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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

# Market analysis of heavy-duty commercial trailers in Canada

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**Author:** Ben Sharpe

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## 1. Introduction

Worldwide, freight vehicles are a major and growing contributor to fuel consumption and climate change emissions in the on-road transportation sector. In the 2020 to 2030 time frame, on-road heavy-duty vehicle emissions will become approximately equivalent to those of on-road passenger car and light trucks, currently the largest overall contributor to climate change within the transport sector (International Council on Clean Transportation 2016). In North America and many regions around the world, the majority of goods that are transported by road are borne by heavy-duty combination tractor-trailers. As a result, tractor-trailers often account for the largest percentage of vehicle-kilometers traveled and thus fuel consumption and emissions from heavy-duty vehicles. In Canada, tractor-trailers are estimated to represent nearly two-thirds of the total diesel fuel use and greenhouse gas (GHG) emissions from the on-road heavy-duty sector (ibid).

In response to the growing fuel consumption and GHG emissions from commercial vehicles, many governments around the world have begun to take targeted steps to promote fuel-saving technologies within their heavy-duty vehicle fleets. Since 2006, Japan, California, the United States, China, and Canada have adopted some form of fuel efficiency or GHG regulation for heavy-duty commercial trucks and buses. In addition, the governments of India, Brazil, South Korea, Mexico, and the European Union are actively developing policy measures to accelerate the adoption of fuel-saving technologies for commercial vehicle fleets.

The U.S. and Canadian[1] Phase 1 heavy-duty vehicle GHG programs are currently being phased in from model-year (MY) 2014 to 2018 vehicles and can be thought of as four rules combined into one regulation. There are distinct provisions for the four primary regulatory subcategories: on-road tractors, pickup trucks and vans, vocational vehicles, and engines of on-road tractors and vocational vehicles. The Phase 1 heavy-duty vehicle programs in both countries delayed the incorporation of trailers within the rulemaking owing to a number of constraints at the time. However, in the proposed U.S. Phase 2 regulation that was published in June 2015, heavy-duty commercial trailers are included as a new major equipment category, and it is anticipated that these new requirements for trailer manufacturers and importers will be included in the final rule, which is expected to be released by the summer of 2016.

The Government of Canada has committed to align its emission standards and test procedures for the transportation sector with those of the federal emissions program of the U.S. Environment Protection Agency (EPA), as set out in the Ozone Annex to the Canada-U.S. Air Quality Agreement (2000), and in the mandate and principles of the Canada-U.S. Regulatory Cooperation Council. Given that Canada has a long history of harmonizing its vehicle regulations as much as possible with the U.S., Environment and Climate Change Canada commissioned this market study along with a previous research project that looked at the costs and adoption rates of heavy-duty commercial trailer fuel-saving technologies in Canada (Sharpe and May 2015) as part of its due diligence to investigate the feasibility of integrating these trailers into its Phase 2 program, as was formally proposed in the U.S. This particular paper is narrowly focused on the trailer market in Canada. Its primary objectives are to: (1) analyze the sales market for new commercial trailers; and (2) use anecdotal data from industry experts to estimate typical ownership cycles and activity rates for various types of trailers. As such, the remainder of the

1 In early 2013, Canada published standards for heavy-duty vehicles that are fully harmonized with the U.S. program in all significant aspects of regulatory design.

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report is organized into two sections:

- Section 2 provides an overview of the heavy-duty commercial trailer market in Canada in terms of sales by province, manufacturer/importer market shares, types of trailers sold, and the ratio of trailers to tractors.
- Section 3 summarizes the data on trailer ownership and activity patterns from interviews with trucking fleets, manufacturers/importers, and other industry experts.

## 2. Overview of Canada's trailer sales market

The Canada trailer market sales data referenced in this paper include calendar years 2005 through 2014. Two datasets were acquired from IHS Automotive. The first dataset has trailer registrations[2] grouped by manufacturer/importer and postal code. The second dataset groups trailers into 35 distinct trailer types and presents annual sales for each of these categories. The second dataset also has aggregated totals of Class 8 (i.e., gross vehicle weight rating greater than 33,000 pounds) tractor and trailer sales.

Though these datasets are helpful in providing valuable information about heavy-duty commercial trailer sales in Canada, a number of shortcomings were found, which are summarized in Table 1.

Having adjusted the sales totals for Quebec and Manitoba, the breakdown of percentage sales of trailers by province in 2014 is shown in Figure 1. Together, Ontario, Quebec, and Alberta represent over 80% of commercial trailer sales in Canada. Sales for each of the remaining provinces are 7% or less, with the three territories accounting for only a negligible portion of overall sales.

2 In this analysis, registrations are used as a proxy for sales. This dataset was created by amassing registration data from the various motor vehicle bureaus in each province.

