's height, roominess and technological features. While comfort is a very subjective experience, the SUV's superior safety features are taken as an article of faith by its owners. The danger their vehicle may pose to other drivers does not figure prominently among their concerns.

Short shrift given to energy efficiency

The interviewees are not very aware of their vehicle's energy consumption, measuring it on the basis of fuel prices at the pump or how many times they need to fill up the tank. They give this factor little if any consideration when purchasing a vehicle. To address this problem, advertisers could be required to include plain language on a vehicle's fuel consumption in their ads.

8.2.3 External factors

Societal influence

Descriptive social norms constitute the external factor most likely to convince someone to buy an SUV, meaning that the approval of others has a large influence on our decisions. Vehicle preferences – but also vehicle brand preferences – are transmitted within a family, since what we see around us becomes the norm. One respondent said that because his family did not own a car for much of his childhood, he has never had much enthusiasm or attraction for vehicles in general.

In addition to vehicles owned by the people around us, vehicles we see on our roads or in our neighbourhood influence individual attitudes and preferences. They

also contribute to the perception of a person's "standards." Our circle of friends also influences our consumption choices when it comes to vehicles.

Marketing

How vehicles are represented in the popular media and advertising (i.e., inspirational marketing) is another factor that influences people's vehicle preferences. One respondent associated SUVs with prestige, another with opulence and a third with a form of "accessible luxury." SUVs were also associated with a certain lifestyle (suburban life).

Impact of the COVID-19 pandemic

The COVID-19 pandemic led the interviewees to take refuge in their vehicle, seen as their private space, while significantly reducing personal and occupational opportunities to use their vehicle. For many, the disruption of their habits made them aware of the high costs generated by their vehicle use.

8.3 Influences during the decision-making process

This subsection presents the various steps in the decision-making process for vehicle purchases.

8.3.1 Vehicle choice filters

The first vehicle choice filter is influenced by appearance, and by what prospective buyers are prepared to sacrifice for the things they value most. In this regard, the most oft-cited elements are safety, comfort and physical appearance rather than energy efficiency.

Figure 20. Typical decision-making process for the purchase of a vehicle



Source: CIRANO (2021)

One respondent said he sacrificed his comfort for a less polluting car, whereas several SUV owners consider that SUVs' perceived safety makes up for the higher fuel prices.

In terms of vehicle style, an SUV's typical look can either convince or discourage consumers from buying this type of vehicle.

8.3.2 Information gathering

Step two of the decision-making process is the gathering of information. Specialized websites and the opinion of others are valued far more than dealerships, which the respondents do not trust. Although dealerships are the most oft-used source of information according to the results of the Canada-wide survey, they do not play a significant role in the information-gathering process; rather, they are consulted once the consumer has a set idea as to the vehicles they are considering.

8.3.3 Purchase price and vehicle financing options

Independent of considerations prior to the decision per se, financing options constitute a strong incentive to purchase a given vehicle. Financing can generate immediate gratification, in fact. One respondent said that she would have opted for a smaller car in the absence of financing options. Another said that zero-interest financing can lead people to buy a new vehicle instead of a used one. The interviewees with a negative view of financing options associate a lack of education with those who use them.

8.3.4 Costs beyond the purchase price

The interviews also indicated that consumers are not always aware of the costs beyond the purchase price. An owner of a hybrid vehicle said that many people fail to consider maintenance expenses.

8.3.5 Existing tax instruments

Finally, fiscal instruments such as taxes and subsidies also have an influence, although it varies across individuals. Gasoline taxes at the pump and taxes on fuel-inefficient and luxury vehicles are powerful tools to encourage the public to buy certain types of vehicles. And indeed, several interviewees said that higher government taxes would influence their choice of vehicle. That same owner of a hybrid vehicle admits that he jumped at the chance to get a \$15,000 incentive from the government. For others, the government

should not stop at incentives, but should also redouble its efforts to put in place EV infrastructure.

8.4 Discussion

The size of vehicles in Canada keeps growing, which influences what people consider to be a "small" vehicle. While the Honda Civic may have been seen as a regular-sized car a few years ago, it is now considered to be a small car. In certain rural regions of Canada, SUVs aren't even considered large vehicles anymore, because the baseline now is the pickup truck.

A promising way to counteract this trend is to change the narrative of what is generally considered socially desirable and to determine who really needs to own a large, fuel-inefficient vehicle. SUVs should no longer be viewed as something to which one aspires, but rather a consumer good that some people need because they have a large family or because their work requires it.

Social influence is front and centre in predicting purchasing behaviours. In this context, descriptive social norms should be considered as an important lever in curbing the trend toward the purchase of increasingly large vehicles. A worthwhile avenue would be to use this normative approach to encourage people to buy more environmentally responsible vehicles such as small hybrids or EVs.

The influence exerted by the concept of family on vehicle preferences was also highlighted by the survey and individual interviews. SUVs have become the symbol of the family vehicle, taking the place of the minivan from the 1990s. Family is seen as a factor legitimizing the use of an SUV. Also, family choices influence our own vehicle choices. The question is what type of legacy do people want to leave their children. What is the environment they will leave behind, and what attitudes will they instill in their children? Taking future consequences into account leads people to make more environmentally responsible decisions. Using this notion of legacy by valuing the future that people will leave their children could steer consumers toward more fuel-efficient vehicles.

EVs: quo vadis?

The interviewees answered a few questions on another polarizing vehicle type: EVs. They expressed many concerns: limited access to charging stations and other infrastructure, battery life, ability to run in winter, market development and so on.

Highlights

Socio-demographic and contextual factors

In 2020, the typical Canadian SUV owner is a suburban, middle-aged woman, in a couple, with children, and a relatively high income.

Also, those most likely to buy a light-duty truck:

- Are those who consider their vehicles to be indispensable;
- Are those who already own a light truck;
- Live in Alberta, Saskatchewan and New Brunswick;
- Live in rural areas (pickup truck); and
- Have a large family.

Other internal factors

Those who are most likely to purchase an SUV:

- Are associated with values such as ambition, social power, influence and authority;
- Place more importance on a vehicle's comfort aspect and look; and
- Enjoy driving.

Those who are least likely to purchase an SUV:

- Have strong environmental values;
- Place more importance on the vehicle's emissions; and
- View vehicles as simply a means to get from point A to B.

External factors

- Descriptive social norms constitute the external factor behind the highest likelihood of purchasing an SUV, which means that others' approval greatly influences individuals' decision-making.
- Place more importance on the vehicle's emissions; and
- Media influence on the choice of an SUV as one's next vehicle is significant.

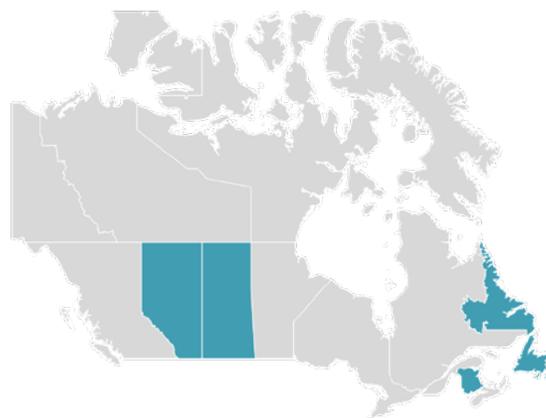
Canadians agree that their vehicle is indispensable



5.73

Sample average

Provinces with the highest rate of SUV ownership



New-Brunswick (46.9%)

Newfoundland and Labrador (46.7%)

Saskatchewan (45.5%)

Alberta (43.6%)

Most used source of information when purchasing

dealer 4.43/7

friends and family 4.39/7

websites 4.26/7

9. UNDERSTANDING THE ROLE OF AUTOMOBILE ADVERTISING

This chapter presents the results of analyses led by Équiterre and taken from the report "Limitless: Car Advertising in Canada – Practices, Regulatory Framework and Recommendations" (Brazeau and Denoncourt 2021). It explores light-duty truck advertising content disseminated in Canada and highlights the key themes and messages encouraging people to buy this type of vehicle. The study also examines the Canadian regulatory framework for automobile advertising, and compares it with the framework in other international jurisdictions. These analyses seek to understand the role of advertising in the rising popularity of light-duty trucks in Canada and to identify ways of leveraging public policy action. These potential solutions are detailed in chapter 10.

For the purposes of this chapter, the term "light-duty truck" refers to four (4) types of vehicles: SUVs, CUVs, pickup trucks and vans. "Standard" or "classic" cars refer to other types of light-duty vehicles, such as sedans, which are generally smaller.

9.1 Car advertising: a key driver of consumer behaviour

Since this research focuses on advertisements disseminated in Canada, the research team opted for the definition of "advertising" set out by the Advertising Standards Canada (ASC):

any message [...] the content of which message is controlled directly or indirectly by the advertiser expressed in any language and communicated in any medium, [...]to Canadians with the intent to influence their choice, opinion or behaviour (ASC 2019).

As a powerful tool for influencing consumers, advertising can:

1. Control social interactions, personal perceptions and consumer choices;
2. Encourage the purchase of goods that an individual does not need;
3. Associate a product with social values;
4. Promote consumption as a way of life (Buijzen and Valkenburg 2003; Pollay 1986; Hall 2002; Stokes and Hallett 1997; Leiss et al. 1986; Lasch 1979).

Furthermore, a single product's multiple advertisements appealing to various positive sentiments reinforce

the public's enthusiasm for the product. Automobile marketing is no exception to this logic and participates in the formation of people's attachment to their cars. (Stokes and Hallett 1997) Finally, the effectiveness of advertising in influencing consumer habits has been the subject of scientific consensus for several decades.

Additionally, the Canadian automotive industry invests enormous amounts of money in the promotion of its products. Its total advertising budget, however, is difficult to determine: an imprecise average of spending by companies in various industry sectors suggests a total of at least \$446 million dollars (Competition Bureau of Canada 2018). Nevertheless, in 2018, the industry led in spending on digital advertising (21%), and in 2019 it accounted for 19% of such spending (Emarketer 2019; Emarketer 2020), representing approximately \$1.6B for this form of advertising alone (Briggs 2020).

However, in Quebec alone, for traditional media (television, radio and print), the automotive industry and dealers injected \$204 million dollars into advertising in 2017, or nearly 16% of the provincial total of this spending (Infopresse 2019). While these data are difficult to generalize nationally, they do illustrate the size of the automotive sector's promotional budget.

The marketing strategies deployed with the help of these significant amounts of money actually pay off: 47% of new-car buyers say they are influenced by some form of media. A majority of them use newspapers to search for discounts and financing deals or to compare prices. Close to 40% of first-time buyers find daily newspapers useful in helping them make their final purchase decision (News Media Canada 2016). In addition, 42% of the same individuals report that they are influenced by magazine ads (News Media Canada 2017).

Against a climate emergency background, where GHG emissions from the transportation sector are increasing, this power of influence should instead be optimized to help achieve carbon neutrality by 2050 rather than hinder it. Consequently, advertising messages should be subject to greater scrutiny. Explained by massive investments and motivated by its proven influence on consumer choices, the pervasiveness of automotive advertising on the various media platforms justifies the need to explore current marketing techniques and to analyze the regulatory framework governing advertising practices in Canada.

