Transportation in Canada: A Statistical Overview

Transportation Association of Canada
Association des transports du Canada
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FOREWORD

This report was prepared for the Transportation Association of Canada under contract. A panel of outside advisors reviewed the outline and drafts of the text and their assistance is acknowledged. Their participation should not be construed as an endorsement of the contents of this report.

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The report follows on two earlier TAC publications: Highways in Canada last published in 1991, and Transportation in Canada last published in 1993. It is a collection and interpretation of recently published data on transportation. Most of this data comes from Statistics Canada and is reproduced here by authority of the Minister of Industry. Specific Statistics Canada sources are listed in the References at the end of this report. Readers wishing further information on data provided through the cooperation of Statistics Canada may obtain copies of related publications by mail from: Publications Sales, Statistics Canada, Ottawa, Ontario K1A 0T6, by calling 1-613-951-7277 or toll free 1-800-267-6677. Readers may also facsimile their order by dialing 1-613-951-1584.

Other sources include the Transportation Safety Board of Canada’s series on rail, air, marine and pipelines; Transport Canada’s data on aircraft, road safety, road expenditures and federal transportation expenditures; Environment Canada’s information on pollutants, plus a large number of articles listed in the References. The only data generated for this publication is the table on road lengths. This was developed from a survey of provinces, territories and federal agencies.

The graphics and all the layout were handled by Michèle Delaquis in Winnipeg and the whole project was managed by Michèle LeBlanc of TAC. Any errors in fact or interpretation are the sole responsibility of the author.

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Hockley Valley, Ontario
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TRANSPORTATION IN CANADA:
INTRODUCTION

The ability to describe transportation is constrained by the availability of data. In what follows, the sometimes incomplete and inconsistent sources are used carefully. None truly describes all aspects of transportation in Canada. Consider, for example, the absence of any information on the distance driven by automobiles, trucks, buses and other road vehicles. That is a serious gap to anyone interested in knowing how Canadians travel or why governments spend so much on roads. There are less serious gaps for things like information on how many farmers or trappers use snowmobiles in the winter to conduct their affairs or how many kilometres are accumulated by cyclists either for recreation or for travel to and from work.

Fortunately, with information from Statistics Canada and other agencies, data exist to provide a good picture of the main characteristics of transportation. These data provide a good picture as long as an interpreter makes sense of the gaps and inconsistencies. That is the aim of this document. Here is the focus:

Geographical: The interest is in transportation activities occurring within Canada or transportation activities conducted by firms based in Canada. Because of the available sources, there are inconsistencies in what follows. For example, freight on foreign-flagged ships moving through Canadian ports is considered but freight entering or leaving the country on US-based trucks is ignored.

Passenger versus freight: Because of a long-standing tradition, passenger and freight transportation are treated separately. This works well when considering many transportation businesses as they tend to carry one or the other. But, it breaks down when considering aspects of transportation infrastructure. Roads, for example, accommodate cars, buses and trucks.

For-hire versus private: Although distinctions are now blurring, it is still convenient to consider two types of commercial transportation activity: for-hire, where the owner of the transportation enterprise is different from the person or firm paying for the service; and private where the owner of the transportation enterprise is the same as, or has a corporate link with, the people or freight being moved.

Transportation mode: Data sources are arranged “modally” and this arrangement is followed here: the “road mode” defined by the vehicle or nature of the service (automobile, truck, intercity bus, transit and taxi), and non road modes defined by both the vehicle and the infrastructure (rail, air, marine and pipeline).

There is another aspect of transportation that is important to understand in the following description. Transportation and governments have a long, close history in Canada. Governments built or owned much of the infrastructure (ports, roads, airports); in the past, and still to some extent, governments owned many important transportation enterprises; and governments have traditionally regulated transportation activity quite closely — everything from safety to who may conduct a service at what price. This is changing or, in many cases, has changed over the past decade, but there still is an important consequence that shows through in the information available to describe transportation. Generally, the federal government is the most important with respect to rail, air, marine and pipeline transportation whereas provincial or territorial governments are most important with respect to transportation over the road. So, for example, when considering safety, a federal source is available for information on rail, air, marine and pipeline and another source with different types of information has to be used to describe road transportation.

Chapter 2 takes a broad look at how important transportation is within the Canadian economy. This is followed in Chapter 3 by an overview of transportation flows — people or freight moving by various means between point A and point B. Chapter 4 examines infrastructure (physical structures built to accommodate transportation activities and, sometimes, the process of regulating movements through these structures) and vehicles. Then, in Chapter 5, transportation businesses are described — so here the focus is only on commercial transportation activity. Finally, Chapters 6 and 7 consider two topics that generate much interest these days: transportation safety and the impact of transportation on energy use and air pollution.
TRANSPORTATION IN CANADA:

TRANSPORTATION AND THE ECONOMY

How important is transportation to the Canadian economy? The best answer is found by looking at transportation’s contribution to the gross domestic product, or “GDP.” GDP is a measure of the value added by each industry — that is, industry sales minus the cost of goods purchased to make these sales.

In 1993, transportation accounted for 4.5 percent of the economy. This measure includes “Transportation Industries” as defined in the GDP accounts — trucking, bus companies, transit operators, railways, airlines and marine carriers — plus several related activities. It also includes the “Pipeline” industry and the “Non-Business Sector Transportation Industries.”

Chart 1 shows the relative importance of these industries. Trucking, accounting for 29 percent of total activity, is the largest and this figure excludes private commercial trucking — everything from retail stores delivering their own goods in their own trucks to farm trucks hauling grain. Private trucking alone may be as large as all for-hire trucking. Other transportation activities shown which share the road with trucks are intercity buses (“bus”) and urban transit operators (“transit”). Transit operators are not purely a road operation as they also operate subways, rail services and even some urban ferries.

The other, non-road transport industries — rail, air and marine — are roughly comparable, in terms of size, to the three road ones (truck, bus and transit). They account for 31 percent of transportation activity. The industry shown as “pipeline” includes both gas transmission and distribution companies and oil pipeline companies. One measurement problem, with respect to gas pipelines, is that these GDP figures include the transportation, distribution and sale of gas. To the extent commodity sales are included, then, they overestimate transportation activity. Offsetting this somewhat is the omission in these figures of some private or “own account” air, pipeline and marine activities.

The 11 percent of the total shown as “other” includes activities either associated with transportation — for example, freight forwarders or road maintenance by private sector firms — or activities such as taxi operations not captured elsewhere. Significantly, the Post Office and couriers, with combined annual revenues of over $6 billion, are not incorporated in these figures. They are not classified as “transportation” in the GDP accounts.

Finally, what is shown as “non-business” — this is the GDP account’s “Non-Business Sector Transportation Industries” — includes establishments, primarily government-owned, providing services used by transportation carriers. Airport operations, air navigation services, ports and harbours, road maintenance when carried out by a government department and similar activities are captured in this figure and account for 8 percent of total transportation.

Chart 2 shows that, even though there is a slight downward drift in the curves, the importance of transportation in the economy has been relatively stable over the past three decades. The first curve, the bottom one, is just the “Transportation Industries” as defined in the GDP accounts. The top curve, a more complete estimate of transportation, includes these same industries plus pipelines and “Non-Business Sector Transportation Industries.”