**Table 1**: Deficiencies in the trailer sales data and mitigation measures

| Issue | Mitigation measure |
|---|---|
| Both datasets included 'personal use' trailers, which include trailers that are generally towed by pickup trucks or small commercial vehicles. These types of trailers are typically used to haul equipment, passenger vehicles, livestock, and various other items. These trailers are not hauled by heavy-duty tractors. | Information about each of the 184 unique manufacturer/importer's product lines and customer types were acquired by surveying their websites. After reviewing all of this online information, it was determined that companies generally sell to either heavy-duty trucking fleets or for light-duty personal use—not both. As such, each manufacturer/importer was identified as either commercial or non-commercial, and only the commercial sales are included in this analysis. |
| Compared to the national total, the reported trailer sales in Quebec for all years are significantly lower than is plausible, given Quebec's population and economic importance in Canada. | Sales for Quebec were adjusted as follows. The author had access to data showing total tractor sales by province for 2010 to 2014. (ENVIRON EC (Canada) Inc. 2015). Provision of Estimates of Historical Sales and Registrations and of Forecast Sales of New On-Road Heavy-Duty Vehicles in Canada. Mississauga, ON. For each year (2005-2014), the average ratio of estimated tractor sales in Quebec compared to Ontario for 2010-2014 were multiplied by trailer sales in Ontario to yield estimated trailer sales in Quebec. |
| Sales in Manitoba for years 2012 to 2014 drop off considerably (by ~ 95%) versus 2005 to 2011. | The ratio of trailer sales in Manitoba to sales in Ontario for 2011 are multipled by trailer sales in Ontario for 2012, 2013, and 2014 to yield estimated trailer sales in Manitoba for those three years. |
| In the second dataset, trailer type is labeled "unknown" or is unspecified for nearly half of total sales. | Due to such a high degree of uncertainty in this dataset, the author decided not to use this trailer type data in the analysis. As described in more detail in Section 2.2, the percentages of sales by trailer type for the United States are used to estimate the breakdown for Canada. |
| Neither dataset has trailer length data. | U.S. data for trailer sales by length provides reasonable first-order estimates for the percentage of sales within each length category by trailer type. See Figure 3-1 in (Sharpe, Clark et al. 2013). |


**Figure 1**: Percentage of trailer sales by province in 2014

As shown in Figure 2, nearly 33,000 trailers were sold in Canada in 2014. In recent years, the market has recovered from the roughly 50% drop in sales due to the global economic crisis of 2008-2009.

## 2.1 MANUFACTURER/IMPORTER MARKET SHARES

The sales of the top 10 commercial trailer manufacturers/importers between 2005 and 2014 are shown in Figure 2. In this figure, the manufacturers/importers are ordered in terms of cumulative sales over the 10-year study period, with the market leader on the bottom and then decreasing in market share moving up the figure. In terms of cumulative sales, Manac led all manufacturers/importers with 15% of total sales, with a maximum market share of 27% in 2008 and a minimum of 8% in 2012. This 19 percentage point swing in market share was second only to Stoughton, which had a 24 percentage point difference between their maximum in 2007 (28%) and their lowest share in 2014 (4%). In 2005, Utility Trailer was the market leader at 13% of total sales, and Great Dane, Manac, and Stoughton followed closely behind with 11%, 11%, and 10% of sales, respectively. Between 2005 and 2014, Hyundai Translead's market share grew significantly (from 1% to 12%), and by 2014 they were the top-selling trailer maker in Canada. The other manufacturer/importer that saw significant growth in sales was Vanguard, with its market share increasing from 2% in 2005 to 10% in 2014, which put this company in second place behind Hyundai Translead. Combined, the market share of the top ten manufacturers/importers was 73% in 2005 and remained relatively stable over the 10-year period and was 72% in 2014.

In Figure 3, the market share breakdowns for 2014 are shown in the chart on the left, while the chart on the right chart shows the manufacturer/importer sales percentages for the entire 10-year period.