9.2 What do we already know about the content of car ads?

According to various research studies and the exploratory interviews, of which the results are summarized in subsection 3.5, vehicle performance is a recurring primary theme in automobile advertising, while safety is rarely mentioned (Burns 1999; Conley 2009; Ferguson et al. 2003; Sheehan et al. 2006; Shin et al. 2005; Watson et al. 2010). However, in Canada, a number of standards and regulations have been put in place in recent years to prohibit messages promoting the dangerous driving associated with this notion of performance. In the context of this analysis, it is therefore to be expected that references to safety will be more frequent than in the past, to the detriment of performance-related messages.

The use of financial incentives is also a popular strategy, although fuel economy is rarely mentioned (Conley 2009; Ferguson et al. 2003). The vehicle's interior features (comfort, luxury, technology, etc.) as well as its aesthetics are often mentioned in ads, but only in passing (Conley 2009; Ferguson et al. 2003; Gunster 2004).

Also, light-duty trucks are shown in both urban and natural settings. Moreover, natural environments are depicted in many different ways, but are most often portrayed as being dominated and controlled by the vehicle (Conley 2009; Gunster 2004; McLean 2009). Finally, ads make few direct references to the family, and gendered representations are still relatively common (McLean 2009; Shin et al. 2005).

Despite the existence of these latter studies, the relevance of this research remains, because:

1. Many of these analyses do not focus specifically on light-duty trucks, and some present an inadequate body of media content to meet the objective of this report;
2. These studies are more than 10 years old;
3. Many of them focus only on specific safety-related messages; and
4. Very few of the studies include an analysis of the regulatory framework that governs advertising.

This chapter explores the limitations to which the Canadian automotive industry is subject and assesses how this framework is aligned with government climate targets, environmental protection and the well-being of Canadians.

9.3 Car advertising: a largely unregulated playing field

This part of the chapter begins with the results of the analysis on advertising content for large vehicles in Canada, and then presents the findings from the analysis of the regulatory framework in which the automobile industry operates. Advertisements drawn from the research are presented at the end of subsection 9.3.1.

9.3.1 Findings from the ad content analysis

The following subsections examine the elements identified in light-duty truck advertisements. The content analysis shows that the automobile industry promotes light-duty trucks more than regular cars. To promote these large vehicles, it primarily uses representations of nature in multiple forms, various attractive financing terms, and the technological and safety aspects of the vehicles.

MEDIA TYPES, VEHICLE TYPES AND VEHICLE MODELS

Automobile advertisements are seen more commonly in newspapers (76.5%) than in magazines (23.5%), which is consistent with consumer preferences to use daily newspapers to inform themselves when contemplating the purchase of a new vehicle. Also, advertisers focused more heavily on light-duty trucks than on other vehicles: in all the newspapers and magazine ads consulted, 79% featured light-duty trucks—an alarming finding given the impacts of their proliferation—and when it comes to these vehicles, SUVs are the most frequently advertised (58.3%), followed by crossovers (21.2%) and pickup trucks (12.1%). Vans are featured in only two (2) of the ads, reflecting the fact that they have been gradually replaced by other types of light-duty trucks.

In addition, there is a correlation between the top-selling brands and models in Canada and those that are the most heavily advertised, providing additional confirmation of the role advertising plays in the choice of a personal vehicle.

ADVERTISING BACKGROUND

References to the season, good market value and scarcity

In its advertising, the automotive industry often refers to various annual events or periods in order to sell light-duty trucks: one third of the ads analyzed refer to a specific season or holiday. In fact, the most frequently

mentioned times of the year are commercial holidays (Black Friday and Boxing Day).

Many of these advertisements also associate a season or a holiday with the high market value of a light-duty truck: 65.9% of the ads that refer to a season or a holiday also make mention of a special offer (additional discounts, included accessories, etc.).

Scarcity is often mentioned in daily newspaper ads, as they are of a short-lived duration. In fact, 43.2% of the newspaper ads featured the idea of a time-limited offer or a limited quantity. Scarcity is also quite often linked to a specific time of year.

Again, in newspaper ads, pickup trucks and SUVs are most often promoted with a statement of rarity and/or high market value, unlike crossovers. This suggests that automotive advertisers want to create a sense of urgency about purchasing an SUV or pickup truck by displaying short-term offers and limited quantities with purchase terms that appear competitive.

Locations depicted

Nature and its elements figure prominently in the ads for light-duty trucks: 68.2% of them feature element(s) associated with a natural environment, including 53.8% that place moderate or high importance on these elements. Consistent with some of the findings from the literature, natural settings are the primary environment with which light-duty trucks are associated. Similarly, a review of the literature indicates that nature is sometimes found in SUV advertisements, where the vehicle is compared to animals, and that was observed in this analysis.

Light-duty truck ads depicting the city or suburbs are less numerous. They make up 22% and 8.3% of all ads analyzed, respectively. Advertisers are therefore relying more on nature and the environment and its attractions, such as the outdoors, to promote light-duty trucks. Ads for the SUV segment follow a similar trend to other light trucks, but differ in that they are placed in a wider variety of settings:

- 58.5% of SUV ads show the vehicle in a natural setting;
- 27.3% in an urban setting; and
- 13% in what appears to be a suburban setting.

The public's exposure to SUVs in these various settings may lead them to believe that this type of vehicle is versatile and multi-purpose, which may

partially explain the increased interest in this type of light-duty truck.

The other types are shown less often in urban or residential settings than are SUVs. For example, crossovers are almost exclusively featured in a natural setting: 85.7% of their ads show the vehicle in this type of setting.

Domination of the environment

As previous studies have indicated, the environment is often presented as something that can be controlled: 31.1% of all ads illustrate this idea in one way or another. In addition, nearly one out of two (2) advertisements that feature natural elements portrays nature as something that can be dominated or controlled by the light-duty truck, promoting a land-use pattern that is incompatible with protecting nature and biodiversity. This strategy is therefore inconsistent with the environmental plans, strategies and objectives of governments. Pickup trucks are the most frequently shown vehicle that has the ability to control nature: 50% of their ads showcase that idea.

Exploration, adventure and discovery

Next, the sense of exploration, adventure, and discovery is present in 22% of ads and is almost exclusively tied to nature: 94.7% of ads that place medium or high emphasis on this feeling also allocate a medium or high amount of space to one or more natural elements. Crossovers are most often associated with this message, indicating that the auto industry is trying to attach a particular image to the various models of light-duty trucks. On the one hand, there would be pickup trucks and SUVs that would be able to dominate the environment, and on the other hand, there would be crossovers, those vehicles built on a car platform that would have similar capabilities and would allow its owner to explore nature.

Families, out-of-town activities and urban-centered activities

Very few ads explicitly mention families or children (5.3%). However, families may be attracted to light-duty trucks by a variety of features and other elements portrayed in the ads: storage space, the number of seats, comfort, technology, safety for those in the vehicle, etc. Thus, explicit mention of the family is not necessary to make light-duty trucks attractive to this audience. As such, the number of seats in the vehicle, while not often mentioned, is only displayed in SUV

advertisements, something that may appeal to larger families.

Also, a very small proportion of the ads, just 3.8%, refer to urban activities. In these ads, with the exception of one crossover ad, only SUVs are featured. This finding is consistent with previous findings: SUVs are presented in a variety of ways.

In contrast, out-of-the-city activities are much more prevalent (22.7%), a finding consistent with the greater recurrence of scenes involving nature, as opposed to those involving cities, mentioned above. Crossovers are the vehicles most used to represent these activities. This is followed by pickup trucks and then SUVs. Conversely, the occurrence of urban settings and urban activities in the same ad is very low, suggesting that when light-duty trucks are being marketed as city-friendly vehicles, advertisers refer to other features.

FEATURES HIGHLIGHTED IN ADVERTISEMENTS

Safety and performance

Safety was mentioned in two thirds of the ads and is a strong theme in light-duty truck ads. Of these, the majority (54.5%) addressed safety in two (2) or more elements (AWD, safety for people on board the vehicle and/or those outside the vehicle). Moreover, when only one safety-related element is mentioned in an ad, it is the safety of those in the vehicle that is most often mentioned. The issue of the safe sharing of the road, both with other vehicles and with individuals using active transportation (walking or cycling), is virtually absent. Ads for crossovers and SUVs address the safety aspect more often than ads for other types of vehicles.

Furthermore, ads that refer to a vehicle's performance are few in number (12.2%). They refer mostly in a textual manner to the sporty aspect of the vehicle or the adrenaline rush associated with driving it, rather than depicting images of the light-duty truck traveling at full speed, which used to be the case in the past. Consequently, the rules that limit representation of hazardous or illegal behaviors seem to have dissuaded the industry from using these messages, and, to the contrary, have led them to focus on various safety-related aspects, which speaks to the effectiveness of public policies.

Therefore, it is realistic to believe that a tightening of the regulatory framework for automobile advertising, especially when it comes to supplying accurate information on fuel economy and price, size and the

safety-related impact of vehicles could have an impact on the content disseminated and on purchasing behaviors.

Practical and/or aesthetic features

When it comes to the practical and aesthetic features of light-duty trucks, technology is the most recurring feature in the ads (83.3%), especially those that feature crossovers or pickups.

As for comfort-related features, they are present in 28% of the ads. Comfort is mentioned in 28% of the ads and would therefore be a characteristic more often associated with vehicles with a truck frame (SUVs and pickup trucks) than with vehicles built on a car base (crossovers). Hence, advertising for vehicles with a larger frame would associate it with space and size to convey the idea of comfort.

Next, storage space is a feature that is mentioned in fewer than a quarter of the ads (22.8%). Pickup truck ads refer to it most often, followed by crossover ads, which mention it far more than do SUV ads. These results indicate that crossovers are being promoted as spacious as SUV-classified models, even though they are built on a car frame.

Engine power—the ability to carry loads and/or the horsepower rating of the engine—is another feature that was looked at. Although relatively infrequent in all ads (20.4%), it is more often mentioned when promoting pickup trucks. In fact, 68.7% of their ads mention it, as against 25% in the case of crossovers and 10.4% for SUVs. Once again, the attributes of an SUV now seem to be increasingly associated with those of a crossover.

The vehicle's aesthetic appeal is another less frequently recurring feature in the ads (18.9%). None of the crossover ads mention it, while 50% of the pickup truck ads and 19.1% of the SUV ads do. The concept of luxury is reserved exclusively for SUV ads, as noted in the literature. However, it remains infrequent in all ads (7.5%).

Thus, as the literature on automotive advertising has shown, the interior, practical, and aesthetic features of light-duty vehicles are often mentioned repeatedly. This study indicates that light-duty trucks are still sold as more than just a vehicle: they offer the prospect of an experience. All of these features, such as comfort, space, high technology, and aesthetics, are said to

make the vehicle an enjoyable spot to be in, rather than simply a means of getting around (McLean 2009).

Awards and recognition

The inclusion of awards or other forms of recognition received by the promoted brand or model is a relatively common strategy, being seen in just over one-third of ads. The most frequently mentioned awards are safety-related distinctions, followed by model- or vehicle-of-the-year awards, although many of the ads that mention an award or recognition mention more than one.