Even though transportation as a whole has been a relatively stable component of the economy over the past three decades, there have been shifts from one type of activity to another. This is shown in Chart 3. Urban transit and intercity bus activities have been declining in importance. All other transportation activities have been growing. In fact trucking, airlines and pipelines have all been growing at relatively faster rates than the economy as a whole. The actual growth in pipelines is overstated because of the measurement problem referred to previously. And the growth of the air industry, and perhaps some others, is probably understated because the last year of the measurement period was a poor one. Transportation activity in general, and airline business in particular, contracts sharply

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1 Freight forwarders are companies that consolidate shipments and then arrange for transportation services from a carrier.
RELATIVE GROWTH RATES
OF TRANSPORT, 1981 - 1993
(average annual percent change)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>truck</td>
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<td></td>
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<tr>
<td>bus</td>
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<td></td>
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<td>transit</td>
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<td></td>
<td></td>
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<tr>
<td>rail</td>
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<td></td>
<td></td>
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<tr>
<td>air</td>
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<td></td>
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<td>water</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pipeline*</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Also includes natural gas sales.

Source: Chart 2

every time the economy is in recession, as it was in 1991 and 1992.

Although the conventional way of showing an industry's importance is to compare its output with gross domestic product, there are shortcomings to this. For one thing, and particularly in the case of transportation, the conventional measure buries much transportation within other industries. For example, the private truck operations of a food store show up as part of retail trade rather than as transportation.

To overcome this problem, and to show the true importance of transportation, the 1992 Royal Commission on National Passenger Transportation measured transportation differently. This is reproduced, in a condensed format, in Chart 4. Line 1 shows total sales made by for-hire carriers — trucking companies, airlines, railways and others. Line 2 shows private commercial transportation activities, excluding the automobile. Most of this (85 percent) is private trucking.

Line 3 shows the importance of the automobile — that is automobile and light truck (or van) expenses by private consumers, business and government. This includes all the costs of owning automobiles: fuel, the purchase of the vehicle, the license, insurance and repairs.

Line 4 shows the total amount spent by all three levels of government on infrastructure (roads, airports, etc), on traffic control and on policing of roads and other safety matters. It doesn't include, however, government subsidies (these are included in line 1) or direct government purchases of transportation services (also included in line 1 as carrier sales) and/or private government transportation services such as government cars or garbage trucks (these items are already counted in lines 2 or 3).

Line 5, using some judgement, eliminates certain items to avoid double-counting the final estimate of the amount spent on transportation. A large component of the $15.9 billion shown is taxes the Royal Commission judges to be user taxes. A second component of this line is inter-industry purchases, that is, expenditures by one transportation company for other transportation services.

RESOURCES DEVOTED TO TRANSPORTATION, 1989
($ billion)

<table>
<thead>
<tr>
<th>Description</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For-hire carriers</td>
<td>34.5</td>
</tr>
<tr>
<td>Road (truck, bus, transit, taxi)</td>
<td>15.3</td>
</tr>
<tr>
<td>Rail</td>
<td>7.4</td>
</tr>
<tr>
<td>Air</td>
<td>7.9</td>
</tr>
<tr>
<td>Marine</td>
<td>2.0</td>
</tr>
<tr>
<td>Pipeline</td>
<td>1.8</td>
</tr>
<tr>
<td>Total</td>
<td>103.1</td>
</tr>
</tbody>
</table>

Source: Royal Commission on National Passenger Transportation

The final estimate, of $103.1 billion, is 15.9 percent of gross domestic product.

"In total, Canadians in 1989 devoted substantially more resources to transportation than they did to health care - equivalent to 16 percent of gross domestic product (GDP) compared to 9 percent of GDP, respectively."

Royal Commission on National Passenger Transportation
**TRANSPORTATION VOLUMES**

**Passengers . . . .**

It is not possible, even as a rough approximation, to say how many people took a trip in Canada for any given year. The biggest problem is simply defining what is meant by a “trip.” However, from four incompatible sources, it is possible to develop numbers for some passenger trips. First, from a survey of people, the number of domestic intercity trips can be estimated—that is, a trip starting and ending in Canada with a one-way distance of at least 80 kilometres. Second, from a survey of people passing through Customs, international trips can be estimated. Third, information from Canadian-based carriers makes it possible to add up the total number of passengers. Fourth, information collected by urban transit operators allows the total number of urban trips to be described. What all of these sources miss are the short trips where a person drives a car, rides a bicycle or simply walks. They also probably miss a certain number of trips made in Canada by non-residents.

Before considering these sources, it helps to look at the numbers assembled by the Royal Commission on National Passenger Transportation. While these are now dated, this is still the best overall picture of domestic, intercity passenger transportation in Canada. The figures, for total passenger-kilometres of travel in 1990, are shown in Chart 5.1 Travel on the roads is clearly the most important means of intercity travel—cars, light trucks and buses account for 84 percent of total movements.

The Royal Commission’s data reveal that domestic passenger transportation is growing, whether measured in absolute numbers or in terms of the amount of travelling done by the average person. According to its figures, domestic intercity passenger-kilometres per person have been growing at an average annual rate of 1.9 percent for the last thirty years (1960-1990). The average Canadian, in 1990, undertook over 6,000 kilometres of intercity domestic travel compared to 3,500 kilometres in 1960.

Surprisingly, even though Canadians are wedded to their cars and light trucks, it is air travel that has increased most rapidly between 1960 and 1990. The average annual growth rate in total passenger-kilometres of domestic air travel has been 7.7 percent. On a per capita basis, air travel increased by 6.3 percent per year. Other large increases have occurred with people travelling in light trucks which, to a certain extent, are taking over from automobiles as one of the more popular means of travel. Intercity bus travel, while showing a small growth over the past thirty years, has actually declined when measured on a per capita basis. Intercity rail travel has declined in both absolute numbers and on a per capita basis.

In the next few pages, more recent data on passenger transportation are described and, unlike the above figures, the numbers are passenger trips, not passenger-kilometres. Passenger-kilometres are the better measure—they measure both the number of people travelling and the distance—but they are not readily available.

In 1992, Canadians made 157.9 million domestic intercity trips (Chart 6). “Trips,” from this source, are the round-trip activity—so, in many cases, they can involve two airplane flights or two car rides many days apart. Also, “trips” are defined as only those journeys involving a one-way distance of at least 80 kilometres excluding such things as travel to work or school. As shown in the Chart, automobiles, including both cars and light trucks, are the favourite means of travel, followed by air travel. Bus travel is a distant third and rail travel is continuing to decline.