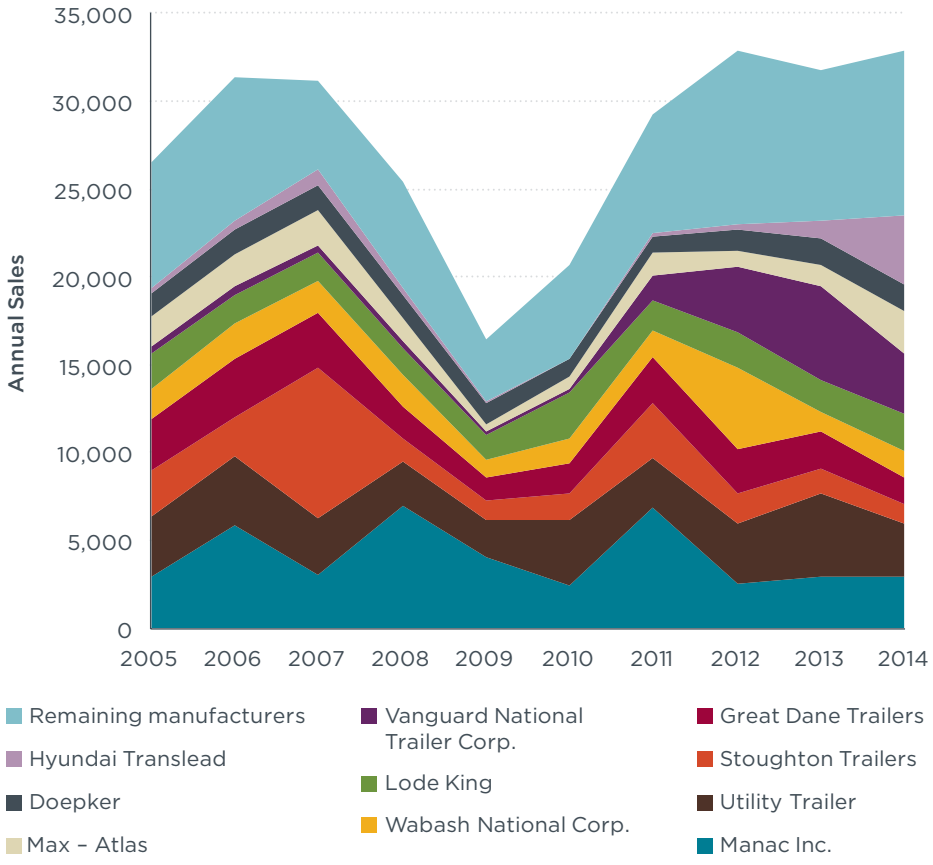


**Figure 2**: Annual trailer sales by manufacturer/importer, 2005 – 2014

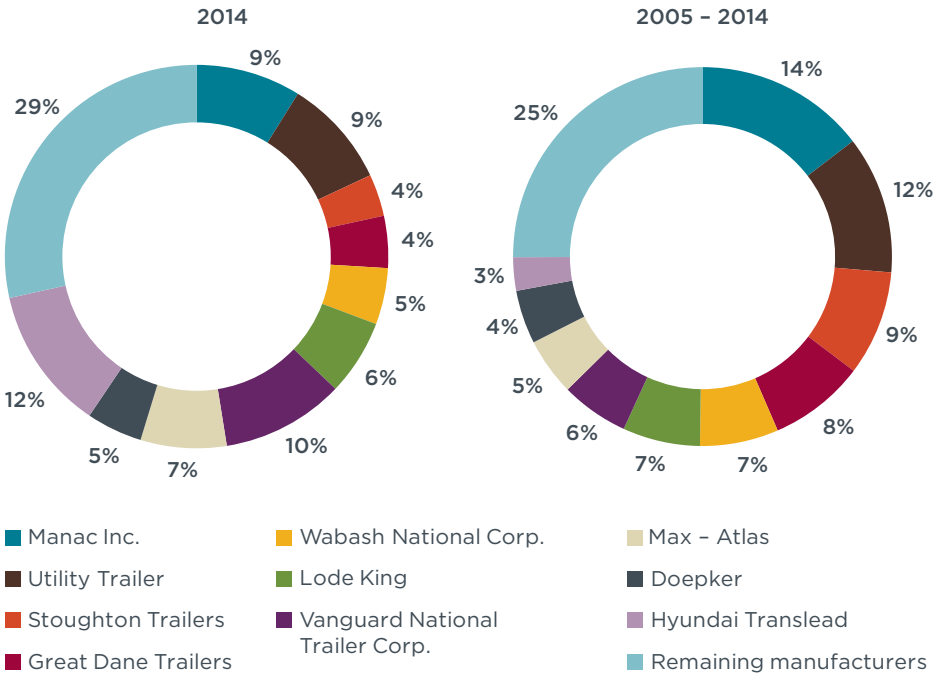


**Figure 3**: Manufacturer/importer market shares for new commercial trailer sales

The average annual registrations/sales between 2005 and 2014 for the top ten manufacturers/importers are shown in Table 2. The right column lists the primary types of trailers sold by each manufacturer. For seven of

the ten manufacturers/importers, box-type trailers (i.e., dry and refrigerated box van trailers) represent the largest portion of their business (Sharpe, Clark et al. 2013). As such, as is discussed in more detail in the following section, box-type trailers are estimated to account for the majority of sales in Canada, as in the U.S.

Just as the manufacturing, import/export, and sales of vehicles is highly integrated between Canada and the U.S., the same is true for the commercial trailer market. In interviews with industry experts, they indicated that supply chains, distribution, sales, and support networks are highly interconnected between the two neighboring countries. This is reflected in the sales data, as six out of the top ten companies operating in Canada are also in the top ten in the U.S. However, the four manufacturers in Canada (i.e., Manac, Lode King, Max-Atlas, and Doepker) have the large majority of their sales in Canada and have a much smaller presence in the U.S.