FINANCIAL INFORMATION

Fuel economy

Fuel economy was only mentioned in 5.3% of the ads, so it is not a strong financial incentive. In addition, some of the messages are vague, referring to the "exceptional fuel efficiency" of the vehicle(s) featured when many other models in the same category consume less fuel. In another ad where the "fuel-efficient engine" is promoted, a quick search reveals that at least three (3) vehicle models in the same class are more fuel-efficient than the one featured (Guide de l'Auto 2021). As a result, high fuel efficiency is sometimes highlighted, even if the vehicles featured are not the most fuel-efficient in their class.

Retail prices and warranties

The vehicle's list price is relatively infrequently displayed in the ads (40.9%), that is, in less than half of them. Half of the ads displaying the retail price present it as a primary element and the other half as a secondary element.

One finding emerges for the crossover subcategory: advertisements promoting it are more likely to have high price visibility, about 75% of the time, rather than low visibility. This is consistent with the idea that these vehicles are presented as having the same attributes as SUVs, but at a much more affordable price, resulting in a more normal display of the list price.

At the same time, less than half (46.7%) of SUV ads that include the retail price give this information a medium or large amount of space. Additionally, 85.2% of ads that displayed the vehicle's list price less prominently also displayed financing terms using a medium or large amount of space. When the retail price is shown in small print, then payment-related information is given more space in the ad.

Moreover, the posting of the selling price generally goes hand-in-hand with the display of financing terms. Still among the ads where the retail price is displayed, but this time in a predominant way, 88.9% of those ads include financing terms. It can in fact be a judicious move to display a selling price with financing offers that make the vehicle seem more affordable. Of the crossover and SUV ads that include the retail price, 100% and 90%, respectively, include financing terms, and in the vast majority of the cases give them a medium or high importance.

In addition, the suggestion of saving money is used to attract potential customers, because 62.3% of the ads that devote a medium or large amount of space to the notion of savings or the good market value of the vehicle never mention the actual retail price. Finally, the warranty, which is mentioned in just over a quarter of the ads, is not a core selling point.

Financing arrangements

Generally, financing arrangements feature prominently in ads for light-duty trucks, which saw 76.5% mention them. A number of more specific financing terms can be seen in the ads such as the interest rate, the amount and frequency of payments. Most advertisers chose to display the smallest payment amounts, that is, either weekly or biweekly. These strategies can make light-duty trucks appear more affordable than they actually are to some consumers. Also, 83.3% of pickup ads and 72.7% of SUV ads that include financing terms give this element a medium or high prominence, far more so than the crossover ads (20.8%).

Next, the offer of the prospect of little or no down payment is another strategy seen in some ads that feature financing terms. For pickup trucks, which have a relatively high base cost, their ads generally make no mention of a down payment or only show it in small print. On the other hand, crossover and SUV ads that include financing terms use a down payment as bait in 16.7% and 5.5% of cases, respectively. So, since SUVs, on average, are more expensive than crossovers, it's little wonder that a down payment is displayed in smaller print alongside the more attractive financing terms.

The financial appeal that can come with the offer of savings or good market value is undeniable: nearly 80% of ads featuring financing terms refer to this. All the pickup truck ads and 85.4% of SUV ads also feature this notion of potential savings or discounts. While both these vehicle types sell at relatively high retail

levels on average, this strategy can allow customers to overlook the list price - especially if it is not displayed - and make the promoted truck seem more attractive. Finally, crossovers use this strategy less often: 58.3% of their ads that feature financing terms display a special offer. Thus, it appears that the auto industry relies more heavily on special offers and discounts in cases when the vehicle price is in the higher range.

In the light of these results, we find there to be a major imbalance between the frequency of the financing arrangements and the frequency of the retail price. Also, most of the components of the financing arrangements analyzed are used in a relatively recurrent manner. These findings confirm that the issue of financing is a central element in light truck advertisements designed to attract the attention of the target audience.

Other elements seen in ads

Automotive advertisers do not rely on the presence of humans to sell light-duty trucks: only 15.9% of ads contain this element. Also, Équiterre's analysis reveals that humans are featured more often when a natural setting is used. This finding is consistent with the fact that, of the ads showing humans, out-of-town activities are often depicted, which may require the use of humans. Additionally, families are only depicted in ads showing one or more SUVs but there is no one particular group or type of individual that stands out in terms of frequency of recurrence.

Reference to a specific group of consumers in the ads is also infrequent: 18.2% of ads include an element aimed directly at a specific group of people, but the industry is tailoring its message to appeal to different groups of people. For example, three (3) ads in the magazine *Triathlon Canada* show athletes participating in a triathlon, along with a discount offer available to athletes. Another ad in the same magazine even includes the slogan "Swim, Bike, Run, Drive". Other ads offer discounts for veterans, active military personnel and Costco members. It is clear that automotive companies are using a variety of marketing strategies to target different segments of the population and cater to their profile.

Next, advertisers only rarely mention environmental or social values. In the ads where such values are observed, the expression "Partial Zero-Emission Vehicles" is found in 10 ads for the Subaru brand. However, GHG emissions data for the models shown are never mentioned, which means that consumers are only provided with partial information.

Finally, crossovers are sometimes associated with expressions connected with the outdoors, such as "The feeling of being outside" or "The refined comfort that is like a breath of fresh air", a finding that is consistent with those presented earlier in this section.

9.3.2 Findings from the regulatory framework analysis

In Canada, both the federal and provincial levels of government have jurisdictional authority to enact legislation on advertising. The following subsections explore the acts, regulations and standards in place in Canada and internationally.

Federal regulation

The national regulatory framework governing advertising includes both industry-led standards and federal legislation. Regarding the industry's self-regulation system, all advertising is governed by ASC, an organization responsible for administering the *Canadian Code of Advertising Standards*. While it is the instrument by which advertisements that are the subject of complaints are evaluated, the Code has no legal force. Nevertheless, a safety clause restricts the use of certain messages such as depictions of dangerous and illegal driving and/or speeding. The inclusion of this section shows that advertising standards can evolve in response to societal issues. Another section of the Code prohibits misleading representations. In addition, certain sectors—which do not include automotive advertising—have specific codes that must be adhered to, and advertising directed at children must be cleared by ASC prior to broadcast.

If a particular ad fails to comply with the code, it is up to consumers and advertisers to lodge a complaint, after which an independent standard council will evaluate the ad in question (ASC 2019). Thus, there is no pre-screening of automobile advertisements, except for those directed at children.

In the event a complaint is received, ASC will first attempt to resolve the dispute between the complainant and the advertiser. If the complaint is not resolved, the ASC will convene a panel to evaluate the complaint and, if substantiated, the advertiser must withdraw or modify the advertisement. If the broadcast period has already ended, the advertiser must not run that ad again. (SAAQ 2012)

From a legal standpoint, the *Competition Act* prohibits the making of false or misleading representations to the public. However, it is once again up to consumers or other advertisers to lodge a complaint. Penalties for violating the law are provided under both the criminal and civil regimes. (Competition Bureau of Canada 2015; Competition Bureau of Canada 2018) Furthermore, there is no federal legislation dedicated specifically to automobile advertising, even though other sectors are subject to a more rigorous regulatory and legal framework. For example, tobacco advertising is regulated by federal and certain provincial legislation, and advertising to children is regulated by law. Various sectors have therefore been regulated in recognition of the negative influence their advertising can have on the health and well-being of the population. Light-duty trucks have not been specifically regulated in this regard.

At the federal level, there are no standards or laws to regulate automobile advertising prior to publication. Furthermore, the industry has no specific code or legislation to follow with respect to advertising, whereas other industries whose activities are detrimental to the public interest are subject to such rules.

Provincial regulations

In Quebec, the *Consumer Protection Act* prohibits advertising that contains a false or misleading representation or omits a material fact (s. 219), as do ASC regulations and federal legislation.

In the case of automobile advertising, there are several prohibitions regarding how financing terms and conditions can be displayed (OPC 2020). In the event of a violation, consumers and advertisers can file a complaint. Also, the SAAQ has established guidelines for automobile advertising that prohibit encouraging reckless, dangerous or illegal actions (*Highway Safety Code*, s. 5.3). Thus, the industry and the government have already taken action to regulate problematic automobile advertising messages. However, none of the measures are aimed at protecting the environment or addressing the increasing number of light-duty trucks on the road.

Furthermore, under the ban on depicting prohibited behaviours in advertisements, the operation of a motorized vehicle on the banks of a watercourse or in a wetland must not be depicted in advertisements. It is indeed prohibited under the *Act respecting the conservation and development of wildlife* (s. 128.6).

Combining this section of the Act with the various rules that prohibit the depiction of illegal behaviour, promoting a vehicle in these natural environments could be deemed misleading. It gives the impression that driving in these areas is permitted when it is not. At present, however, there does not appear to be a link established between these regulations since there are no fines or constraints applied to advertisers who display a car in these natural areas.

In Ontario, false advertising is also prohibited by the *Motor Vehicle Industry Act* (s. 28). In the event of a violation, the ad in question may have to be discontinued or a correction requested.

A review of other provinces indicates that they all have laws to protect consumers, including through the prohibition of misleading or deceptive advertising and false statements. In addition to Quebec, some provinces have specific rules governing the promotion of motor vehicles; for example, Manitoba has specific requirements governing the prices that can be shown in automobile advertisements (Government of Manitoba 2015).

In summary, at the provincial level, there is no process to screen ads prior to broadcast. Nevertheless, misleading advertising is prohibited, and certain practices, such as the posting of financing terms and conditions, are regulated.

Currently, the Canadian regulatory framework governing automotive advertising in Canada is not aligned with government climate objectives, although public authorities have the power to regulate advertising messages, as they have done in the past for other societal issues such as speeding and advertising to children. Environmental issues remain excluded from the laws, regulations and standards governing the advertising practices of the automotive industry.

International best practices

Belgian standards require that the fuel consumption and carbon dioxide (CO₂) emissions of vehicles be displayed in advertisements (*Code on the advertising of motor vehicles and their components and accessories*, s. 5). These standards also specify that an advertisement may not encourage behaviour that is harmful to the environment (s. 4) and that, if it depicts a location that is not part of the public highway system, it must be clear that this location is closed to highway users. Finally, under the *Belgian Environmental Advertising Code*, advertising may not mislead the public regarding the effects that a product has on the environment (s. 3).

In the United Kingdom, print advertisements for automobiles must also include data on the vehicle's fuel consumption and CO₂ emissions (Vehicle Certification Agency 2018; Vehicle Certification Agency 2020). There are rules governing the appearance of the text containing this information, but it is still in very small print.

Sweden has rules governing advertising and the environment. The word "environment" may only be used in association with a product if it has significant environmental benefits over comparable products, and the term "environmentally friendly" may only be used if the product does not harm or improve the environment. It is considered misleading to use these terms to describe products that damage the environment. (Friends of the Earth Europe 2012)

New Zealand's advertising standards prohibit advertisements that promote or depict environmental damage in areas of significant conservation value such as beaches, sand dunes, riverbeds, wetlands, peat bogs, lakeshores, and estuaries (ASA 2018). Similarly, under Australian standards, advertisers must ensure that automotive advertisements do not present deliberate or significant environmental damage (FCAI 2020).

