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# Trucking dangerous goods in Canada, 2004 to 2012

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Environment, Energy and Transportation Statistics Division

Release date: February 11, 2015



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- |                |  |
|----------------|--|
| .              | not available for any reference period   |
| ..             | not available for a specific reference period  |
| ...            | not applicable   |
| 0              | true zero or a value rounded to zero   |
| 0 <sup>s</sup> | value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded |
| <sup>p</sup>   | preliminary  |
| <sup>r</sup>   | revised  |
| x              | suppressed to meet the confidentiality requirements of the <i>Statistics Act</i>                                   |
| <sup>E</sup>   | use with caution   |
| F              | too unreliable to be published   |
| *              | significantly different from reference category ( $p < 0.05$ )   |

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## Highlights

- The Canadian for-hire trucking industry moved 650 million tonnes of freight in 2012, of which almost 17% consisted of dangerous goods.
- In 2012, crude petroleum products accounted for the largest share of dangerous goods at over one-third (38%), up from one-quarter (25%) in 2004.
- During 2012, the for-hire trucking industry is estimated to have transported approximately four times the dangerous goods by weight than did railways.

## Introduction

Recent events have heightened public awareness concerning the transportation of dangerous goods. While economic regulation of Canada's transportation sector has been reduced over the last 25 years, the movement of dangerous goods continues to be carefully regulated. Compared to other freight, shipments of explosives, gases, flammable liquids, flammable solids, oxidizing substances, poisonous and infectious substances, nuclear substances, corrosives and other products pose public safety and environmental risks.<sup>1</sup> The consequences of accidents or spills can be severe, particularly if shipments travel through population centres or fragile ecosystems.<sup>2</sup>

Regulations on the movement of dangerous goods can vary by jurisdiction but generally require accurate classification, appropriate means of containment, and correct marking, labelling and documentation. In Canada, federal legislation currently prohibits the transportation of certain high risk dangerous goods unless an Emergency Response Assistance Plan (ERAP) has been submitted and approved. The plan outlines how specialized emergency response personnel will react to

an accident and their overall capacity to respond. As dangerous goods are likely to remain a significant portion of the overall freight moved across the country, there is a recognized need to further enhance the monitoring of these shipments.

For instance, in June of 2014 Transport Canada amended the *Transportation of Dangerous Goods Regulations* to clarify the criteria for displaying safety marks.<sup>3</sup> The regulation now requires safety marks to be displayed on trucks, rail cars and bulk containers used to transport dangerous goods, identifying the type of goods and the nature of the risk posed. And in August, Transport Canada launched the second stage of consultations concerning adequate railway third party liability insurance in order to cover, among other costs, the spill of contaminants and environmental damage related to railway operation.<sup>4</sup>

Surface transportation (i.e., road and rail excluding pipelines) is estimated to move almost 95% of the total tonnage of dangerous goods in Canada with trucking accounting for the largest share.<sup>5</sup> The possibility that accidents might occur at any time or any location

1. Dangerous goods are defined by the *Transportation of Dangerous Goods Act, 1992* as products, substances or organisms in any of these nine classes. Based on their inherent nature, these goods are further classified from Packing Group I indicating great danger to Packing Group III indicating minor danger.
2. For example, estimated costs to clean-up the 2010 spill of diluted bitumen into Michigan's Kalamazoo River basin now exceed \$1-billion; De Souza, M., 2014, "The pipeline proposals feeding Harper's oil grid," *Power & Influence: The Business Issue*, Vol. 3, no. 3, Hill Times Publishing.
3. Government of Canada, 2014, *Regulations Amending the Transportation of Dangerous Goods Regulations (Part 4, Dangerous Goods Safety Marks)*, P.C. 2014-684, June 12, 2014, SOR/2014-159, *Canada Gazette*, Vol. 148, no. 14, July 2, 2014.
4. Transport Canada, 2014, *Comprehensive Review of the Third Party Liability and Compensation Regime for Rail*, TP 15242 E, [www.tc.gc.ca/media/documents/policy/Discussion-Paper-Compensation-Liability.pdf](http://www.tc.gc.ca/media/documents/policy/Discussion-Paper-Compensation-Liability.pdf) (accessed September 19, 2014).
5. Provencher, M., 2010, *The Movement and Handling of Dangerous Goods in Canada for the Year 2008*, Transport Canada, Transport Dangerous Goods Directorate, Ottawa.