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1 Information on intercity ferry traffic is not included. In 1988, the total was estimated at 0.85 billion passenger-kilometres which is too small to show up in Chart 5.
**INTERCITY PASSENGERS, 1993**

<table>
<thead>
<tr>
<th>Passengers (million)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus 10.9</td>
<td>13.5</td>
</tr>
<tr>
<td>Rail 4.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Air 31.5</td>
<td>39.2</td>
</tr>
<tr>
<td>Ferry 34.0</td>
<td>42.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong> 80.5</td>
<td></td>
</tr>
</tbody>
</table>

Source: Statistics Canada

For one thing, the amount of travel is increasing. The figures for 1992 suggest an average of 5.5 domestic trips per person per year. The comparable figure for 1980 was only 4.6 trips per person. Trips tend to cover long distances in Canada. The average round-trip distance in 1992 was 586 kilometres, not much of a change from earlier years.²

Finally, most of this travel is discretionary. In 1992, 67 percent of the domestic intercity trips made were for pleasure or for visiting relatives and friends.

In terms of international travel, there were 112.5 million people entering Canada from other countries in 1993 and, of these, 70 million were Canadians returning home. When added to domestic intercity trips, this suggests that Canadians make a total of 8.3 intercity round-trips per capita per year.

Chart 7 shows characteristics of international trips over the past decade, for both Canadian residents and non-residents entering Canada from the United States. As shown, Canadians are spending more and more time travelling to other countries. Most of these trips — 95 percent in 1993 — are to the United States. Non-resident travel to Canada has been relatively flat over the past decade. Not surprisingly, most of the visitors — 90 percent in 1993 — are from the United States.

Another way to measure passenger volumes is to add up the number of people carried by for-hire carriers. This changes the focus from the previous numbers because here it is Canadian-based companies moving people, whatever their nationality. Chart 8 shows that, in 1993, there were 81 million passengers on Canadian-based air carriers, bus companies, railways (excluding commuters), and ferries. The total may actually be higher as there are several estimates for the number of people travelling by boat, ranging from the low of 34 million used in Chart 8 to a high of 53 million.

The 81 million passengers shown in Chart 8 — one way passenger trips accounted for by Canadian-based for-hire carriers — cannot be directly compared to the 158 million domestic intercity trips (Chart 6) or the 70 million international trips (Chart 7). For one thing, the first set of numbers are round trips and, for another, they include trips by private automobiles and trips taken on carriers based outside of Canada.

Chart 9 shows the changes that have occurred among Canadian carriers over the last three decades. What stands out is the dramatic decline of the intercity bus industry, the pronounced increase in air traffic — except during times of recession which show up as downward blips in the graph, and the stagnant and even declining importance of rail traffic.

Turning now to the movement of people within urban areas, 91 urban transit operations in Canada carried 1.40 billion passengers in 1993. This is down slightly from the year before and about 9 percent below the most recent peak of 1.54 billion in 1988. There has been a general decline in the number of transit passengers over the past decade, both in absolute numbers and in the number of passengers per capita.

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² 5.5 trips times 586 km suggests 3,223 km of travel per year. Presumably, the difference between this figure and the Royal Commission's 6,000 km is accounted for by the definitions used in the Travel Survey.
TRANSPORTATION IN CANADA:

rides per capita — that is, urban transit ridership divided by the population of the area served. In 1993, there were 89 annual transit rides per capita, down from 110 in 1986. Partial figures for 1994, based on the 82 largest transit systems, suggest the trend is continuing: traffic fell another 2.5 percent.

Freight....

An overview of intercity freight transportation in Canada is shown in Chart 11. "Domestic" is anything picked up and delivered in Canada. For example, an international marine container handled by a railway is considered "domestic" if it is picked up at a Canadian port and delivered to a Canadian destination. This is an important point as much of the rail traffic — the grain, iron ore, coal, forest products, intermodal containers, potash, chemicals and sulphur — is actually destined for overseas markets. In chart 11, however, it is counted as domestic.

Another important point about Chart 11 is that the tonnes shown cannot be added. Much of the traffic handled at the ports is counted again on the railways and, sometimes, once again when a truck makes a final delivery. Similarly, much air freight is picked up and delivered by trucks. Many of the refined oil products that, at some point, move as crude oil through a pipeline, are delivered by truck.

The oil and gas volumes shown, in millions of cubic metres, can be roughly converted to 200 million (plus) tonnes. This makes pipeline transportation almost as large as rail and marine transport, at least in terms of total tonnage.

To put an historical perspective on these numbers, Chart 12 shows for-hire truck, rail and air freight over the last decade. This is freight carried by Canadian-based carriers only. Air freight, in thousands of tonnes on the right-hand scale, is for scheduled services. As shown, it is growing rapidly — by an average of 7.4 percent annually over the 13 years shown — although it is still rather minuscule when compared to the tonnes carried by truck or rail.

Rail volumes (million tonnes) are freight on the initial or final haul only — this avoids double counting some traffic that moves on more than one railway. Rail traffic has been fairly constant over the past thirteen years, although preliminary figures for 1994 suggest it may now be starting to grow.

Truck volumes shown (million tonnes) are based on a series of statistics that, strictly speaking, cannot be compared from one year to another: from 1981 to 1986 the coverage is all domestic traffic of for-hire carriers earning $100,000 or more; from 1987 on Canada/United States tonnages are added; in 1988 the coverage is carriers earning $500,000 or more; and in 1990 the criteria for inclusion in the series was raised to $1 million. With all these changes, it is not possible to say anything meaningful about growth in truck traffic.

Looking at freight handled at Canadian ports (Chart 13), total volumes have been relatively constant over the past decade. This disguises, however, a gradual decline in domestic volumes and an off-setting rise in international volumes. In 1994, there were 299 million tonnes of marine freight in Canada (Chart 11). However, because domestic marine freight is handled twice, once at the port of origin and once at the port of destination, Canadian ports actually handled 351 million tonnes in total (Chart 13).

There are also large volumes of freight moving by truck within urban areas that do not show up in the available intercity transportation statistics. One study, from the late 1970s, estimates the total movement of urban goods to be 45 to 73 tonnes per capita per year. This suggests a volume of well over one billion tonnes annually in Canada that, presumably, includes much of the 173 million tonnes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Total Traffic</th>
<th>International Traffic</th>
<th>Domestic Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>million tonnes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road (1993)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-large</td>
<td>173.4</td>
<td>33.0</td>
<td>140.4</td>
</tr>
<tr>
<td>-small</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>-private</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Courier</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Bus (parcels)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Rail (1993)</td>
<td>239.3</td>
<td>59.8</td>
<td>179.5</td>
</tr>
<tr>
<td>Air (1993)</td>
<td>0.7</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td>Marine (1994)</td>
<td>299.3</td>
<td>247.1</td>
<td>52.2</td>
</tr>
<tr>
<td>Pipelines (1993)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>123.4</td>
<td>63.0</td>
<td>60.4</td>
</tr>
<tr>
<td>Gas</td>
<td>140226.4</td>
<td>63016.5</td>
<td>77209.9</td>
</tr>
</tbody>
</table>

Notes: Some rows do not add to totals shown because of rounding.
* N/A = not available

Source: Statistics Canada
carried by large for-hire truck carriers and, quite likely, a lot of the freight shown for the railways, airlines and even the ports. Much of this intercity freight either starts or ends its journey in an urban area.