Finally, in France, a judge has ordered that one car company withdraw its advertisements in which SUVs were shown in the wild. Indeed, he ruled that it was forbidden to depict a vehicle that was not being driven on public roads. This ruling was based on two (2) laws: article L. 362-4 of the *Environment Code*, which prohibits the depiction of a vehicle in violation of various provisions, including the prohibition of driving a motorized vehicle off the public highway network (art. L. 362-1), and article L. 121-1 of the *Consumer Code*, which prohibits misleading advertising. In short, because gasoline-powered vehicles cannot be driven off public roads, i.e., in natural areas where there are no official roads, the depiction of such vehicles in these types of locations was deceptive because it led the public to infer that they could drive there. (IREDEC 2012)

In Canada, there are no :

- Requirements to display fuel consumption and CO₂ emissions data or the retail price of a vehicle;
- Prohibitions on depicting vehicles in certain settings;
- Regulations governing the use of environmental claims to sell a product;
- Standards for the protection of nature and the environment.

Inspiring municipal practices in Canada and internationally

Cities also have a role to play in regulating automobile advertising, since they have certain powers to prohibit or control messages that appear within their jurisdiction.

In 2015, North Vancouver was the first city in the world to require the posting of warning stickers on gas station pumps to show the significant contribution that fossil fuels make to climate change (Baluja 2015; Crossan 2016; Our Horizon 2020). In 2019, Cambridge, Massachusetts passed a bylaw requiring that these warnings be placed on gas pumps as part of its goal to achieve carbon neutrality by 2050 (City of Cambridge 2020; Guzman 2020).

In doing so, these municipalities have acted at their own scale to enable their citizens in making more informed transportation choices. They are therefore proactive in meeting their climate commitments.

On an even broader front, in December 2020, the City of Amsterdam in the Netherlands passed a motion to ban the advertising of fossil and aviation fuels (Daley, 2020). Finally, the UK city of Bristol has included in its climate plan the creation of "advertising standards and restrictions to support responsible consumption" (Bristol's One City 2020, 46), which means that the advertising of high-carbon emitting products could be banned. In Canada, no government body has taken similar steps to limit the promotion of pollution-causing industries.

9.4 Discussion

Based on the analysis of advertising content and the regulatory frameworks for automotive advertising in effect in Canada and in other countries, the advertising practices appear to conflict with various Canadian standards and with various environmental commitments made by governments across the country.

First, while Canadian advertising standards do not allow the depiction of prohibited behaviour, 24.4% of the ads that depict an element of nature show vehicles in proximity to various waterways, which are part of the natural areas in which Quebec law prohibits the use of motorized vehicles. Therefore, since they lead the public to believe that these vehicles can be used in these areas when in fact they cannot, it would be interesting to examine whether these ads could be declared false or misleading by a court of law, as has already been done in France.

Further, just under a third of the ads refer to a feeling of dominance of the environment, and some may even encourage damage to the natural environment with the promoted vehicle. For example, there is the mention of “playground” on the snowy hills in the background or the wording “Go wild” with a vehicle in the grass instead of on a road or marked path. These messages imply that it is acceptable to drive a motor vehicle wherever you want, when in fact there are regulations that must be followed. In showing a picturesque natural backdrop, which the increasing numbers of light-duty trucks and the growth in the automobile fleet are helping to destroy, these ads are ironic at best. A more in-depth analysis by legal experts would be necessary to assess whether or not they are misleading.

With their standards prohibiting the depiction of environmental damage in certain natural environments, New Zealand and Australia offer consumers an opportunity to take action. Indeed, it is possible to lodge a complaint based on this idea to the relevant authorities, but not so in Canada. If governments were to bring in one or more environmental standards, the public would have an opportunity to take action to limit the dissemination of these ads. However, because this mechanism is reactive and does not allow for advance scrutiny of advertising, any such measures would ultimately have to be incorporated into legislation.

Additionally, there is no mention of vehicle fuel consumption and/or CO₂ emissions figures in any of the ads, highlighting the relevance of the Belgian and British standards. One advertisement even mentions that the company has been “working to reduce emissions since 1948” without any mention of CO₂ emissions. This message is inconsistent, to say the least, and could potentially be considered misleading, considering that the transportation sector is a growing source of GHG emissions.

Finally, the emphasis on safety in the ads that were analyzed represents one more element of irony. Two thirds of the ads mention safety, even though numerous studies have shown the increased danger posed by light-duty trucks to those sharing the road (motorists, pedestrians, etc.). More specifically, crossovers and SUVs are extensively promoted as safe vehicles, yet they exacerbate numerous societal problems, such as declining air quality, increasing GHG emissions from the transportation sector and driving up Canadians’ household debt, not to mention the fact that their large size threatens community safety.

In conclusion, there is a pressing need to beef up the regulatory framework for automobile advertising in Canada in order to steer consumers toward more sustainable modes of transportation and to make progress in meeting our climate targets. Équiterre’s recommendations are detailed in chapter 10.

Table 5. Key insights from the focus groups

The focus groups provided an opportunity to explore individuals’ perceptions of light-duty truck advertising.

Key insights from the focus groups	
Content	<ul style="list-style-type: none"> • Participants claim that they are aware of marketing practices designed to make large vehicles seem more appealing; • Nevertheless appear to be influenced by advertising, based on the ease with which they are able to recall scenes of the outdoors and of adventure; • Associate the dominance of a harsh and hostile environment by an SUV with safety; and • Mentioned the emotional attachment promoted by the ads, which even go so far as to portray the SUV as a member of the family.
Price and financing options	<ul style="list-style-type: none"> • Participants pointed to the central importance of price and financing information shown in the ads and feel that they are aware that these are tactics intended to make SUVs appear more affordable than they actually are; • Are often able to relate the experiences of people they know who have had difficulty making the required payments; and • Feel that it is important and useful to have information about the all-in vehicle cost included in the advertising.
Information regarding environmental impacts	<ul style="list-style-type: none"> • Participants feel that it is not necessary for a vehicle ad to include information regarding the vehicle’s environmental footprint or fuel consumption numbers; • Do not trust vehicle manufacturers to make truthful claims about fuel efficiency or are unable to make sense of this information when it is presented in raw form; • Believe that consumption data (fuel cost and use, GHG emissions) are primarily a function of driving style and are therefore not objectively comparable.

Source : CIRANO (2021)

Highlights and issues

Advertising:

- Is effective in influencing people's perceptions, attitudes and personal choices about consumption;
- Allows products to be associated with groups, identities, or social values;
- Sells the idea that consumption leads to satisfaction of needs and happiness, through the multiplication of its messages and its ubiquity;
- Can reinforce the public's positive emotions towards a product advertised in several attractive measures.

Automotive advertising investments:

- Are not easily accessible in Canada;
- Were the second largest in digital advertising in Canada (19%) in 2019, just behind retail, whose share represented 21%;
- Amounted to \$153 million in 2017 in Quebec, which represented 16% of the province's advertising investments, placing the automotive industry in second place; and
- Are in the majority on television, daily newspapers and radio, despite the growth that advertising is experiencing on digital platforms.

Advertising practices around light-duty trucks are problematic:

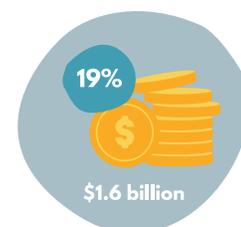
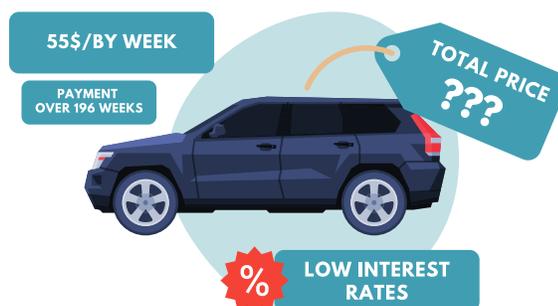
- 79% of Canadian newspaper and magazine ads feature light-duty trucks;
- Nature and the domination of the environment are recurring themes, as well as technology;
- Safety is very often referred to, especially in reference to safety for people in the vehicle;
- Highly attractive financing terms (special offers for regular payment amounts, down payments, low or no-interest rates, etc.) are very often featured, while the vehicle's full retail price is displayed in less than half of the ads;
- None of the ads mention the vehicle's fuel consumption and/or CO₂ emissions, but a few of them still highlight the vehicle's "great" fuel efficiency.

The regulatory framework for automotive advertising lacks stringency:

- There is no control of advertising prior to broadcasting, except for children's advertising;
- Some sectors have specific codes that must be adhered to, but the automotive industry does not.

The advertising industry and the federal and provincial governments can strengthen this framework:

- False, misleading or deceptive advertising is prohibited by federal and provincial legislation;
- Advertising standards and laws, both federal and provincial, are evolving in response to public health and public safety issues raised, but the environment has not been incorporated into legislation.



10. REVERSING THE TREND: RECOMMENDATIONS

In light of the findings from this report, which are the result of various analyses carried out as part of the broader study entitled "The Rise of Light-Duty Trucks in Canada: Reversing the Trend", there is an urgent need to determine possible solutions to the problems that were identified. Governments have a central role to play in slowing, and then reversing, the rise in the number of light-duty trucks in Canada, a phenomenon that is driven by a number of factors.

There is no denying that the practices of the automotive industry are inconsistent with the government's ZEV sales and GHG reduction targets. This mismatch can and must be resolved through various measures on several fronts. This chapter presents Équiterre's recommendations for limiting the proliferation of large vehicles in Canada.

10.1 Recognize the rise of light-duty trucks in Canada as a public health and safety issue

Public health refers to efforts to maintain human health and prevent injury, illness and premature death (CPHA 2016). Public safety refers to "the set of measures put in place by the State to guarantee public order and the safety of citizens" (Government of Quebec 2021). Given this context, governments will need to recognize that the rise in popularity of light-duty trucks in Canada is a threat to the well-being of Canadians, given their contribution to Canada's GHG emissions and the danger they pose to the environment and the safety of highway users, as well as the major impacts they have on road capacity and the financial health of Canadian households.

Canadian government authorities need to recognize that the proliferation of light-duty trucks and the continued growth of the vehicle fleet constitute serious issues, in order to accelerate action to redirect these alarming trends towards more sustainable trajectories.

10.2 Form an independent advisory committee

A first step towards evaluating measures needed to better regulate the automobile advertising sector is to work with an independent advisory committee whose mandate would be to advise and assist the government in developing and implementing measures intended to reduce the supply of and demand for light-duty trucks in Canada, which would include regulating automobile advertising in

Canada. As such, the committee would review current regulations to ensure that they are more in line with the government's climate goals, since they predate the light truck invasion of the market.