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between the origin and destination raises questions concerning the nature of these types of shipments. To provide some perspective, this study examines the dangerous goods

transported by the Canadian for-hire trucking industry from 2004 to 2012, focusing on tonnage, types of goods and average distance per shipment.

### Increasing weight shipped

In 2012, the combined weight of all commodities moved by Canadian for-hire trucking establishments reached

### What you should know about this study

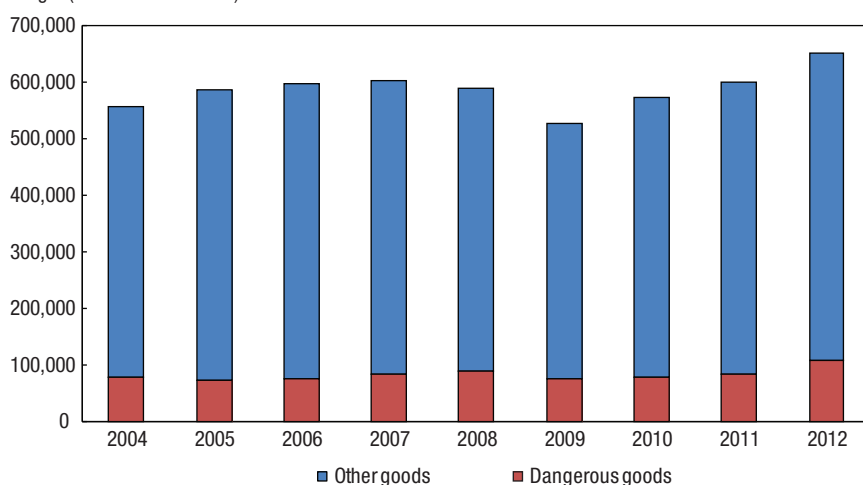
Statistics Canada's Trucking Commodity Origin and Destination Survey (TCOD) targets large (annual revenue > \$1.3 million) establishments in the Canadian for-hire trucking industry (North American Industry Classification System 484). It excludes foreign-based trucking establishments operating in Canada and non-trucking establishments with their own fleets (i.e., private trucking). As such, TCOD estimates should be considered as a lower boundary of total trucking activity in Canada. For comparison, for-hire trucking establishments in the United States accounted for just 58% of dangerous goods trucked by weight in 2012, but averaged over 4.5 times the distance shipped.

Over the study period, the number of target establishments ranged roughly from 2,100 to 2,900; in 2012, 92% of 2,196 establishments responded to the survey. Statistics Canada interviewers visit each establishment and, using a systematic sample of shipping documents, record information on the origin and destination of shipments as well as the weight and type of goods. The coefficient of variation (CV) by weight was calculated at less than 5% for all types of shipments in 2012.

Commodities are classified to a Standard Classification of Transported Goods (SCTG) aggregation, which includes about 500 groups. In many cases, all commodities in a group are considered dangerous while, in other groups, some are dangerous and others are not. In the second case, an algorithm based on Transport Canada information is used to apply a flag that reflects the likelihood that the shipment includes dangerous goods. In 2012, 97% of shipments by weight flagged as dangerous goods were classified to SCTG groups in which all goods are dangerous, such as Petroleum products. In comparison, shipments of Glues and prepared glues were considered as dangerous 18% of the time.

**Chart 1**  
**Total goods trucked by type, Canada, 2004 to 2012**

weight (thousands of tonnes)



**Source:** Statistics Canada, Environment, Energy and Transportation Statistics Division, Trucking Commodity Origin and Destination Survey (survey number 2741), various years.

over 650 million tonnes, a record amount culminating from steady growth experienced following the 2009 economic downturn (Chart 1). A key portion of these shipments in 2012 consisted of dangerous goods at just over 107 million tonnes (17% of all goods), up from the 81 million tonnes (or 14%) trucked in 2004. This represents an increase of 32% since 2004, almost twice the rate of growth of the industry's overall shipments (17%) during this same period.