**Table 2**: The top ten trailer manufacturers/importers in Canada

| Manufacturer/ importer | Average Annual New Registrations (2005-2014) | Rank in 2014 | Primary types of trailers sold |
|---|---|---|---|
| **Manac** | 4,058 | 4 | Dry and refrigerated box van, flatbed, specialty |
| **Utility Trailer** | 3,274 | 3 | Dry and refrigerated box van, flatbed |
| **Stoughton Trailers** | 2,497 | 10 | Dry box van, grain, drop frame van |
| **Great Dane Trailers** | 2,283 | 9 | Dry and refrigerated box van, flatbed |
| **Wabash National** | 1,869 | 7 | Dry and refrigerated box van, flatbed, tanker |
| **Lode King** | 1,841 | 6 | Grain, flatbed, drop frame van |
| **Vanguard National** | 1,611 | 2 | Dry box van, container chassis |
| **Max-Atlas** | 1,366 | 5 | Container chassis |
| **Doepker** | 1,274 | 8 | Grain, flatbed, forestry |
| **Hyundai Transled** | 793 | 1 | Dry and refrigerated box van, container chassis |

**Table 3**: Length breakdown of new commercial trailer sales in the U.S. between 2003 and 2011

| Trailer category | < 40 ft. | 40 – 52 ft. | 53 ft. | > 53 ft. | Total |
|---|---|---|---|---|---|
| **Dry box van trailers** | 20.3% | 9.7% | 69.8% | 0.2% | 100% |
| **Refrigerated box van trailers** | 16.3% | 16.1% | 67.3% | 0.3% | 100% |
| **Non-box trailers** | 29.2% | 53.9% | 14.0% | 2.9% | 100% |

## 2.2 SALES BY TRAILER TYPE

From conversations with seven manufacturers, fleets, and other industry experts, a common message was that the distribution of sales of various types of trailers is fairly similar in Canada and the U.S. Therefore, rather than relying on the highly uncertain Canadian data file with sales by trailer type, the author determined that the percentage breakdowns for sales in the U.S. is a reasonable first-order approximation for Canada. The sales by trailer type data for the U.S. (for 2003-2011) is much more robust than the Canadian data. In that U.S. file, only about 2% of sales are unspecified, compared to around 40% for the Canadian file. See Figure 3-2 in (Sharpe, Clark et al. 2013).

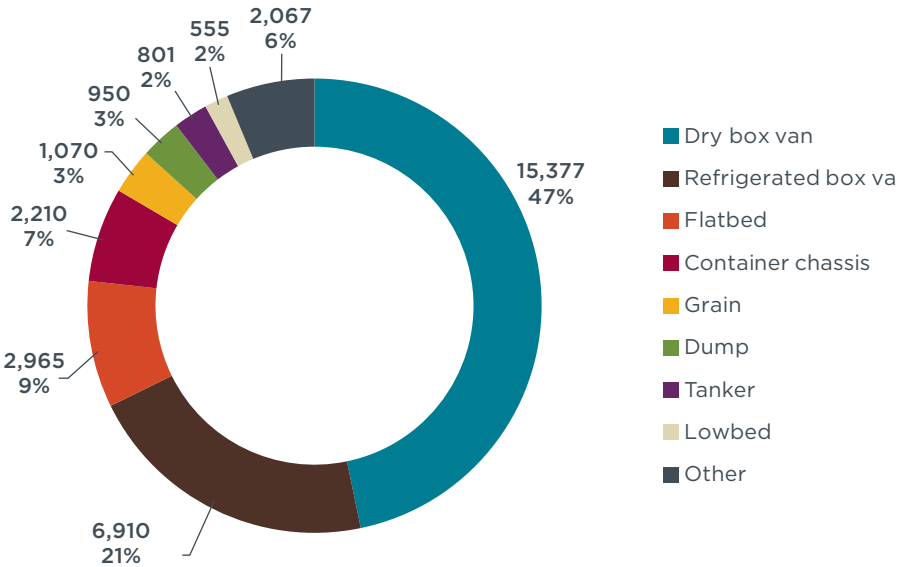


**Figure 4**: Trailer sales by type in 2014, assuming the identical breakdown of sales by type as in the U.S. between 2003 and 2011

Applying the sales by trailer type percentages from the U.S. to the Canadian sales totals yield the values shown in Figure 4 for sales in 2014. As shown, dry box van trailers (dry vans) are the most common type of trailer in the market, representing roughly half of total sales. Refrigerated box van trailers (refrigerated vans or "reefers") follow dry vans as the second-highest selling type of trailer at about one-fifth of total sales. Together, these box-type trailers make up just over two-thirds of the market, with specialty trailers such

as flatbeds, container chassis, grain, dump, and tanker trailers making up the remaining one-third of sales.

Trailer length is also a parameter that was missing from the dataset, thus the U.S. data can again be used as a reasonable first-order approximation for the Canadian market. Table 3 summarizes the length breakdown for three major commercial trailer categories. For both dry and refrigerated box van trailers, nearly 70% of new sales are 53 feet (ft.), and the remaining 30% of new sales (approximately) are trailers shorter than 53 ft. Trailers longer than 53 ft. only represent a marginal (i.e., less than 0.3%) portion of box trailer sales. As shown, non-box trailers tend to be shorter, on average, than box trailers, with almost 85% of sales being less than 53 ft. in length.