10.3 Establish an automatic and universal classification system for light-duty vehicles

Given the confusion and inconsistencies surrounding the concepts of "light-duty vehicle", "light-duty truck" and "SUV", both within the automobile industry and among government authorities, the Mobility Chair of Polytechnique Montréal stated that "the harmonization of definitions and establishment of a clear nomenclature are essential" (Morency et al. 2021) for several reasons:

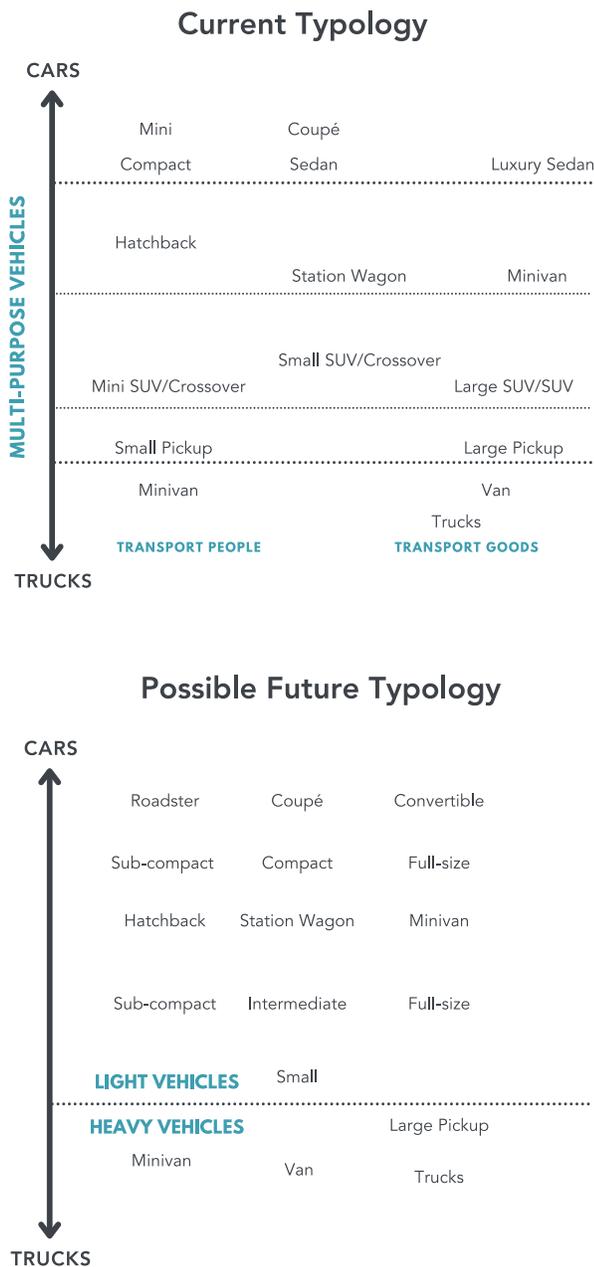
- To provide a coherent framework for the industry;
- To promote cooperation between public authorities; and
- To facilitate the monitoring of various governmental objectives.

These objectives should be given even higher priority, given the findings of the previous recommendation: the transformation of the vehicle fleet is resulting in multiple negative impacts that run counter to the collective ambitions of municipalities, provinces and the country.

The classification proposed for Canada by the Mobility Chair needs to be developed according to how it is to be used. It suggests that a typology be used to classify vehicles according to their potential impact on the safety of others, based for example on vehicle weight, width and height. Another approach would be to classify vehicles according to their impact on congestion or use of space, based on vehicle length and width. (Morency et al. 2021)

In this respect, in order to better regulate the polluting emissions of fuel-inefficient vehicles, the Canadian government should abolish the binary division of light-duty vehicles, which no longer reflects reality, and instead give way to the continuum that vehicle types now constitute. The Mobility Chair proposes two (2) typologies "that highlight the changes in vehicle offerings, regardless of the terminology used to identify or classify them" (Morency et al. 2021). These are important to understanding vehicle purchasing trends and the make-up of the existing fleet. A detailed description of these typologies is provided in annex 3.

Figure 21. Current and possible future typology



Source : Morency et al. (2021)

However, it must be stressed that the establishment of an automatic and universal classification system for light-duty vehicles cannot happen without the close cooperation of the United States, especially in the context of a highly integrated North American automotive market with the same GHG vehicle emission standards.

Recording road accidents according to vehicle type

In order to obtain Canadian highway-collision data that are current and consistent, it would be helpful for provincial highway safety agencies to revise their classification systems to include information on vehicle type, for example through a pre-established, universal dynamic classification system. This would allow the impact of the increase in light-duty trucks on human safety to be studied on a national basis, with the help of standardized data.

10.4 Putting measures in place to lower the supply of large vehicles

In addition to a comprehensive review of the regulations on light-duty vehicle GHG emissions, the Canadian government can take other measures to curb the growth in size of the automobile fleet and the vehicles that comprise it. Nevertheless, these regulations are an indispensable tool in reducing emissions from the light-duty vehicle sector.

10.4.1 Reforming the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations

The recommendations in this section take into account the points raised in the analysis of public policy regarding light-duty vehicles.

Holding the line on and increasing the stringency of Canada's emission standards for light-duty vehicles

It is essential to establish an overall limit on average CO₂ emissions of light-duty vehicles. This limit would be applied to all automakers, regardless of the size and weight of the light-duty vehicles sold. At present, standards are based on vehicle "footprint" and are laxer for vehicles with a larger footprint. Coinciding with the increased manufacture of large vehicles, the overall CO₂ emissions limit is rising too, since it is based on the average of these size-based limits. The continued rise in the manufacture of light-duty trucks, including crossovers at the expense of sedans, is a notable consequence of this flaw, since automakers are freer to produce larger and more polluting vehicles. This also points up the ineffectiveness of the voluntary measures proposed by the automobile industry to meet Canada's electrification objectives. Inevitably, future regulations will need to be improved

to slow the proliferation of light-duty trucks and the increase in average vehicle size. (Rous 2019)

Revising compliance crediting to eliminate advanced technology multipliers for ZEVs

As explained in chapter 10, with the standards currently in effect in Canada, automakers selling larger and more polluting vehicles will end their year with higher authorized emissions. Consequently, they are less dependent on innovation.

At present Canada's GHG regulations will phase down its ZEV multipliers beginning with vehicles in the 2022-2025 MY; there is no reason to wait, however – by following that schedule, the regulations are helping to bring more truck-type vehicles and other high-emitters to market. More crucially, given the expected impact of existing provincial policies (i.e., the required ZEV sales thresholds in BC and Québec), advanced technology credits are no longer necessary to promote ZEV sales. In order to align with the federal government's aspiration to implement a 100% ZEV mandate for new vehicle sales by 2035, advanced technology multipliers for ZEVs should be eliminated entirely as early as 2021.

Overseas, to correct the problem of high ZEV multipliers, which are especially important in calculating emissions because EVs represent as much as 28% of new vehicle sales, the EU has rolled back their ZEV credits, and will phase them out by 2023.. In the US, ZEV multipliers will be phased down from 2.0 to 1.3 from 2017 to 2021, and will not be available thereafter (Rous 2019).

Amending off-cycle credit system

In the absence of adequate incentives for automakers to prioritize proven vehicle efficiency improvements, the only real avenues available to make the GHG regulations more effective are to strengthen the applicable emissions targets, or to eliminate compliance crediting flexibilities. In order to expand the possible range of pathways to GHG reductions, Canada must take a hard look at the regulations' existing allowances for off-cycle technologies, which manufacturers have relied upon to meet their compliance obligations to the exclusion of proven fuel efficiency innovations. The 10g/mi threshold for many off-cycle technologies, even cumulatively, proves to be far too generous as a rule.

The availability of market-ready, advanced vehicle efficiency technologies does not guarantee their uptake,

nor the prioritization of technologies with greater emissions reduction potential. To date the industry trend has been for manufacturers to rely on off-cycle credit use, but this greatly reduces the deployment of other efficiency technologies (Rous 2019).

10.4.2 Imposing "green conditions" on the automotive industry

In order for government spending in Canada to be consistent with climate commitments and to help move the country away from its dependence on fossil fuels, governments must stop supporting the auto industry, either directly or indirectly, unless that support is accompanied by publicly stated "green conditions" that include reporting on:

1. The actual amounts spent on R&D towards zero-emission vehicle technologies;
2. Expected GHG emission reductions from the company's operations, along with frequent updates;
3. The indicators and calculators that will make it possible to monitor compliance with these targets.

Further, during any period of economic downturn, government policies and support programs cannot continue to favour the production of large vehicles. Post-pandemic stimulus activities must necessarily contribute to accelerating a just transition, in contrast to the bailout of the auto industry that took place following the 2008 financial crisis.

10.5 Implementing measures to reduce the demand for large vehicles

In combination with a comprehensive review of the light-duty vehicle GHG emission regulations, there are other measures that the Canadian government can take to curb the growth in the size of the vehicle fleet and the vehicles that comprise it.

Although automobile advertising is a practice that affects public demand, the recommendations regarding this issue are included in a separate subsection due to the large number of them.

10.5.1 Establish a self-financing feebate system

First, it is essential that strong measures be taken to reduce the demand for vehicles and ensure that the demand is commensurate with Canada's GHG emission-reduction targets. To this end, Équiterre suggests the introduction of a feebate system. This

type of policy tool has the advantage of adding no burden on the public purse, a measure that is essential within the context of a fair and sustainable post-pandemic economic recovery.

Canada's current Green Levy program has a number of structural weaknesses:

- It only applies to a small segment of the vehicle market (large vans and luxury vehicles);
- It provides differentiated incentives that favour marginal GHG emission reductions, as the charge only starts to apply above a certain fuel consumption rate; and
- It sends out weak price signals.

Although an additional tax on luxury vehicles was included in the 2021 federal budget, it applies only to vehicles over \$100,000 and is therefore only a token tax: it is still not effective enough to bring about a change in vehicle purchase decisions.

With respect to rebates, while the iZEV program is a step in the right direction toward supporting the switch to ZEVs, Canadian incentives are significantly lower than those of comparable international jurisdictions. As such, European Union member states whose automotive manufacturing sectors play an important role in their economies have raised the level of subsidies for ZEVs as part of their post-pandemic stimulus packages.

In December 2020, the federal government announced an additional \$287 million for the iZEV Program, on top of the initial \$300 million in funding, plus \$150 million in investments in charging infrastructure. The proposed feebate system could be used to offset these costs, allowing for additional investments aimed at reducing GHG emissions from the transportation sector, better adapting to climate change and ensuring a just transition for all workers.

In short, when purchasing a vehicle, Canadians are given a financial incentive, by means of a rebate, to choose a zero-emission vehicle (ZEV), and this subsidy in turn is funded through a transportation electrification contribution (levy) on the owners of over-dimensioned, energy-inefficient vehicles.

A feebate system therefore has the potential to be effective on two (2) fronts: it discourages the purchase of fuel-inefficient vehicles while at the same time contributing significantly to the transition to cleaner cars. The funds generated by the feebate system

could therefore be used to fund other measures to decarbonize transportation in Canada. Among other benefits, the feebate system helps focus attention on the issue of GHG emissions while at the same time engaging manufacturers, dealers and consumers.

A study by Horizon Advisors indicates that the most promising system for Canada is one that uses an increasingly restrictive fee structure until the consumer buying trend is reversed.

To implement this system, it is recommended that the federal government restructure its Green Levy and iVZE programs to bring them together under a single administrative agency. A new unified system would allow the government to review and adjust both measures in parallel and according to a common set of indicators, while sending a strong signal to the market regarding the direction in which the government is headed and attracting the capital needed to manufacture ZEVs in Canada.

Finally, Canada could draw inspiration from the California system by setting an annual income limit for entitlement to the rebate and in this way address equity issues.