In calculating urban goods tonnages, the same tonne of freight shows up two, three or more times: a tonne of intercity freight counts as one tonne in each city; if it moves to a warehouse and from there to a retail store, it counts as another tonne; if it moves from a retail store via a delivery truck to a final destination, it counts as still another tonne; and so on. In other words, the 173 million tonnes of intercity for-hire truck freight, plus some of the air, rail and port freight, can only be compared to the more than one billion tonnes of urban freight with an understanding that the two measures are somewhat different.
TRANSPORTATION IN CANADA:

INFRASTRUCTURE AND VEHICLES

Transportation infrastructure consists of the structures required to move vehicles or commodities — roads, rail track, airports, ports and pipelines — and systems needed to control traffic — for example, air navigation systems. A great deal of public money went into its construction, a great deal of public money goes into its operation and upkeep, and much of it is still publicly owned. In cases where it is privately owned, a great deal of public policy was involved in its creation (licensing, choice of routes, public guarantees on financing, etc).

Roads . . .

Information on road lengths is shown in Chart 14. The agencies supplying this categorize their roads in a variety of different ways. As a result, the combined data in Chart 14 may contain some errors. This aside, there are 901,903 kilometres of roads in Canada, measured on a two-lane equivalent basis. A “two-lane equivalent” is a length of road measured as if there were only two lanes. So, for example, a one kilometre stretch of road with two regular lanes and one passing lane down the middle counts as 1.5 in Chart 14. A “route kilometre,” on the other hand, is simply the length of road as measured by a vehicle travelling from one end to the other. The total in Chart 14 can be (roughly) converted to 887,720 route kilometres.

Just over one third of this road network — 317,920 two-lane equivalent kilometres — is paved (first three rows in Chart 16). The length of the paved road network has grown relatively quickly. Although there are gaps in the data (see Chart 15) available figures suggest that paved route kilometres have grown from just over 100,000 in 1959 to about 306,646 kilometres today. The most rapid growth was in the 1960s and, notwithstanding the missing information, it is clear that the growth rate has levelled off since then.

ROAD LENGTHS, 1995
(two-lane equivalent kilometres)

<table>
<thead>
<tr>
<th></th>
<th>Federal, Provincial, Territorial</th>
<th>Newfoundland</th>
<th>Prince Edward Island</th>
<th>Nova Scotia</th>
<th>New Brunswick</th>
<th>Québec</th>
<th>Ontario</th>
<th>Manitoba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeways</td>
<td></td>
<td>110</td>
<td>-</td>
<td>1518</td>
<td>494</td>
<td>4707</td>
<td>3888</td>
<td>-</td>
</tr>
<tr>
<td>Paved</td>
<td></td>
<td>6396</td>
<td>3818</td>
<td>12377</td>
<td>4393</td>
<td>22231</td>
<td>20418</td>
<td>7915</td>
</tr>
<tr>
<td>Surface treated</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8863</td>
<td>-</td>
<td>3272</td>
<td>4720</td>
</tr>
<tr>
<td>Gravel</td>
<td></td>
<td>2241</td>
<td>254</td>
<td>9476</td>
<td>4730</td>
<td>2406</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Earth</td>
<td></td>
<td>-</td>
<td>1296</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6212</td>
<td>-</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1640</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1141</td>
<td>-</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>8747</td>
<td>5128</td>
<td>23371</td>
<td>18480</td>
<td>29344</td>
<td>28458</td>
<td>21628</td>
</tr>
</tbody>
</table>

Local
- Freeways      |                                 | -            | -                    | -          | -            | -      | 96      | -        |
- Paved (urban) |                                 | 648          | 407                  | 2209       | 1315         | 50000  | 26834   | 2709     |
- Paved (rural) |                                 | 2468         | 95                   | -          | 948          | 16000  | 21031   | 516      |
- Surface treated|                                 | -            | -                    | -          | 922          | -      | 25550   | -        |
- Gravel        |                                 | 1011         | -                    | 121        | -            | 24000  | 60225   | 61275    |
- Earth         |                                 | -            | -                    | -          | -            | 3236   | -       | -        |
- Winter        |                                 | -            | -                    | -          | -            | -      | -       | -        |
- Other         |                                 | -            | -                    | -          | -            | -      | -       | -        |
| Subtotal       |                                 | 4127         | 502                  | 2330       | 3185         | 90000  | 137087  | 64500    |

TOTAL
Federal Roads
By Jurisdiction

<table>
<thead>
<tr>
<th></th>
<th>Federal, Provincial, Territorial</th>
<th>Newfoundland</th>
<th>Prince Edward Island</th>
<th>Nova Scotia</th>
<th>New Brunswick</th>
<th>Québec</th>
<th>Ontario</th>
<th>Manitoba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td>12874</td>
<td>5830</td>
<td>25701</td>
<td>21665</td>
<td>119344</td>
<td>165545</td>
<td>86128</td>
</tr>
</tbody>
</table>

GRAND TOTAL

<table>
<thead>
<tr>
<th></th>
<th>Federal, Provincial, Territorial</th>
<th>Newfoundland</th>
<th>Prince Edward Island</th>
<th>Nova Scotia</th>
<th>New Brunswick</th>
<th>Québec</th>
<th>Ontario</th>
<th>Manitoba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Total</td>
<td></td>
<td>13081</td>
<td>5686</td>
<td>25992</td>
<td>21683</td>
<td>119878</td>
<td>167891</td>
<td>87868</td>
</tr>
</tbody>
</table>
Of the total 1995 road network, about 2 percent is under federal jurisdiction, 25 percent is under provincial or territorial jurisdiction, and the remaining 73 percent is under local jurisdiction. Looking at it another way, the total network by road surface or road type is shown in Chart 16. There are a lot of gravel roads in Canada! The “winter roads” shown are roads built in the winter over frozen lakes, rivers and muskeg.

By international standards, this is a very large road network for a country with a population the size of Canada’s — 30.2 route kilometres for every thousand people or, turning this around, 33.1 people per kilometre. That is 23 percent more roads per person than in the United States. On a per capita basis, it is twice the size of France’s network and almost four times the size of Britain’s. Of course when the physical size of Canada is considered — almost 10 million square kilometres — the network does not appear so large. In fact, there are only nine kilometres of road for every hundred square kilometres of territory.

Chart 17 shows how the size of the network varies by province or territory, from a low of five people per kilometre in Saskatchewan to a high of 66.3 in Ontario (these are on a two-lane equivalent basis). The chart also shows the number of vehicles per two-lane equivalent kilometre. Again, Saskatchewan is at the bottom of the list, having only 3.5 registered vehicles for every kilometre of two-lane road. This is the “bottom of the list” from the perspective of the number of taxpayers available to pay for road upkeep. Some may consider it the “top of the list” from the perspective of traffic congestion. British Columbia has the most densely used road network, at least it does if all vehicle owners are out driving at the same time. It has 40.5 registered vehicles per two-lane kilometre of road.