The ICCT recommends that future research be aimed towards developing a more accurate Canada-specific breakdown of sales by trailer type and length.

## 2.3 TRAILER-TO-TRACTOR RATIOS

In North America and many regions around the world, trailers are typically paired with numerous different on-road tractors and are often parked alone without a tractor in order to accommodate logistical constraints and allow for more efficient use of the tractor fleet. As such, it is generally the case that trailers far outnumber tractors.

Estimating the ratio of trailers-to-tractors is an important element of any analysis looking at the impacts of additional technologies for tractor-trailers. For example, say there is a trucking fleet that has 100 tractors and 300 trailers, and they are considering a technology package that would impose an increase of X dollars per tractor and Y dollars per trailer. In their return on investment calculation, the fleet must express the total per tractor-trailer costs as X + 3Y to account for the fact that there are three trailers for every tractor in the fleet, and thus the average annual vehicle kilometers traveled (VKT) for tractors is three times as large as that of trailers.

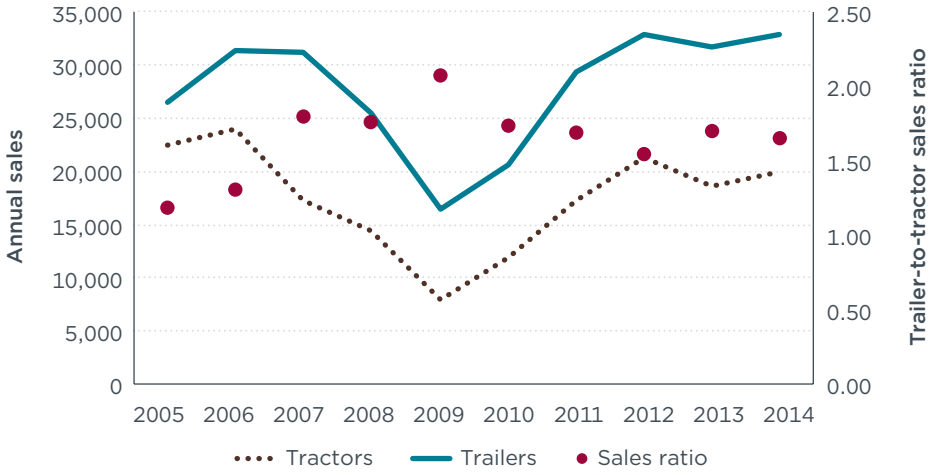


**Figure 5**: Tractor truck and trailer sales, 2005 – 2014

Therefore, since the value assumed for this ratio has such a critical impact on the economics of trucking operations, it is important that policymakers have a reasonably good assessment of the average trailer-to-tractor in-use and sales ratios so that the costs and benefits estimated in a regulation targeting both tractors and trailers adequately reflect conditions in the real-world. According to the Bureau of Transportation Statistics in the U.S., there are approximately three trailers for every tractor for the entire tractor-trailer fleet in the U.S. (Bureau of Transportation Statistics 2010). This three-to-one in-use ratio is used in both of the major studies that formed the basis for the U.S. Phase 1 regulatory technology potential and cost analyses (Kromer, Bockholt et al. 2009, Committee on Assessment of Technologies and Approaches for Reducing the Fuel Consumption of Medium- and Heavy-Duty Vehicles 2010, U.S. Environmental Protection Agency 2011), and this same ratio was also assumed in the trailer impact analysis in the U.S. Phase 2 proposal (U.S. Environmental Protection Agency 2015).

One of the objectives of this study is to analyze trailer-to-tractor sales and stock ratios for Canada's trucking fleet. Figure 5 shows sales of tractors and trailers between 2005 and 2014. The red data point for each year is the ratio of trailers to tractors sold. This sales ratio ranged from 1.2 in 2005 to 2.1 in 2009, and over the 10-year period the ratio of cumulative sales was 1.6. This value of 1.6 is comparable to the average trailer-to-tractor sales ratio in the U.S. between 1986 and 2011, which was 1.7 (R.L Polk & Co. 2012). For the time period over which the datasets for the two countries overlap—that is, 2005 to 2011—the trailer-to-tractor sales ratios for Canada and the US were 1.6 and 1.5, respectively.

Todaystrucking.com has maintained a database of the 100 largest trucking fleets in Canada by combined tractor and trailer ownership since 2001. (Carter 2016) The latest data from 2016 is summarized in Figures 6 and 7. Figure 6 is a scatter plot of the trailer-to-tractor ratios for all 100 fleets. While the in-use ratios range widely (from 1.2 to 19.4), the large majority (84%) of values are clustered between 2 and 6. Combined, these 100 fleets own roughly 130,000 trailers and 43,000 tractors, which yields an estimated average ratio of 3.