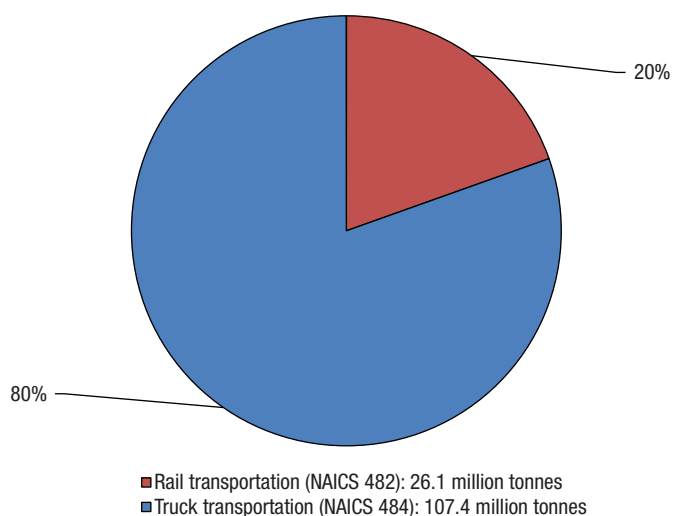
### Road versus rail

Recent derailments have served to increase the level of scrutiny associated with the movement of dangerous goods by rail.<sup>6</sup> However, a larger tonnage of dangerous

6. See for example, Winter, J., 2014, "Safety in Numbers: Evaluating Canadian Rail Safety Data," *SPP Communiqué*, Vol. 6, no. 2, University of Calgary, The School of Public Policy.

## Trucking dangerous goods in Canada, 2004 to 2012

**Chart 2**  
**Surface transportation<sup>1</sup> of dangerous goods in Canada, 2012**



1. Excluding pipelines.

**Note:** NAICS: North American Industry Classification System.

**Sources:** Statistics Canada, Environment, Energy and Transportation Statistics Division, Trucking Commodity Origin and Destination Survey (survey number 2741) and Monthly Railway Carloadings Survey (survey number 2732), 2012.

goods is transported by truck. In 2012, the for-hire trucking industry handled approximately four times the dangerous goods by weight than did the mainline railways (Chart 2).<sup>7</sup> In the United States, but including private trucking carriers, about 93% of the more than 1.6 billion tons of dangerous goods transported by surface moved by truck.<sup>8</sup>

Despite carrying more dangerous goods by weight, the consequences of an accident by truck are limited to a small number of trailers on a per truck basis. And moreover, the average shipments by truck involve shorter distances.<sup>9</sup>

Shipments of dangerous goods by truck and rail would be therefore more comparable on a per tonne-kilometre basis. However, it should also be noted that most accidents and spills of dangerous goods occur during handling rather than during actual transit.<sup>10</sup>

### The top four dangerous goods

Although the top four dangerous goods trucked by weight remained the same over the study period, they accounted for almost 80% of the total by 2012, up from 71% in 2004 (Chart 3). The increase was driven largely by the trucking of crude

petroleum products, which more than doubled to reach over 40 million tonnes by 2012, accounting for more than one-third (38%) of the total.

Over the same period, shipments of gasoline and aviation turbine fuel rose 11% to 26 million tonnes, while fuel oils increased 16% to 12.4 million tonnes and non-metallic minerals (such as sulphur) rose 43% to 5.2 million tonnes. Fertilizers and fertilizer materials (including nitric acid, sulphonitric acids and ammonia), the fifth largest category of dangerous goods trucked in 2012 at 2.6 million tonnes, increased by approximately 180% over the study period.