These figures on the length of the road network and the (potential) intensity of its use are a little misleading. Not all roads are equal. As can be seen in Chart 16, most Canadian roads are unpaved. Traffic volumes are not very high on these roads. In fact, while accurate figures are unavailable, most vehicles travel on the freeways, perhaps the top 10 percent of the rural paved roads (the main provincial highways) and some of the main urban roads. This network of freeways, main provincial highways and major urban arterial roads may only account for 5 percent of total road...
TRANSPORTATION IN CANADA:

**INTENSITY OF ROAD USE**
(population and registered vehicles per 2-lane kilometre)

Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia | Northwest Territories | Yukon
---|---|---|---|---|---|---|---|---|---|---|---

Source: Statistics Canada and survey

lengths in Canada. Yet it likely accounts for over half of all vehicle kilometres of travel. Total vehicle kilometres of travel are estimated to be in the range of 215 to 250 billion kilometres annually.

In 1993, the three levels of government in Canada spent over $11 billion on roads (Chart 18). The figures shown are “net” expenditures — that is, total spent less transfers from higher levels of government. For example, in 1993 (fiscal year 1993/94) provincial/territorial governments spent $5.64 billion on roads minus $0.19 billion received from the federal government for net expenditures of $5.45 billion. But, of this $5.45 billion, a total of $0.89 billion was transferred to local governments for help with their roads. Net expenditures cannot be compared directly to the roads under the jurisdiction of each level of government as the actual flow of money doesn’t match the road lengths owned.

Federal expenditures are relatively small, amounting to between $0.2 and $0.3 billion a year. (Complete information on federal expenditures is not available for the last three years shown.) Although provincial expenditures, including grants to local governments, increased over the 13 years shown in Chart 18 at an annual rate of 2.4 percent, there has been a decline over the last few years. The real “news” in Graph 18 is the increase in local government spending. At $5.4 billion in 1993, it now constitutes just over 50 percent of road spending in Canada and it has been growing at an annual rate of 6.7 percent over the past 13 years.

In 1993, there were 17.5 million registered motor vehicles in Canada and close to 19 million licensed drivers. Most of these vehicles are automobiles as shown in Chart 19. Between 1983 and 1993, total motor vehicles grew at an average annual rate of 1.9 percent while the automobile component grew at an average rate of 2.3 percent.

The 3.6 million trucks in the total of 17.5 million motor vehicles include many pickups and vans — smaller trucks often used by trades-people or, increasingly, as a substitute for passenger automobiles. It is estimated that only 672,000 of the 3.6 million trucks are “large” in the sense of having a registered weight of 4,500 kilograms or more.
Rail . . .

Canadian railways, other than VIA Rail, operated 84,648 kilometres of track in 1993. Of this total, 37,855 kilometres or 45 percent are mainline tracks and the rest is split almost evenly between branch lines and track in rail yards. Eighty-four percent of the freight traffic is accounted for by one-third of this network. VIA Rail, the federally-owned passenger railway, provides service over 13,829 kilometres of track mostly operated by other railways.

Chart 21 shows the total length of the rail track. It is contracting, although the length of mainline track has been relatively constant over the last decade or so. As a rough measure of use, the line at the top of the graph shows million tonne-kilometres of freight per kilometre of mainline track from 1982 to 1993. While there are year-to-year fluctuations, the trend is upwards, with about a 17 percent increase over the period shown.

While the comparison is not perfect, rail companies spent $1.3 billion on their track (“way and structures” in railway accounting terms) in 1993 versus the $11.0 billion spent by governments on roads. Looked at another way (Chart 22), the increase in expenditures on rail infrastructure since 1985 has been at half the rate of the increase in road expenditures — 1.5% increase per year versus 3.2% for roads.

Another important aspect of rail infrastructure — and road infrastructure — is the number of times these two modes cross. As of 1993, there were 23,482 public rail crossings in Canada and a further 28,500 crossings on private lands.

Chart 23 shows the fleet of rail cars operated by railways in Canada, with the proportion accounted for by the largest railways on the right-hand side.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>number in service</th>
<th>accounted for by CN &amp; CP Rail</th>
<th>accounted for by VIA Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>locomotives</td>
<td>3300</td>
<td>85.2%</td>
<td></td>
</tr>
<tr>
<td>freight cars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- box</td>
<td>29311</td>
<td>88.9%</td>
<td></td>
</tr>
<tr>
<td>- hopper</td>
<td>40227</td>
<td>96.6%</td>
<td></td>
</tr>
<tr>
<td>- gondola</td>
<td>15846</td>
<td>68.2%</td>
<td></td>
</tr>
<tr>
<td>- refrigerated</td>
<td>256</td>
<td>92.7%</td>
<td></td>
</tr>
<tr>
<td>- flat</td>
<td>25520</td>
<td>80.3%</td>
<td></td>
</tr>
<tr>
<td>- livestock</td>
<td>28</td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>- caboose</td>
<td>1069</td>
<td>89.7%</td>
<td></td>
</tr>
<tr>
<td>- other</td>
<td>416</td>
<td>82.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>117533</td>
<td>86.4%</td>
<td></td>
</tr>
<tr>
<td>passenger cars</td>
<td>570</td>
<td>69.3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Statistics Canada

Air . . .

There are 726 certified airports in Canada, most of which are locally-owned and operated. The federal Department of Transport owns, operates or subsidizes 149 of these, including 26 of the largest and busiest. These 26 airports account for 94 percent of all air passengers and cargo. The government is currently revising its airports policy and will be getting out of the business of operating such facilities. It will get rid of all airports — presumably to provincial or local governments or private interests — except the 26 that constitute the National Airports System (see Chart 24). These the federal government will continue to own while local airport authorities handle the operations.

The other half of the infrastructure essential to the operation of aircraft in Canada is the air navigation system. This provides air traffic control in domestic and international airspace, flight information services such as weather briefing for pilots, airport advisory services and air navigation aids. These services are delivered through area control.
TRANSPORTATION IN CANADA:

PASSAGERS AT NATIONAL AIRPORTS, 1993

<table>
<thead>
<tr>
<th>Airport</th>
<th>Passengers</th>
<th>Total passengers completed, deplaned (million passengers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto - LB Pearson</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Vancouver Int'l</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Montréal - Dorval</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>Calgary Int'l</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Montréal - Mirabel</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Ottawa</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Winnipeg Int'l</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>Halifax Int'l</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Edmonton Int'l</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Victoria Int'l</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Québec</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>St. John's</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Regina</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Thunder Bay</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Kelowna</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Prince George</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>London</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Moncton</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Yellowknife</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Fredericton</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Sudbury</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Charlottetown</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Saint John</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Gander Int'l</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Whitehorse</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

Source: Statistics Canada

centres, air traffic control towers, flight service stations, a national radar system, communications systems, computers and operational software, radar display systems and navigation aids. The total cost of running this system, including paying the wages of 6,600 people, is in the neighbourhood of $800 million a year. About $600 million of this is offset by a user tax. As with airports, the federal government is planning to put these services on a more commercial footing.

In 1993, there were 27,912 registered aircraft in Canada. This total includes a large number of very small aircraft — including "ultralights" — as the number with "certificates of airworthiness" is only 17,742. In Chart 25, this fleet of 17,742 aircraft, which logged 3.5 million flying hours in 1993, is broken down to its constituent parts. The two major families of air carriers, Air Canada and Canadian Airlines, plus their affiliated regional companies, account for 343 aircraft in this fleet.