One of the reasons why this in-use ratio of 3 is much higher than the 1.6 sales ratio is the fact that trailers tend to have longer useful lives than tractors and are often used as parked storage devices. Also, there are often permanent registration options for trailers, which makes it difficult to know when trailers are taken out of service.

Figure 7 summarizes the trailer and tractor ownership for the 25 largest fleets. The value to the right of the data bars is the trailer-to-tractor in-use ratio for each fleet. Transforce is by far the largest fleet in Canada and has more than double the combined number of trailers and tractors than Mullen Group, the second-largest carrier. Beyond the top five fleets, the next largest 20 fleets each own between roughly 2,000 and 5,000 trailers and tractors.

## 3. Trailer ownership and activity patterns

Quantitative data on trailer ownership cycles and activity patterns are lacking. To address this knowledge gap, the ICCT has interviewed a number of experts in the Canadian trucking industry. For this project, the study team interviewed seven individuals that represent some of the leading trailer manufacturers/importers, fleets, and suppliers in Canada. These individuals provided their best judgment on average trailer ownership and activity (i.e., annual kilometers) patterns. These seven responses were combined with previous survey data of 18 companies that were collected by Pollution Probe in collaboration with the ICCT (Sharpe and May 2015). Together, these 25 interview responses form a diverse set of perspectives and data points that the study team used to create typical profiles for trailer ownership and activity, which are summarized in Figure 8.

As shown in the figure, trailers are segmented in three categories: dry and refrigerated box van trailers and specialty trailers, which include all non-box trailers such as flatbed, tanker, and bulk material trailers. This three-category segmentation approach (i.e., dry and refrigerated box van trailers, and non-box trailers) is the same framework that was employed in the trailer portion of the U.S. Phase 2 GHG proposal (U.S. Environmental Protection Agency 2015).