10.5.2 Maintain Canada's focus on gradually increasing the price of carbon

The Canadian government has recognized that higher fuel prices may help stimulate consumer demand for fuel-efficient vehicles. Because retail fuel prices do not take into account the social cost of carbon pollution, they are below their optimal level, thereby encouraging consumers to drive more and to move to larger models. (Rous 2019)

While Canadian vehicles are among the most heavily polluting in the world, according to the IEA, the focus groups conducted for this study revealed that consumers would be inclined to reduce their gasoline consumption if the price were to be increased significantly. Indeed, when consumers purchase a vehicle, they rarely consider the cost of owning and operating it beyond the initial purchase price. A sharp and sustained increase in the price of gasoline would therefore be an important incentive to encourage the purchase of clean vehicles.

10.5.3 Introduce kilometre-based pricing

This type of measure is complementary to the feebate system, but may also represent an interesting alternative to the current gas tax. Aiming to charge

a fee for the use of the road network based on the number of kilometres travelled by a vehicle, this type of pricing is currently being partially used in Germany for heavy vehicles and, since recently, in the state of Utah for EVs, in addition to gasoline-powered vehicles (Utah Department of Transportation 2019).

In Quebec, kilometre-based pricing has been proposed by several transportation experts and economic organizations such as the *Conseil du patronat du Québec* (2019), the *Institut de développement urbain du Québec* (2015), the *Chambre de commerce du Montréal métropolitain* (2019) and *CAA-Québec* (2020). As such, the TRANSIT Alliance has studied this measure for the CMM: this is a potential source of funding for transportation infrastructure that is likely to be seriously considered in the coming years (CMM 2019). It provides an incentive to reduce the distances travelled by individual vehicles, especially the more fuel-inefficient ones, but it also has the potential to limit the distances travelled by ZEVs, which are also increasing in size and mass. Kilometre-based pricing is therefore likely to be a key measure in the coming years and decades, when the majority of light vehicles will be electric, to discourage the purchase of larger EV models, whose battery weight will not be without consequences.

10.5.4 Introduce more widespread tax-creditable vehicle scrapping programs

Emissions from light-duty vehicles vary, depending on a number of vehicle properties: purchase or acquisition, length of ownership, disposal and replacement. Reducing oil consumption requires a transition to ZEVs. Disposal programs encourage the removal of older, high-polluting vehicles from the road by offering a tax credit for the purchase of a more sustainable mode of transportation, such as a ZEV or bicycle. In addition, GHG emission reduction standards focus on new vehicles rather than existing ones, which means that environmental regulation of used vehicles remains limited at present.

Cash-for-disposal options are already available in most Canadian municipalities, allowing vehicle owners to dispose of their old high-polluting vehicles with registered operators who meet the environmental guidelines for end-of-life vehicles. Tax credits or a bonus under the iVZE program could be offered to owners who dispose of their high-polluting vehicles, and these could be increased if they replace their old vehicles with active transportation. These disposal options could help reverse the trend towards ever

more massive vehicles and remove a significant number of high-emitting light-duty trucks from the fleet.

To rapidly decarbonize the light-duty vehicle segment in Canada, there is no quick fix other than a rigorous and unified strategy that includes a feebate system, a gasoline-vehicle retirement program, additional investments in charging infrastructure, and a national ZEV standard.

10.6 Gradually expand the regulation of automobile advertising

The following sub-recommendations outline potential actions to be taken in chronological order from now until the end of new gasoline-powered vehicle sales in Canada.

10.6.1 Systematically archive automobile advertisements

In order to regulate the content of automotive advertising, it is important to make all publicly aired advertising openly available to the public. Since the broadcast of automobile advertisements in traditional and digital media encourages the purchase of vehicles that threaten the well-being of Canadians, such advertisements should be part of a national public inventory, but that is not currently the case. In order to ensure compliance with the regulations, a bank of automobile advertisements needs to be established and made freely available to the public. This would also help advertisers who have difficulty adapting to the new Canadian Code of Automobile Advertising, as they would be able to use previously approved archived ads as examples.

10.6.2 Systematize the collection of data on amounts spent on advertising by the auto industry

This sub-recommendation is in line with the view that products representing a danger to public health and safety require additional monitoring. Since the figures on investments in automobile advertising that have been identified are incomplete, the industry needs to disclose how much it spends to promote products whose multiple negative impacts can no longer be introduced. Thus, in parallel with the archiving of advertising content by the Canadian government, companies in the automotive sector should be required to report their annual spending on advertising and promotion. These figures need to be public and accessible, as is the case with the data frequently shared by public transport companies.

10.6.3 Restrict automobile industry advertising practices

In order to adequately address the issue of light-truck advertising, a number of legal tools relating to the content of advertisements and spending on promotional activities by automobile companies need to be put into place and gradually implemented. Such a process would allow the industry, governments and the public to adapt to them as they come into play: manufacturers and dealers will begin to shift more towards the promotion of ZEVs, governments will increasingly favour the promotion of ZEVs, as well as the advertising of sustainable modes of transportation, and the public will gradually shift towards these options over time, provided they are comparable in terms of effectiveness.

The sub-recommendations listed below are applicable to both traditional and digital media. However, close attention will need to be paid to digital advertising as it is more beyond the control of governments and the investments in that form of advertising are huge. Indeed, as mentioned earlier, the automobile industry ranks near the top of this list.

Establishment of a Canadian Code of Automobile Advertising

The development of a Canadian Code of Advertising is needed, in conjunction with the Independent Advisory Panel, to tighten regulation of this sector and to limit practices that run counter to governments' objectives. It could be incorporated into Advertising Standards Canada in a manner similar to the Spirits Canada Code of Responsible Advertising and Marketing.

Display of vehicle CO₂ emissions and fuel consumption data

To begin, this code would include the requirement that CO₂ emissions and fuel consumption data be shown in vehicle ads. This simple measure would be similar to the requirement for tobacco companies to include warnings about the dangers of their products on their packaging: in the midst of a climate crisis, it is critically important that the public be informed about the negative environmental impacts of the consumer goods they buy.

Further, a study carried out in the U.S. showed that the public wants more information about their vehicle's fuel consumption. The study also indicated that people tend to choose a more fuel-efficient vehicle

when they are provided with this type of information. This is reportedly the number one attribute that car owners would like to see improved in their next vehicle (Consumer Reports 2018).

Public availability of information on the negative aspects of vehicles

The focus groups highlighted the fact that the raw information about GHG emissions or fuel efficiency displayed in car advertisements is not informative enough for most people. Indeed, it would be difficult for them to make sense of such figures without a comparative index.

The suggestion was therefore made that we take things further than the Belgian and British codes in order to ensure a common and clear understanding of the information contained in the advertisements. Indeed, it is important that the environmental impact of vehicles be communicated to the public, using images and comparisons that the public can readily identify with and that are not objectively measurable (e.g., number of trees to be planted to offset the vehicle's GHG emissions, comparison of vehicles from the same year using a colour code based on fuel consumption data, etc.). This principle could be extended to other issues related to light-duty trucks, such as the safety of vulnerable individuals.

The advisory committee could be responsible for determining how best to display this information in advertisements. This objective approach would also be intended to help combat the greenwashing practiced by certain automobile companies.

Posting of the vehicle's retail price and transparency

If financing options such as the applicable interest rate or the amount and frequency of payments are shown in the ads, then the ads should also include the retail price of the vehicle. This would give the public all the information they need to make an informed decision when purchasing a new vehicle. In addition, clear rules should be established so that the retail price does not simply appear in very small print, unlike the financing options.

Tightening of practices for posting allowable financing options

With Canadian auto loan debt increasing and surpassing all other forms of household credit in recent years, it is critical that the practice of displaying financing options in auto advertisements be more

tightly controlled. Currently, these practices lead the public to believe that a vehicle is more affordable than it really is. One-on-one interviews revealed that this marketing technique is effective with some of the more vulnerable individuals.

Generally speaking, the Canadian Code of Automobile Advertising would limit the use of certain marketing tactics such as:

- Using base models as price reference points;
- Using fine print to display added costs;
- Displaying the amount payable on a per-week basis instead of a per-month basis;
- Showing 0% interest financing options in large print.

Restrictions on the depiction of natural features and the use of environmental values

Based on practices seen in New Zealand, Australia and Sweden, it would be wise to restrict the depiction of natural environments and practices that contribute to their degradation, as well as the use of terms and expression that reflect environmental concerns. It is recommended that the code include:

- A prohibition on depicting a vehicle operating off the public road system, as this is illegal behaviour;
- A prohibition on encouraging or depicting damage to nature and the environment; and
- A prohibition on the use of terms referring to the protection of nature or the environment.

10.6.4 Establish a mechanism to review and validate the content of automobile advertisements

To ensure compliance with the new Canadian Code of Automobile Advertising, a review and approval process for all broadcast-ready automobile advertising should be established, as is already the case in some sectors. A permanent multi-sectoral team or committee made up, for example, of representatives from areas such as industry, government and the public, would be created and administered by the ASC to review advertising for compliance, similar to what is done with advertising directed at children. A Children's Clearance Committee conducts this review and issues a certificate of clearance to advertisers whose ads adhere to the established code. Such a system would provide effective pre-clearance control over the broadcast of automobile advertising. This would

limit the broadcast of potentially misleading and dangerous messages and ensure that the obligations enshrined in the Canadian Code of Automobile Advertising are met.

10.6.5 Require an increasing share of advertising dollars be spent on ZEVs compared to light-duty gasoline vehicles

In order to make effective progress toward achieving carbon neutrality by 2050, it is recommended that the government require an increasing share of advertising dollars be spent on ZEVs as the 2035 ban on the sale of combustion-powered vehicles approaches.

The details of this measure would be determined based on the recommendations of an independent advisory committee that would be responsible for determining the various thresholds and, consequently, the various models that would be eliminated from advertising over time. In effect, sub-categories could be created so that the regulations are tailored to fuel consumption, but also to vehicle weight and size. This type of approach takes into account both the need to reduce Canada's GHG emissions and the issue of road obesity as highlighted by the Mobility Chair. While manufacturers will necessarily have to turn to ZEV advertising, it will still have to respect the standards governing the proportion of vehicle types in order to encourage the promotion and adoption of smaller models.

Accordingly, a ban on promoting the most highly polluting vehicles would come into play first, based on the intensity of their GHG emissions, followed by a phased prohibition on the promotion of all gasoline-powered cars. This would be done in step with ZEV sales targets and GHG emission-reduction objectives for the transportation sector, as identified in the governments' climate action plans.

In sum, it is critical that advertising practices that promote socially and environmentally harmful goods be progressively restricted in order to influence consumer demand in time to ensure that climate and transportation targets are met.

Building on existing advertising restrictions

In Canada, advertising restrictions have been implemented to limit the sale of tobacco products and messages inciting unsafe driving. Displaying nutritional values on food products and pre-clearance prior to broadcasting advertisements for children are other avenues to explore.

Tobacco products

In the past, public authorities had recognized the damage to health caused by tobacco products and had thus decided to regulate advertising more rigorously. Indeed, in Canada, the advertising practices of the tobacco industry were gradually restricted and then banned by the Tobacco and Vaping Products Act and by various provincial laws. These products have even been the subject of negative advertisements or warnings about their negative health effects. These various measures have been used to change the public's perception of tobacco. It then follows that a similar strategy should be considered to focus on the climate, environmental, and socioeconomic hazards of light trucks as illustrated above.