Marine . . .

There may be as many as 2,400 ports and harbours in Canada, although there is no record of the exact number. Of the total, about 365 commercial ports are under federal jurisdiction. While administrative structures vary, the common purpose of port authorities is to provide the necessary infrastructure of wharves, cranes, storage facilities, and services such as navigation, security, and property management. Actual port operations are carried out by private companies, terminal operators and shipping lines.

Fifteen of the largest ports are administered by Canada Ports Corporation. These represent a mixture of large, multi-purpose facilities and smaller specialized ports which handle the vast majority of Canada's import and export traffic, including bulk, general and containerized cargo.

Nine other large ports are administered by harbour commissions. These ports offer services to a wide variety of industrial sectors, but handle primarily commodities such as steel, automobiles, and forest products. The numerous other small ports are administered through the Harbour and Ports directorate of the Canadian Coast Guard.

Thirty ports account for 80 percent of all marine freight.

The top ten, shown in Chart 26, handled 196.6 million tonnes in 1993, 61 percent of the Canadian total.

There were 45,039 vessels registered in Canada, including 21,086 fishing vessels, in 1993. There are also over 1.5 million pleasure craft, and approximately 19,400 foreign flag vessels involved in Canadian seaborne trade. There were a total of 99,985 vessel movements at Canadian ports in 1993, 57.2 percent of these being international movements — that is, movements between a Canadian and a foreign port.

The merchant fleet, the 188 Canadian vessels with a gross registered tonnage of 1,000 tons or more, are shown in Chart 27. A "gross registered ton" is the cargo space, measured in cubic feet and divided by 100. Only four of the ships shown are involved in foreign, overseas trade. But, in fact, Canadian companies are more involved in international shipping — that is, shipping to countries other than the United States — than these figures suggest. These compa—

1 By 1994, this fleet had increased to 350.

2 The total number of fishing boats, registered and unregistered, is 36,722.
### TOP TEN PORTS, 1992 - 1993

<table>
<thead>
<tr>
<th>Port</th>
<th>Tonnage Handled (million tonnes)</th>
<th>1993 International Tonnage (%)</th>
<th>1993 Container Tonnage (%)</th>
<th>1993 Major Commodity (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver, British Columbia</td>
<td>61.3</td>
<td>56.9</td>
<td>95.7</td>
<td>6.5 coal - 20.5, wheat - 8.8, containers - 3.8</td>
</tr>
<tr>
<td>Sept-Iles/Pte-Noire, Québec</td>
<td>19.2</td>
<td>21.0</td>
<td>79.2</td>
<td>* iron ore - 18.8</td>
</tr>
<tr>
<td>Port Cartier, Québec</td>
<td>21.3</td>
<td>19.3</td>
<td>79.2</td>
<td>* iron ore - 14.7</td>
</tr>
<tr>
<td>Saint John, New Brunswick</td>
<td>15.6</td>
<td>19.3</td>
<td>90.0</td>
<td>1.2 crude petroleum - 8.9</td>
</tr>
<tr>
<td>Montréal/Contrecœur, Québec</td>
<td>16.6</td>
<td>15.8</td>
<td>67.8</td>
<td>37.4 containers - 5.9</td>
</tr>
<tr>
<td>Halifax, Nova Scotia</td>
<td>13.8</td>
<td>14.2</td>
<td>79.7</td>
<td>23.6 petroleum - 4.8, containers - 3.3</td>
</tr>
<tr>
<td>Québec/Lévis, Québec</td>
<td>15.7</td>
<td>13.2</td>
<td>72.2</td>
<td>* coal - 5.1, wheat - 2.5</td>
</tr>
<tr>
<td>Hamilton, Ontario</td>
<td>12.6</td>
<td>12.4</td>
<td>47.1</td>
<td>* iron ore - 6.8, coal - 3.0</td>
</tr>
<tr>
<td>Prince Rupert, British Columbia</td>
<td>12.6</td>
<td>11.3</td>
<td>99.0</td>
<td>* coal - 5.5, wheat - 3.1</td>
</tr>
<tr>
<td>Thunder Bay, Ontario</td>
<td>12.7</td>
<td>11.3</td>
<td>32.0</td>
<td>* wheat - 5.6, coal - 2.3</td>
</tr>
</tbody>
</table>

* less than 0.1%

Source: Statistics Canada

### Pipelines

A critical part of marine infrastructure is the service provided by the Canadian Coast Guard. It is responsible for ensuring marine safety (for example, search and rescue operations), supporting commercial shipping (for example, providing navigational aids and icebreaking services) and responding to marine pollution. It does all of this with a budget of about $600 million.

Another critical part of marine infrastructure is the Great Lakes/St. Lawrence Seaway system, which between Montréal and Lake Superior, lifts ships a total of 170 metres vertically. The Seaway was completed in 1959 and can accommodate vessels up to 23.8 metres wide, 225.5 metres long and a draft of up to 7.9 metres. There are seven locks in the Montréal-Lake Ontario section (5 Canadian, 2 American), eight more in the Welland Canal (all Canadian) between Lake Ontario and Lake Erie and five between Lake Huron and Lake Superior (1 Canadian, 4 American). Seaway traffic in the Montréal-Lake Ontario section and in the Welland Canal which, recently, has been in the range of 31 to 39 million tonnes annually, is well down from a peak of 66 million tonnes in the late 1970s.

### Pipelines in Canada, 1993

<table>
<thead>
<tr>
<th>Oil Pipelines</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering*</td>
<td>11112 km</td>
</tr>
<tr>
<td>Trunk crude</td>
<td>19259 km</td>
</tr>
<tr>
<td>Product lines</td>
<td>5969 km</td>
</tr>
<tr>
<td>TOTAL</td>
<td>36341 km</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas Pipelines</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gathering**</td>
<td>6924 km</td>
</tr>
<tr>
<td>Transmission</td>
<td>71261 km</td>
</tr>
<tr>
<td>Distribution</td>
<td>182012 km</td>
</tr>
<tr>
<td>Compressor stations 265</td>
<td></td>
</tr>
</tbody>
</table>

* Excludes producers' gathering lines.
** Excludes gathering lines of the upstream producing industry.

Source: Statistics Canada
TRANSPORTATION IN CANADA:

TRANSPORTATION BUSINESS

In this chapter, the focus is on transportation businesses. Because of the available data, Canadian-based companies and, generally, only the larger ones within each sector, are the centre of attention. Excluded from this discussion are such things as the private use of the automobile, people sailing their own yachts and people on snowmobiles. Although some of this activity may be commercial — for example, the travelling salesperson driving a car — it is not for-hire transportation and, therefore, does not constitute a transportation industry.

Also excluded are such things as ferry boats between Canada and the United States where the boat is based in the United States. A company's base — that is, where it has an office — has little to do with ownership. There are many cross-border ownership links between Canada and the United States. But, a company's base does have a lot to do with the availability of statistics: Canadian agencies tend to collect information only from companies based in the country. Foreign airlines and American-based trucking companies operating into or out of Canada are excluded for this same reason, even if they are partly or wholly Canadian owned. Activities such as the large cruise ship business out of Vancouver or the boats that carry most of Canada's international sea-borne trade are also excluded: the ships are foreign flagged.