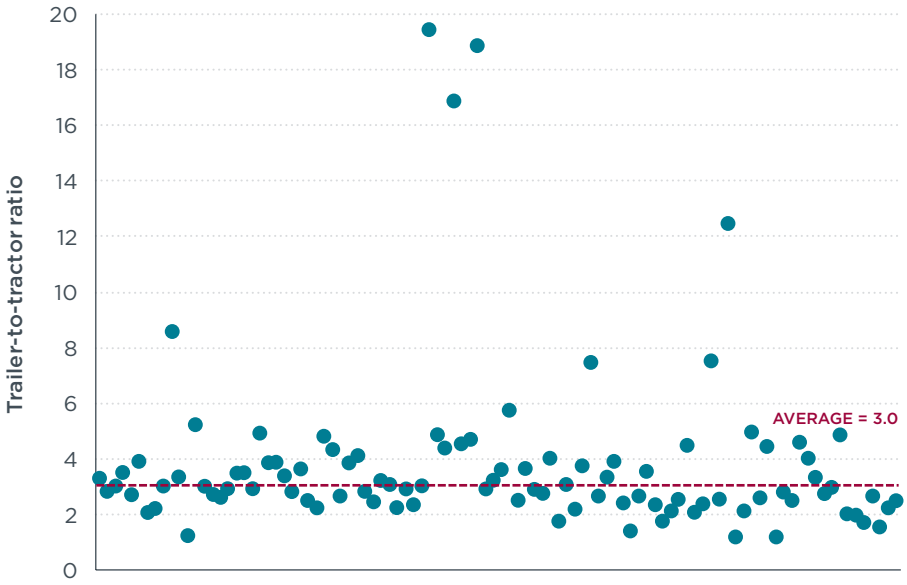


**Figure 6**: Trailer-to-tractor ratios for the 100 largest trucking fleets in Canada

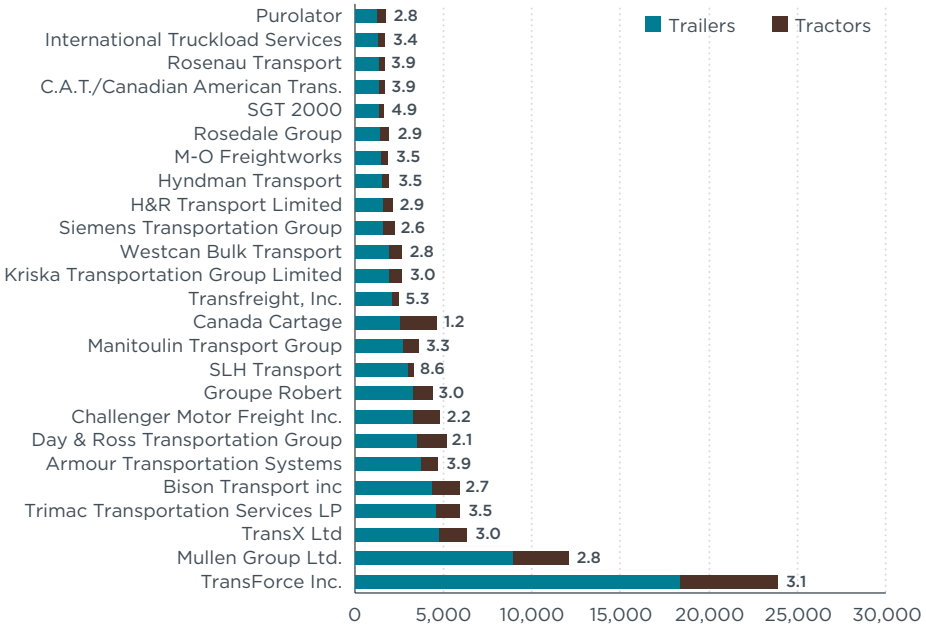


**Figure 7:** Tractors and trailer owned by the 25 largest trucking fleets in Canada

When asked about the average duration of ownership for the first owner of a dry van, responses ranged from 7 to 15 years, and the most common answer was 10 years. Interviewees stated that trailers are generally in long-haul operations and most active in terms of annual kilometers (km) during this first ownership cycle, and a reasonable estimate is between 40,000 and

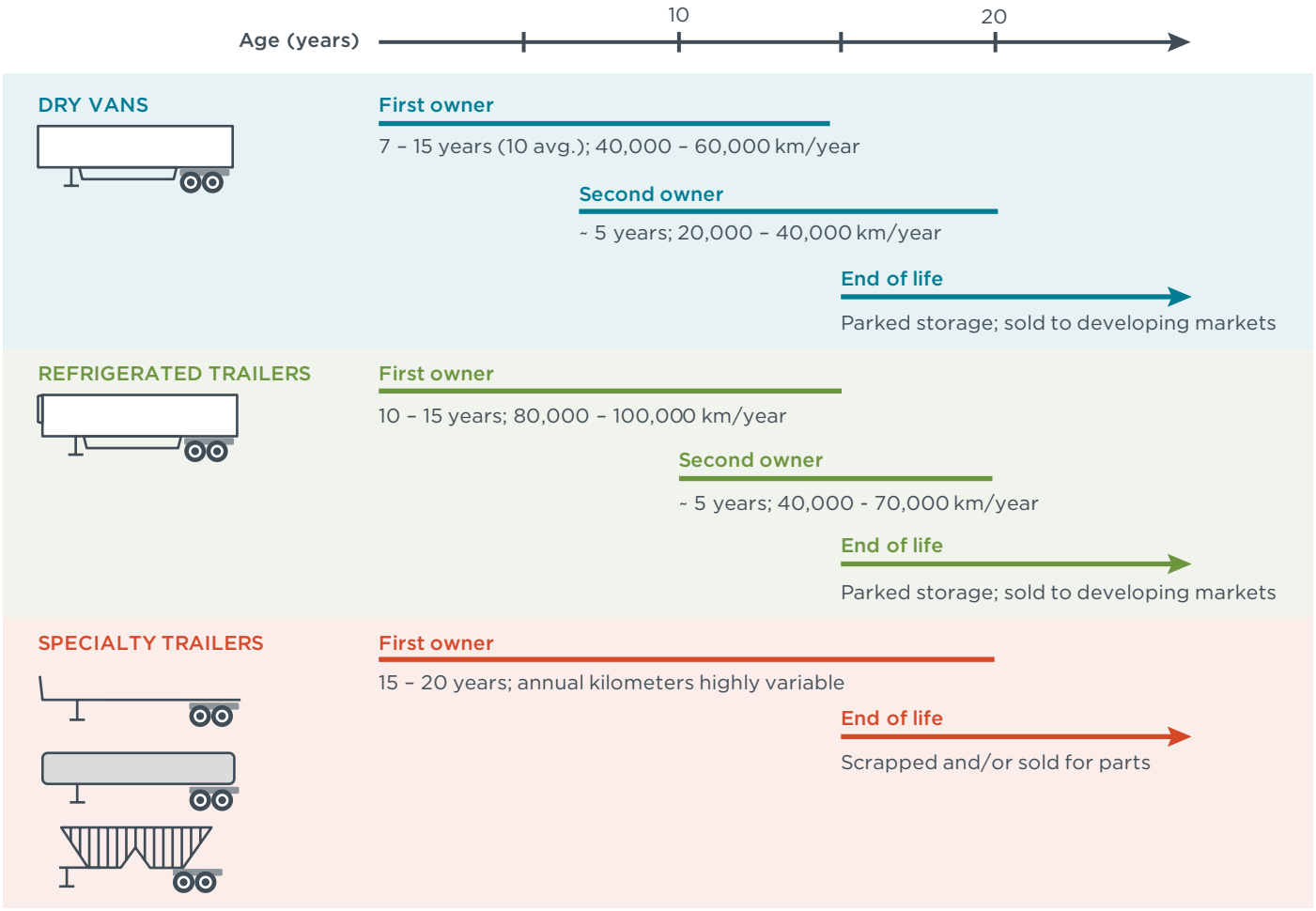


**Figure 8:** Typical trailer ownership and activity patterns over its useful life

60,000 km per year. Typically, dry vans can be re-sold fairly easily, since they are not highly specialized for a particular payload or operational profile. Respondents stated that dry vans tend to go into more regional and local service during their second ownership cycle, and annual activity decreases to between 20,000 and 40,000 km. Following this second ownership cycle, most interviewees indicated that dry vans are either sold to developing markets (e.g., Latin America) or used as permanently parked storage.