In addition to these severe restrictions, many countermarketing interventions to reduce the prevalence of tobacco use have been implemented by federal and provincial government departments and anti-smoking associations in recent years. Capitalizing on the negative effects of tobacco products, public authorities have succeeded in destroying the social acceptability of cigarettes by transforming their image. Indeed, while restricting and banning advertising were not the only measures implemented, they are recognized as being effective. Between 1999 and 2012, the smoking rate among Canadians aged 15 years and older decreased from 25% to 16% (Statistics Canada 2013).

Thus, the simple fact of banning the advertising of a product reduces its social acceptability and is a strong communication signal from the government. In short, the regulatory framework for automobile advertising should become increasingly restrictive to curb their proliferation in the Canadian fleet.

Unsafe driving advertisements

As with tobacco products, governments have become aware of the influence of certain advertising messages on driver behaviour and have intervened to limit behaviour that threatens road safety. The automotive industry frequently promoted the power and performance of vehicles by depicting dangerous, illegal or speeding driving maneuvers. The advertising industry and governments have banned the dissemination of such messages using various tools, including section 10 of the Canadian Code of Advertising Standards, the Québec Highway Safety Code and a new SAAQ guideline.

Safety as a theme was present in two thirds of the ads reviewed during the content analysis. This contrasts with the results of the studies conducted before the regulations were put in place.

Furthermore, according to basic marketing logic, it is in the interest of any advertiser to respond to market demand by providing messages that address the concerns and needs of the target audience. This is why, in the 1990s, as the public became more aware of road safety issues, advertisers emphasized this element and governments regulated the use of anti-road safety commentary (Burns et al. 2005). Today, with a strong and growing majority of Canadians recognizing the magnitude of the climate crisis and its consequences, and supporting policy and regulatory measures to address it, it is reasonable to tighten the regulation of the automotive industry's advertising practices.

10.6.6 Establish a cap on advertising for zero-emission oversized vehicles

Over the longer term, in parallel with the electrification of personal vehicles in Canada, governments will need to take into account the impacts that vehicle size and weight have on safety and also on highway infrastructure. Indeed, because it is not desirable that the future Canadian fleet be composed of a majority of oversized zero-emission vehicles, measures such as establishing a cap on spending on promotional activities for zero-emission light-duty trucks will have to be considered.

10.7 Campaigns promoting sustainable mobility

If the government sets ambitious targets for vehicle electrification and reduction of polluting emissions, it must dispel the myths surrounding transportation decarbonisation and find ways to ensure buy-in on the part of the public. To do so, governments must roll out programs to support this process, inform the Canadian population about the adverse impacts of large vehicles on our roads and encourage consumers to make sustainable transportation choices. The survey shows that individuals who rely on television and radio for their information are more likely to buy an SUV. Thus, consideration could be given to using these same information sources to reach the public and discourage them from purchasing large vehicles.

In this regard, promotion of public transit and active transportation, by such means as the transportation cocktail campaign, should feature more prominently in the media and the public square. As mentioned earlier, since advertising does not just sell consumers a product or service but also a lifestyle, doing more promotion of sustainable mobility would lead residents of major urban centres to consider sustainable modes of transportation more often. The government should therefore invest more in sustainable mobility advertising and/or fund promotional efforts by public transit corporations to counterbalance the flood of automobile advertising. If public transit systems

have more money to spend, their messages can keep pace with, and eventually supplant automobile advertisements in daily newspapers, which are an important source of revenue for them. Public transit corporations should also take a page from the automakers' promotional playbook, which clearly works.

In less densely populated regions, promotional messages should be adapted to take into account the available mobility options and infrastructures. Also, since work realities vary greatly in Canadian households, sustainable solutions could be further promoted in communities where residents need to operate light-duty trucks.

Results of CIRANO trials

To roll out campaigns promoting sustainable mobility, Canada must develop proven communication strategies. The following three (3) subsections explore the results of the trial phase led by CIRANO regarding strategies to adopt to discourage the purchase of SUVs and other light-duty trucks.

Demonstrating the negative impacts of driving a light-duty truck

The automobile industry employs numerous identity-related strategies to promote its vehicles: family, gender roles and driving abilities, for example. Naturally, automakers rely only on positive identities. The general opinion on SUVs is far more nuanced, however: social media and the findings of the survey and interviews show that people sometimes associate poorer driving skills with people who drive SUVs. Consequently, CIRANO verified whether presenting a more contrasted image, including negative information on SUV driving, could help mitigate this vehicle's appeal.

The approach bore fruit by making SUVs less appealing, even in the eyes of people who already own one or some other type of light-duty truck. Similar trends were observed when it comes to the intent to purchase, which also abated. This is an encouraging result, because it suggests that people who don't consider themselves good drivers, but who feel confident in an SUV, whether because of its size, weight, or FWD, would be less likely to purchase this type of vehicle when exposed to messages that question the driving competence of SUV owners.

Thus, emphasizing the negative aspects of SUVs and their drivers in advertising could help counter the messages in advertising and the media that depict SUV drivers as "plugged in" ..

Changing the societal norm around SUVs and other light-duty trucks

Used in automobile advertising to convey the idea that the SUV is the "right" choice, social norms exert a major influence on purchasing decisions. Social marketing campaigns can exploit this same mechanism to convince people to make greener decisions. Thus, CIRANO tested the effectiveness of normative messages against SUVs and in favour of smaller cars to make these large vehicles less appealing and reduce the likelihood of purchasing them.

The trial confirmed the importance of presenting normative messages. Among owners of large vehicles, it was the message emphasizing that smaller vehicles are the norm that was most effective in reducing the appeal of SUVs.

The suggestion, therefore, is to present smaller vehicles and/or EVs as the norm. Much of the existing media coverage continues to emphasize the growth of SUVs and their prevalence on Canadian roads. Paradoxically, even though the articles point to this as a disquieting trend, they could be strengthening SUVs as a descriptive social norm. Instead, the media should be presenting small electric vehicles or compact cars as the norm.

Using temporal references to get people to consider the legacy they're leaving their children by buying a light-duty truck

Messages that incorporate a temporal reference have proven effective in reducing the appeal of SUVs. This is an important finding, in that adopting sustainable behaviours often generates benefits that only materialize in the future. As shown in the chapter on factors motivating people to buy a light-duty truck, legacy is an important consideration for individuals. That is why CIRANO tested the effectiveness of future- or past-oriented messages in reducing the likelihood of buying such a vehicle.

The trial showed that among owners of large vehicles, the message underscoring the legacy left by previous generations helps make SUVs significantly less appealing. As for purchase intention, future-oriented messages help reduce the penchant for SUVs.

The suggestion, therefore, is to use temporal references in communications and advertising on vehicle choices. Such messages can be combined with normative messages, as done by the movement Fridays for Future, which incorporates both a temporal perspective and a normative appeal ("our" planet).

In addition, to short-circuit the potential desire of car owners to switch to a larger vehicle, future-oriented messages seem to be more effective. With the increase in large vehicle sales directly related to the decrease in car sales, while it is important to convince SUV owners to move back to a smaller vehicle, it is even more urgent to convince small vehicle owners not to choose a larger vehicle, or even to get one at all, in the future.

Building individual capacity to consider the full costs associated with vehicles

The trend toward increasingly larger vehicles and its important financial impacts on households are well documented. However, as revealed in the various chapters of the study, the implications associated with buying a large new vehicle are obscured by a variety of strategies (long-term financing (long-term financing arrangements, advertising messages, etc.). The results of the CIRANO experiment indicate that individuals often have difficulty evaluating their financial capabilities, which makes them much more likely to give in to the purchase of a vehicle with a high total cost.

Consequently, developing tools to calculate, simplify and help with decision-making for a purchase as important as a vehicle would be highly relevant and would make it possible to simplify some of the information advertised by dealerships and in advertisements.

Tableau 6. Synthesis of recommendations

Recommendations and sub-recommendations	
1. Recognize the increase in light-duty trucks in Canada as an issue of public health and public safety	
2. Create an independent advisory committee to support the government	
3. Establish an automatic, universal light-duty vehicle classification system in line with Canada’s regulatory objectives	
4. Put measures in place to help reduce the supply of large vehicles	4.1 Reform the <i>Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations</i> <ul style="list-style-type: none"> • Holding the line on and increasing the stringency of Canada’s emission standards for light-duty vehicles • Revising compliance crediting to eliminate advanced technology multipliers for ZEVs • Amending the off-cycle credit system
	4.2 Offer direct and indirect monetary support to the automobile industry contingent upon accelerating light-duty vehicle electrification
5. Put measures in place to help reduce the demand for large vehicles	5.1 Introduce a self-funding feebate system
	5.2 Maintain the Canadian strategy aimed at phasing in higher carbon pricing
	5.3 Implement kilometre pricing
	5.4 Implement Canada-wide programs to retire vehicles in exchange for tax credits

Recommendations and sub-recommendations

<p>6. Gradually increase the regulations governing automobile advertising</p>	<p>6.1 Systematically archive automobile advertisements</p>
	<p>6.2 Systematically collect data on advertising investments by the automobile industry</p>
	<p>6.3 Restrict the automobile industry’s advertising practices</p> <ul style="list-style-type: none"> • Create a Canadian automobile advertising code • Post the vehicle’s CO2 emissions and fuel consumption • Publicize vehicles’ negative externalities in plain language • Post the vehicle’s retail price, and transparency • Tighten up practices for displaying financing options permitted • Restrictions on the depiction of nature and the use of environmental values
	<p>6.4 Put in place a mechanism to review and validate automobile ad content</p>
	<p>6.5 Require a growing proportion of investments in ZEV advertising in relation to gas-powered light-duty vehicles</p>
	<p>6.6 Establish a ceiling for the share of ads for zero-emission oversized vehicles</p>
	<p>7. Launch campaigns to promote sustainable mobility with the help of messages geared to the various communities</p>

CONCLUSION

At a time when transportation is one of the few Canadian sectors whose GHG emissions are rising, there is an urgent need to reverse the increase in the number of light-duty trucks on our roads. The proliferation of large vehicles is undermining the well-being of the Canadian population. It is imperative, therefore, to encourage consumers to opt for more sustainable modes of transportation and to take effective action in meeting our climate targets.

Against this backdrop, Équiterre has partnered with the Mobility Chair of Polytechnique Montréal, CIRANO and Horizon Advisors to launch a major study that aims to explain the causes and consequences of the popularity of light-duty trucks. To do so, exploratory interviews were conducted to orient the research, a definition was proposed for light-duty trucks and vehicle classification systems were compared, leading us to conclude that there was no uniformity among the various authorities in this regard.

Our analysis of changes in vehicle supply revealed that Canada suffers from “road obesity.” Indeed, the key size indicators for Canadian vehicles (height, width, weight) have continued to increase since the 1990s. What is more, the advent of crossovers has helped make the binary system of vehicle categorization (light-duty trucks vs. cars) antiquated. It seems clear that light-duty vehicles now form a continuum.

An analysis of the changing demand for light-duty vehicles over time underscores the fact that the client base for light-duty trucks is far more diverse than it used to, which is consistent with the proliferation of SUV and pickup truck models and versions. There are now light-duty trucks for every sociodemographic profile. This reality is attributable to a series of historical, economic, political and psychosocial factors, as well as various practices of the automobile industry.