The figures in Chart 29 provide an overview. There are a number of question marks and qualifications that pertain to these numbers but, even though these are important, they are largely unstated in the text of this chapter. Question marks and qualifications aside, the table is a good summary of commercial transportation activity by Canadian-based businesses operating Canadian-based equipment.

Even without data problems, there are other, more conceptual problems in drawing up such a table: where is the dividing line between transportation and other businesses? Courier companies are included in the table but the Post Office, with 1994 revenues of $4.1 billion, is not. Pipeline companies are included, but figures shown for gas utilities only include what are referred to in the accounts as transportation revenues less the cost of gas purchased.1 Canadian fishing boats, all 36,722 of them, are not included as

<table>
<thead>
<tr>
<th>OVERVIEW OF TRANSPORTATION ENTERPRISES</th>
<th>Number of Enterprises</th>
<th>Total Revenues ($billion)</th>
<th>Employees</th>
<th>Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. for-hire carriers (1992)</td>
<td>7438</td>
<td>10.1</td>
<td>93308</td>
<td>55940</td>
</tr>
<tr>
<td>2. courier (1990)</td>
<td>2433</td>
<td>1.9</td>
<td>26480</td>
<td>27554</td>
</tr>
<tr>
<td>3. large private carriers (1992)</td>
<td>474</td>
<td>[exp=2.2]</td>
<td>26151</td>
<td>18103</td>
</tr>
<tr>
<td>4. small private carriers, govt'</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>&gt;500000</td>
</tr>
<tr>
<td>operations, farmers, etc.</td>
<td>37658</td>
<td>[earn=4.5]</td>
<td>57867</td>
<td>52529</td>
</tr>
<tr>
<td>5. owner-operators (1992)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>48003</td>
<td>12.0</td>
<td>203806</td>
<td>672000</td>
</tr>
<tr>
<td>Bus Industry (1993)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. intercity bus</td>
<td>29</td>
<td>0.4</td>
<td>4034</td>
<td>1252</td>
</tr>
<tr>
<td>7. school bus</td>
<td>366</td>
<td>0.9</td>
<td>26084</td>
<td>24356</td>
</tr>
<tr>
<td>8. other bus/limousine</td>
<td>82</td>
<td>0.2</td>
<td>4736</td>
<td>2963</td>
</tr>
<tr>
<td>TOTAL</td>
<td>403</td>
<td>1.5</td>
<td>34840</td>
<td>28571</td>
</tr>
<tr>
<td>9. Transit (1993)</td>
<td>74</td>
<td>3.6</td>
<td>38128</td>
<td>13527</td>
</tr>
<tr>
<td>10. Taxi (1989)</td>
<td>N/A</td>
<td>0.6</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>11. Railways (1993)</td>
<td>29</td>
<td>7.0</td>
<td>59247</td>
<td>121403</td>
</tr>
<tr>
<td>Airlines (1993)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. large</td>
<td>243</td>
<td>7.6</td>
<td>47540</td>
<td>2481</td>
</tr>
<tr>
<td>13. other</td>
<td>660</td>
<td>N/A</td>
<td>N/A</td>
<td>2298</td>
</tr>
<tr>
<td>TOTAL</td>
<td>933</td>
<td>4.9</td>
<td>4759</td>
<td></td>
</tr>
<tr>
<td>Marine (1993)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. large commercial</td>
<td>191</td>
<td>2.7</td>
<td>22723</td>
<td>1740</td>
</tr>
<tr>
<td>15. small commercial</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>22123</td>
</tr>
<tr>
<td>TOTAL</td>
<td>170</td>
<td>4.3</td>
<td>8263</td>
<td>23953</td>
</tr>
</tbody>
</table>

"N/A" = Not available

Sources: Statistics Canada, National Transportation Agency, Transport Canada, the Transportation Safety Board and various articles.
part of marine transportation, even though the occupation of fishing clearly involves moving fish from point A to point B and even though many ports and harbours are used by fishermen. Farmers, on the other hand, are included—at least to the extent they own any trucks shown in line 4. There are many inconsistencies in the notion of what is and what is not transportation.

**Trucking . . .**

Other than a rough estimate of 672,000 trucks with a registered weight of 4,500 kilograms or more, there are no overall measures of trucking activity available. Nevertheless, the most important part of the industry in terms of intercity freight is captured reasonably well in the first line of the table. These are Canadian-based, for-hire motor carriers.

The figures in Chart 30 give a rough idea of the financial health of for-hire motor carriers over the past few years. It is “rough” as the criteria by which carriers are included in the calculations change three times over the period shown.² This has an important impact on the picture that emerges as smaller companies tend to be more profitable than larger ones.

The Canadian economy experienced a sharp downturn in 1991 and this is evident in the numbers shown. Trucking activity is particularly susceptible to swings in the overall level of economic activity. Revenues fell sharply in 1991 and hardly grew at all in 1992. The apparent fall in 1993 is caused by changes in the revenue threshold for surveyed firms; without this change, there is evidence that industry revenues began to grow. This growth continued into 1994: information on the largest carriers suggests that revenues grew by about 19 percent.

The operating ratio—that is, the proportion of revenues accounted for by operating expenses—is shown in two ways. “O/R-industry,” for all trucking companies, corresponds to the total revenues shown in Chart 30. “O/R-large carriers” is just for trucking companies earning $25 million or more. Large carriers account for roughly one-third of industry revenues and the data from which this operating ratio is calculated is consistent over all years shown.

The industry as a whole had a healthy operating ratio in 1990—0.92 is considered “good.” Since then, it has risen to what is generally considered a poor level. For the largest motor carriers, the operating ratio was 1.0 in 1991. In other words, large carriers as a group just broke even and this is before considering such non operating expenses as interest payments. However, by 1994, the financial health of the industry had improved dramatically. Total industry revenues were up over 20 percent from 1993 and the operating ratio had returned to 0.92. Larger carriers managed an operating ratio of 0.97 in 1994.

For-hire trucking in Canada is almost completely deregulated. That is, there is no government body deciding who can operate and what price can be charged. An interesting debate has been whether this deregulation had an impact on the financial performance shown in Chart 30.

Couriers, on line 2 of Chart 29, are similar to the truckers shown on line 1. They move packages or parcels and often use trucks for the intercity portion of these movements. In doing so, they compete with some for-hire truckers—the less-than-truckload carriers. They also compete with the Post Office and, in fact, some services offered by the Post Office are identical to those offered by couriers—either a regular or an expedited movement of small packages.

Most trucks (lines 3 and 4 of Chart 29) are operated by private carriers, that is, companies hauling their own goods. These operations include everything from large firms within the retail food business to very small businesses such as a farmer with a two-axle truck occasionally taking products to town and returning with bags of feed. Private trucking, depending on how it is defined, also includes a large number of trucks owned by governments (snow ploughs, garbage trucks or road maintenance vehicles), utilities (such as telephone companies), construction companies and others. Not much is known about this wide assortment of private truckers, at least in terms of truck activity. Limited information is available (line 3) on the very largest (annual expenses of $1 million or more). Since the trucking division of some industry doesn’t ordinarily earn “revenues,” the only financial information that can be given is total operating expenses (“exp”). All other private truckers, that is, those shown on line 4, operate a fleet of over half a million trucks. At least two hundred thousand of these are farm trucks.