According to Commercial Trailer Blue Book data, an average refrigerated box van trailer costs about twice as much as a dry box van trailer (Price Digest 2012). Since reefers are more expensive and additional resources must be invested annually to maintain the refrigeration units, survey respondents indicated that fleets tend to keep reefers longer than dry vans. Another unique aspect of refrigerated van operations is that fleets with a large percentage of reefers in their fleet tend to have a much lower trailer-to-tractor ratio than fleets that primarily run dry vans. One respondent said that a rule of thumb is that dry van fleets have trailer-to-tractor ratios between 2 and 2.5, while reefer fleets have ratios between 1.2 and 1.5. As such, the interviewees remarked that reefers usually travel more annual kilometers than dry vans. In terms of ownership progressions, most respondents commented that a reefer follows a similar path as a dry van, migrating from high mileage service with the first owner, to regional operations later in life, and storage or export as the final stage in its lifetime.

Due to the tremendous variety in the specialty trailer market, there was less convergence in the survey responses around ownership cycles and activity rates. However, one of the key themes about specialty trailers was that these trailers are often expensive to purchase and maintain, and, therefore, fleets generally keep them for many years. On the question of ownership, a typical answer was that fleets keep these trailers for 15 to 20 years or more and use these trailers until they have little to no residual value. Average annual kilometers for specialty trailers are highly dependent on the specific operational profile of the fleet. Consequently, most of the interviewees were hesitant to give a numerical range for annual kilometers for this category of trailers. More

research is needed to determine how activity rates vary amongst the various operations of different types of specialty trailers.

## 4. Conclusions

The primary objectives of this study were to analyze the new commercial trailer sales market in Canada and build on previous research to refine estimates for trailer ownership cycles and average activity rates. Overall, the Canadian trailer market has rebounded from the 2008-2009 global economic crisis, and annual sales averaged 32,000 units between 2011 and 2014. Manac, Utility Trailer, Stoughton, Great Dane, and Wabash National have the largest cumulative sales between 2005 and 2014, though in recent years, sales for both Hyundai Translead and Vanguard National have surged, and in 2014 those two companies were the market leaders.

Between 2005 and 2014, cumulative sales of trailers in Canada were larger than sales of tractors by a ratio of 1.6, which is quite similar to the ratio in the U.S. between 2005 and 2011 (1.5). For the largest 100 fleets in Canada, the average in-use trailer-to-tractor ratio is 3, but values ranged widely—from 1.2 to 19.4. National tractor and trailer registration totals are needed to determine whether this value of 3 is reasonably accurate for the entire Canadian fleet. More research is needed to determine the number of total commercial trailers in Canada, since the Statistics Canada data for trailer registrations includes personal use trailers that are used in the passenger car and light truck markets.

Interviews were conducted with seven Canadian trucking industry experts with the primary objective of collecting information about ownership and activity patterns over the useful lifetimes of trailers. These survey respondents were asked about typical trailer usage behavior for fleets with respect to dry vans, reefers, and specialty (i.e., non-box trailers) trailers. Combining these interview responses with ownership and activity data obtained in a previous industry survey conducted by Pollution Probe and the ICCT, the study team developed typical usage profiles for the three broad trailer categories, which are summarized as follows:

- First owners tend to keep dry vans for about 10 years and operate them between 40,000 and 60,000 km per year. Second owners are then likely to use dry vans in more regional routes, and annual activity is roughly cut in half. After 5 to 7 years of this more limited service, dry vans are generally sold to developing markets or converted to stationary storage units.
- Reefers follow a similar three-tier ownership and usage progression as dry vans, except it was clear from the interview responses that fleets primarily operating reefers tend to have lower trailer-to-tractor ratios, and thus these reefer units amass more annual kilometers with their first (80,000 to 100,000 km) and second (40,000 to 70,000 km) owners.
- Given the remarkable diversity within the non-box trailer category, it is difficult to establish a uniform ownership and usage profile that applies across the entire group. Nevertheless, a common theme from the respondents was that these trailers are typically more expensive to purchase and maintain, and thus, fleets tend to keep these trailers for the large majority or all of their useful life, which can be 15 to 20 years or more.

This project will provide data and analysis to assist Environment and Climate Change Canada and other policymakers across North America in their evaluation of policy measures for heavy-duty commercial trailers. More comprehensive and granular data are needed to sharpen the knowledge of the Canadian trailer market, particularly with respect to trailer types, lengths, and overall population estimates.

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