### Average distance

An interesting factor is the distance that dangerous goods travel to reach their destination. From 2004 to 2012, the average distance of all shipments trucked in Canada was estimated to have increased from 608 to 632 kilometres. However, shipments of dangerous goods declined from an average of 316 to 269 kilometres. This decline reflects an increase in energy-related shipments, particularly crude petroleum products since, on average, shipments of these products travelled about one-third (35%) of the distance than did other dangerous goods (Table 1).

7. The rail proportion is estimated from the Monthly Railway Carloadings Survey based on the U.N. dangerous good designation identified by Standard Transportation Commodity Codes for revenue-generated freight moved by the two mainline freight railways only.

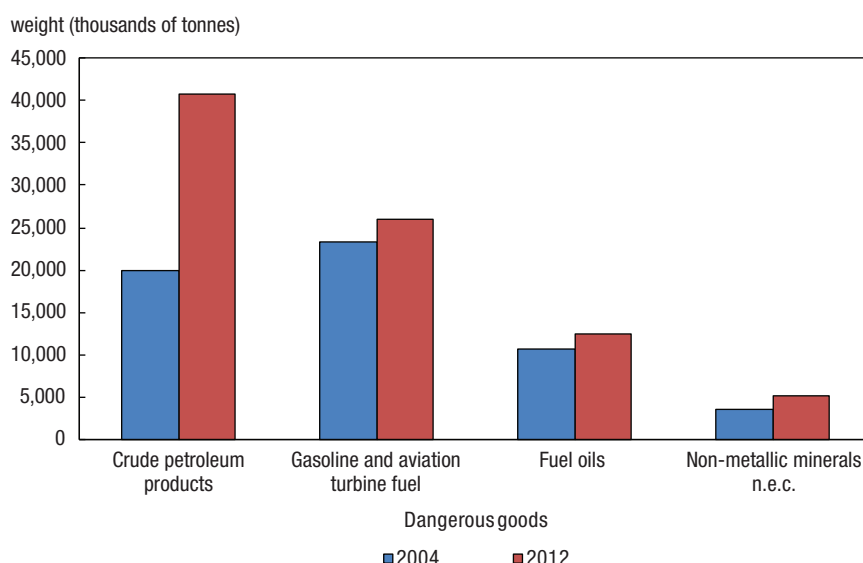
8. U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2015, *Hazardous Materials, 2012 Commodity Flow Survey* (Draft, January), Washington.

9. In the United States, the average distance per hazardous material shipment by for-hire truck was 150 miles versus 808 by rail (2012 U.S. Commodity Flow Survey).

10. Provencher, M., 2010, *The Movement and Handling of Dangerous Goods in Canada for the Year 2008*, Transport Canada, Transport Dangerous Goods Directorate, Ottawa.

## Trucking dangerous goods in Canada, 2004 to 2012

**Chart 3**  
**Top four dangerous goods trucked in Canada, 2004 and 2012**



**Source:** Statistics Canada, Environment, Energy and Transportation Statistics Division, Trucking Commodity Origin and Destination Survey (survey number 2741), various years.

A shorter average distance for trucking crude petroleum products is partly tied to extraction areas in Alberta and Saskatchewan and proximity to trans-loading facilities.

For Alberta, the oil sands region in the north of the province has limited rail service and pipeline access. Consequently, heavy oil is often trucked to feeder pipelines which serve consolidation points in the

Edmonton area for rail and further southeast for pipeline.<sup>11</sup> In 2012, shipments of crude petroleum products were trucked an average distance of 95 km in Alberta.

For Saskatchewan, although its Bakken region in the south of the province has extensive rail coverage, there has been insufficient feeder pipeline infrastructure. Although the majority of crude is shipped out

of the region by rail, it must first be trucked to a rail loading facility. On average, crude petroleum products were trucked a distance of 118 km in Saskatchewan.

### Provincial perspectives

By province of origin, Alberta accounted for almost half of the national total weight of dangerous goods transported by truck in 2012 (Chart 4). The province also experienced the largest growth, increasing by over 19 million tonnes from 2004 to 2012. Again, this growth was driven largely by crude petroleum products as shipments of these products that originated in Alberta more than doubled from almost 15 million tonnes in 2004 to over 30 million tonnes by 2012.