The study also identifies factors that motivate individuals to purchase a light-duty truck, especially an SUV, as well as their perceptions of this type of vehicle. To do so, a Canada-wide survey and in-depth individual interviews were carried out to identify the factors behind the interest in large vehicles. Internal factors (individual context, values and attitudes, vehicle features) were also explored, as were certain external factors (societal norms and advertising).

To further explore the role of advertising and identify the most common marketing strategies and themes, an ad content analysis was carried out. Depictions of nature and information on financing options are among the elements that feature almost systematically in Canadian ads for light-duty trucks. This part of the research also highlights the fact that most advertisements pay little or no attention to any vehicles other than light-duty trucks.

To round out this part of the study, an analysis of the regulatory framework for advertising in Canada and an overview of international best practices show that Canada is dragging its feet when it comes to bringing its laws, regulations and advertising standards in line with the imperatives of the climate emergency.

Lastly, this multidimensional research analyzed the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations, whose flaws have contributed to the proliferation of large vehicles in Canada.

In light of the results of the various analyses, a series of recommendations were developed to reverse the trend and help Canada meet its climate objectives. The first step is to recognize that the increase in large vehicles on our roads is a public health/safety issue. Such recognition paves the way for measures that can quickly reverse the trend. An independent advisory committee and an automatic, universal classification system for light-duty vehicles should also figure among the first measures to be rolled out.

Next, the reform of the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations and the addition of "green conditions" when the government offers support to the automobile industry are recommended to lower the supply of large vehicles in Canada. From a demand standpoint, various solutions can be considered: introducing a self-funding feebate system, maintaining the carbon pricing system, implementing per-kilometre pricing and putting in place a plan to retire older, polluting vehicles across the country.

Advertising practices can also be better regulated to bring them in line with the Canadian government's carbon-neutral objectives. To that end, several actions must be taken: systematically archiving automobile advertisements and collecting data on industry investments, putting in place a Canadian automobile advertising code complete with ad content guidelines, assessing ads before they run, and promoting a greater number of sustainable vehicles. Another promising measure would be to roll out campaigns promoting sustainable mobility and supporting individuals in their vehicle purchasing decision making.

In conclusion, at a time when Ottawa is airing more and more ads promoting more ambitious climate objectives and when the climate crisis is already affecting the most vulnerable communities, measures must be prioritized to encourage people to make sustainable consumption choices for their transportation.

ANNEXE 1. OPERATIONALIZATION OF THE VARIABLES

All items presented here have been measured using the Likert scale, ranging from 1 (extremely unlikely) to 7 (extremely likely).

Respondents were asked to indicate the likelihood of choosing each type of vehicle presented (SUV, pickup truck, sedan, minivan, electric vehicle) when purchasing their next primary vehicle for private use.

Instrumental motivations are measured using two (2) items:

1. It doesn't matter to me what kind of vehicle I drive;
2. I only have a vehicle to get from point A to point B;

Affective **motivations are measured using eight** (8) items:

1. Driving is fun;
2. Driving is relaxing;
3. I like to drive just for fun;
4. I feel free and independent when I drive;
5. I like to drive fast;
6. I like sporty and adventurous driving;
7. I enjoy driving;
8. Driving is a chore (a necessity) more than anything else.

Symbolic **motivations are measured using five** (5) items:

1. The vehicle gives me a sense of prestige;
2. The vehicle shows who and what I am;
3. A vehicle provides status;
4. The vehicle gives me power in traffic;
5. You can tell a person by looking at their vehicle.

For individualistic, epistemic, and materialistic values, the Ali et al (2019) Horizontal Individualism Scale was used. This scale assessed individualism as a trait among male and female respondents. The scale consists of three (3) items:

1. I prefer to depend on myself rather than on others;
2. I often do "my own thing";
3. My own personal identity, independent of other, is very important to me.

A review of the CIRANO literature underscores the importance of social norms in influencing new vehicle purchase decisions. For example, Nayum et al. (2013) Social Norm Scale was replicated and adapted for SUVs (instead of EVs) in order to gauge normative influences.

Next, the descriptive norms scale assesses the level of influence that relatives have on the perception of different types of vehicles, based on (3) three items:

1. Many of the people who are important to me own an SUV;
2. I believe that many people who are important to me are considering buying an SUV;
3. I believe that many people who are important to me expected me to buy an SUV.

The introjected norms scale consists of four (4) different items, two (2) of which relate to a guilty conscience for not owning an environmentally friendly vehicle and two (2) others which relate to a guilty conscience for having an entry-level vehicle. For the sake of economy, only one item was selected for each subgroup:

1. I sometimes have a guilty conscience because I don't own an environmentally friendly car (for example, a very economical car or an electric car);

2. I sometimes have a guilty conscience because I own a powerful roomy car (e.g. a 4-wheel drive, a pick-up truck, an SUV, a large limousine).

For the Opinion seeking behaviour scale, the three (3) items from the study conducted by Janson et al. (2017) were repeated as is. This scale measures the degree to which respondent seeks out and values the opinions of others when it comes time to purchase a vehicle:

1. When I'm considering buying a vehicle, I often ask other people for help;
2. I like to have the opinions of others when I'm about to purchase a vehicle ;
3. When I'm choosing a vehicle, the opinions of others are not important to me.

In addition, the influence of the media was measured using the Subjective Norms Peer (SNP) scale developed by Moons and De Pelsmacker (2015), which was replicated and adapted to the context of the SUV study. Two (2) items were selected:

1. The media create a strong impression of SUV use;
2. Articles in the media encourage me to drive an SUV.

The survey also included a construct called "vehicle indispensability" which was originally developed by Schifferstein and Zwartkruis-Pelgrim in 2008. It consists of three (3) items:

1. Without a car, my life is beautiful (reverse coding);
2. A car is indispensable for me;
3. I need a vehicle to live the way I want to.

Finally, in order to establish links between purchasing behaviours and respondents' attitudes towards the environment, Van der Werff et al. (2013) Environmental Self-Identity Scale was used to measure a construct named identity in relation to the environment. This scale consists of the following three (3) items:

1. Acting with respect for the environment is an integral part of my identity;
2. I am the type of person that acts with respect for the environment;
3. I consider myself as someone who is environmentally conscious.

ANNEX 2. TYPOLOGIES

To demonstrate the feasibility of developing an automatic classification system, two (2) trials were run by the Mobility Chair of Polytechnique Montréal. The objective was to shine a light on the transformations in vehicle supply. The first trial used all the variables available in the CVS database, and the second used only the dominant vehicle volume properties, namely length, width, height and mass. For example, the Mobility Chair analyzed the three (3) best-selling vehicle models in Quebec for the 2019 model year by vehicle class for typologies 1 and 2.

Typology based on all the variables

Table 7. Automatic typology 1 – Best-selling 2019 MY vehicles in Quebec by class

	C1	C2	C3	C4	C5
Veh #1	FORD F-150	TOYOTA RAV4	TOYOTA COROLLA	HONDA CIVIC	FORD TRANSIT
Veh #2	GMC SIERRA	HONDA CR-V	VOLKSWAGEN JETTA	HYUNDAI KONA	-
Veh #3	CHEVROLET SILVERADO	KIA SORENTO	HYUNDAI ELANTRA	MAZDA CX-3	-

Source: Morency et al. (2021)

This classification enables us to analyze the transformation of the vehicle supply over time. In this first typology, C1 contains vehicles with the highest average values for most of the variables, C2 contains vehicles with average values, C3 contains vehicles with a more “sporty” profile (shorter, with a long hood and low doors), C4 contains the vehicles with the lowest values for most of the variables, and C5 contains long, heavy vehicles but with a very short hood.

Typology based on width, height, length and mass

Table 8. Automatic typology 2 – Best-selling 2019 MY vehicles in Quebec by class

	C1	C2	C3	C4	C5
Veh #1	FORD TRANSIT	TOYOTA TACOMA	HONDA CIVIC	TOYOTA RAV4	FORD F-150
Veh #2	-	FORD EDGE	HYUNDAI KONA	HONDA CR-V	GMC SIERRA
Veh #3	-	TOYOTA HIGHLANDER	TOYOTA COROLLA	KIA SORENTO	CHEVROLET SILVERADO

Source: Morency et al. (2021)

In this classification, C1 contains the largest and heaviest vehicles and C3 contains the smallest (all dimensions) and lightest vehicles. While this class comprised more than 44% of the vehicles for sale in 1994, it accounted for less than 17% in 2019. Class C5 has also become far more prominent in the distribution of vehicles on offer: it also contains large, heavy vehicles, but to a lesser extent than C1.

ANNEX 3. SYNTHESIS OF INTER-PROVINCIAL DIFFERENCES

Table 9. Summary of inter-provincial differences according to selected indicators

		Atlantic Provinces	Quebec	Ontario	Prairie Provinces	B. C.
Vehicle-related indicators	Registered automobiles (per person 16 years of age or older) – 2017	0.78	0.76	0.70	0.88	0.71
	Light-duty trucks used to carry passengers (per person 16 years of age or older)	0.35	0.26	0.31	0.40	0.31
	Light-duty trucks used to carry freight (per person 16 years of age or older) - 2017	0.10	0.07	0.09	0.18	0.12
	Share of light-duty trucks among registered vehicles (%) - 2017	49.4	38.2	48.5	61.3	50.7
	Average distance driven (1000 km) - 2017	19.57	13.01	16.39	13.44	12.35
	Sales of new light-duty trucks (per 1,000 persons 16 years of age or older) - 2017	30.51	26.97	29.24	42.58	23.25
Expense-related Indicators	Average annual expenditures on private vehicle ownership and use (\$/household)	5,282	4,780	4,959	4,871	4,182
	Average expenditures on the purchase of new light-duty trucks (\$/ménage) - 2019	1,687	1,121	1,390	1,342	1,048
	Average value of light-duty trucks purchased (\$) – 2019	40,499	41,332	43,273	46,085	46,339
	Average annual expenditures on used vehicles (\$ per person of driving age) - 2019	828	614	681	567	499
Economic Indicators	Median total personal income (\$) - 2019	32,800	33,600	34,500	38,800	34,300
	Gross domestic product per capita (\$/per) - 2019	56,447	57,655	65,838	92,109	63,360
	Share of self-employed workers (%) - 2017	11.7	13.3	15.5	16.6	17.9
Public Policies	Gasoline taxes (\$/litre) - 2021 (1)	0.388	0.442	0.377	0.309	0.365
	Annual licensing and registration fees (\$) - 2021	163	275	82	116	72
	Annual expenses for parking (\$ per person 16 years of age or older) - 2019	52	95	121	132	113
	Average annual cost of insurance (\$) - 2021	1,097	737	1,520	1,158	1,834
Total Cost	Annual costs for a Honda CR-V – 2020 (2)	8,703	8,578	9,203	8,663	9,745
	Annual costs for a Honda Civic – 2020 (2)	7,488	7,067	7,969	7,494	8,572

Source: Morency et al. (2021)

Note: (1) Estimate based on a hypothetical base gasoline price of \$1 per liter. Excludes impact of carbon tax or GHG cap-and-trade system. (2) Estimate based on new vehicle travelling 20,000 km per year.

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