Similarly for Saskatchewan, crude petroleum products shipped by truck rose from about 5 million tonnes to over 9 million tonnes. Combined with increased shipments of gasoline and aviation turbine fuel as well as fuel oils, fertilizers and fertilizer materials, the weight of dangerous goods shipped in the province reached 14.7 million tonnes by 2012.

Over the study period, British Columbia and Manitoba experienced some growth in shipments while Ontario and Quebec both experienced a decline in the tonnage of dangerous goods transported by truck.

Although provincial patterns of dangerous goods shipped by truck will evolve, crude petroleum products in the west are likely to continue driving national estimates by weight. In Alberta for instance, total crude oil production per month

**Table 1**  
**Average distance trucked by type of shipment, Canada, 2012**

Shipment type	kilometres
Dangerous goods	
Crude petroleum products	110
Other dangerous goods	313
Non-dangerous goods	665
All shipments	632

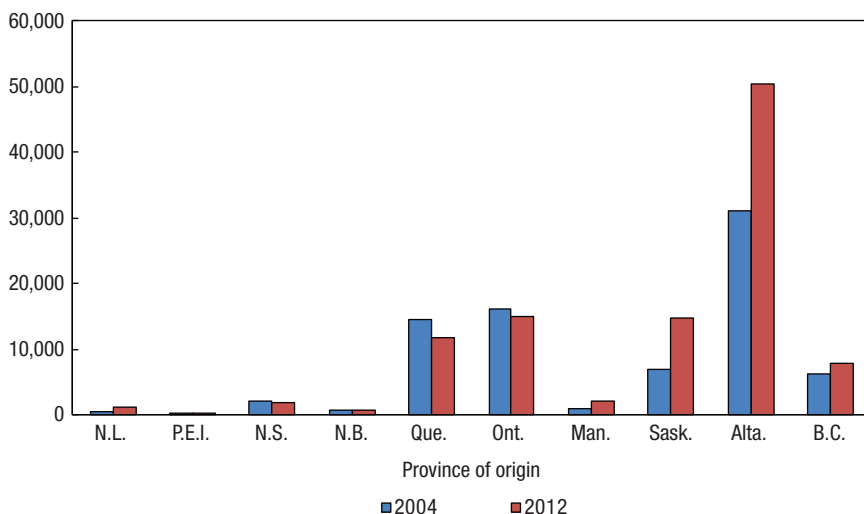
**Source:** Statistics Canada, Environment, Energy and Transportation Statistics Division, Trucking Commodity Origin and Destination Survey (survey number 2741), 2012.

11. See Cairns, M., 2013, *Crude Oil By Rail - Parts I and II: Potential for the Movement of Alberta Oil Sands Crude Oil and Related Products by Canadian Railways*, Canadian Transportation Research Forum Proceedings (June 10 to 12, 2013), pages 412 to 433, Halifax.

## Trucking dangerous goods in Canada, 2004 to 2012

**Chart 4**  
**Dangerous goods trucked by province of origin, 2004 and 2012**

weight (thousands of tonnes)



**Source:** Statistics Canada, Environment, Energy and Transportation Statistics Division, Trucking Commodity Origin and Destination Survey (survey number 2741), various years.

has risen from an average of 9.3 million cubic metres in 2010 to 12.5 million cubic metres during the first half of 2014,<sup>12</sup> largely from synthetic crude oil and crude bitumen extraction. And truck-to-rail delivery is now considered as a medium term alternative to access those areas not served directly by pipelines.<sup>13</sup>

12. Statistics Canada, CANSIM table 126-0001 (accessed October 5, 2014).

13. Ricciotti, L., 2013, "Railcars and trucks make a comeback as methods for shipping oil," *Alberta Oil Magazine*, [www.albertaoilmagazine.com/2013/02/railcars-trucks-make-oil-comeback/](http://www.albertaoilmagazine.com/2013/02/railcars-trucks-make-oil-comeback/) (accessed September 28, 2014).