¹ Unlike oil pipelines, which act as common carriers, gas pipelines buy gas and then move it to market.

² The revenue threshold for inclusion in the numbers shown is: $100,000 or more in 1988 to 1989; $25,000 or more for 1990 to 1992; and, $1 million or more for 1993 and 1994.
TRANSPORTATION IN CANADA:

The last line shown under trucking, labelled "owner-operators," includes people who generally own their own equipment and work under contract to someone else. For example, about half the 37,658 enterprises shown on line 5 are owner-operators working for for-hire carriers on the first line. That is why earnings ("earn") shown on line 5 cannot be added to other revenues in the trucking column. Some owner-operators are fairly large, owning several trucks and employing their own drivers.

Bus Industry . . .

There are three types of operations within the bus industry: 29 intercity bus companies, 366 school bus operators, and 82 others. This last group includes such things as sightseeing bus companies and airport limousine services.

Intercity buses serve 3,000 communities in Canada and carried 10.8 million passengers in 1993, down considerably from the 47.9 million carried thirty years earlier. As shown in Chart 31, revenues have been relatively flat over the past few years and operating ratios, while reaching good levels in 1989 (0.874) have been fairly consistent in the range of 0.96 for most of the time. The most recent information available suggests revenues for larger bus companies were up by almost five percent in 1994 and passenger volumes were up by over eight percent.

Some aspects of intercity bus operations, unlike most other transportation business in Canada, are still regulated. Licences are required to enter the business and a government body decides who can have these licences.

As shown on line 7 of Chart 29, school bus operators are the largest component of the bus industry with $861 million in revenues. Their 1993 operating ratio of 0.89 was also the healthiest.

3 The number of trucks shown on lines 1-to-5 do not add to the total shown since it is not possible to identify some of the small (less than 4,500 kg) trucks.

Urban Transit . . .

There are 109 communities in Canada with transit service — buses, subways, street cars, light rail, harbour ferries and other forms of transportation. It is estimated that 55 to 60 percent of the Canadian population lives in these communities. In 1993, they made 1.4 billion transit trips.

Transit operators are generally government-owned. Provincial and local governments heavily subsidize the service provided, presumably because transit is seen as a public good and, perhaps, as a social service. It may also be that governments see paying for transit as a cheaper alternative — and a more environmentally friendly alternative — to providing new urban road capacity. In the last few years, subsidies have accounted for 52 to 60 percent of total revenues. Chart 32 shows the relationship between the amount paid by passengers versus the amount paid by taxpayers.

"Transit systems are being increasingly asked by governments to play a key role in fulfilling the growing mobility needs of seniors and disabled persons . . . These needs are being met through widespread provision of specialized transit systems and, more recently, through the provision of accessible conventional transit services using new technology of low-floor buses. In addition, government responsibility for transit has placed it on the forefront of environmental technology, with new transit vehicles meeting emission standards that are far more stringent than those required in other transportation sectors. The transit industry is faced with the considerable challenge for the years to come of trying to meet societal objectives of mobility and environmental quality in a period of constraint and tremendous pressure on financial resources."

Canadian Urban Transit Association, 1995
**Railways . . . .**

There are 29 railways in Canada: CN North America, CP Rail, VIA Rail and 26 smaller companies including everything from large regional railways such as BC Rail to the newer short-line railways to small terminal or switching railways. Most of the freight — 91 percent of the revenues in 1993 — are accounted for by CN North America and CP Rail. Total industry performance is shown in Chart 33.

CN North America is a government-owned railway operating in eight provinces and the Northwest Territories. The federal government plans to privatize it in 1995. It operates over 19,738 kilometres of mainline track in Canada and, through subsidiaries, it has access to the US midwest. It also has agreements with US railways that extend its reach into New York, the US southeast and as far south as Mexico. With a new tunnel under the St. Clair River between Ontario and Michigan, it now operates double-stack container trains from the port of Halifax directly into Chicago. Total revenues from all sources in 1994, including more than just the Canadian rail revenues shown in Chart 29, were $4.7 billion and net income was $245 million. This is an increase of over 11 percent in revenues from 1993 and an impressive turnaround from a loss of $79 million.

CP Rail operates 11,429 kilometres of mainline track in six provinces, having recently sold its line into New Brunswick. Its US subsidiaries give it access to the US Northeast (New York, Philadelphia, Baltimore and Washington) and the US midwest (Minneapolis, Milwaukee, Chicago, Kansas City and Louisville). With its newly enlarged tunnel connecting Windsor and Detroit it, too, operates double-stack container trains directly into the US midwest market. It is the seventh largest railway in North America, with 1994 revenues of $3.7 billion and net operating income of $277 million. The parent company, Canadian Pacific Ltd, had total revenues of over $7 billion in 1994.

"The Canadian rail industry is the third largest in the world in terms of route kilometres and it handles the world's sixth largest volume of freight over this network."

*National Transportation Agency, 1994*

Both CN and CP suffer from the problem of having too much track with too little freight volumes. More than 90 percent of their combined tonnage is carried on only 40 percent of their track. This is one of the reasons why there has been a spate of new short-line railways created in Canada recently — ten since 1986.

Here is what a recent government paper says about the rail freight industry in Canada:

"The Canadian rail industry is in decline: its share of the surface-freight market has fallen 20 per cent over the past 10 years, while the revenue it collects per tonne-kilometre of goods moved has fallen 31 per cent. In the past decade alone, Canadian rail companies have abandoned 20 per cent of their track and shed 40,000 jobs.

Changes in the structure of the economy from resource-based to manufactured goods have had a major impact on rail. New north-south trading patterns, strong competition from truckers and US railroads, and demands from shippers for better service have also eroded the industry's position."

This paints a bleak picture. Yet, with restructuring — track abandonment, new short lines, the privatization of CN — with the increasing links into the United States, and with the aggressive development of such things as double stack intermodal trains, the future of Canadian railways may be brighter than this picture suggests. Recent figures show that output per employee for CN and CP — this is tonne-kilometres of freight per employee — increased by 59 percent between 1987 and 1994.

Railways are mostly unregulated in Canada, at least in terms of rates charged and many aspects of service. The remaining elements of regulation, such as when a railway can abandon track, are being phased out. The federal govern-

"CN Rail and CP Rail System will still exist in 2004 but they will focus their energies on hauling heavy volumes over long distances. Many branch lines will either be abandoned or sold to independent short-line operators."

*R.H. Ballantyne, president of the Railway Association of Canada, spring 1994*
Transportation in Canada:

VIA Rail, Revenues Versus Subsidies, 1988 - 1993

<table>
<thead>
<tr>
<th>Year</th>
<th>Fare &amp; Other Revenue</th>
<th>Subsidy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>1989</td>
<td>450</td>
<td>150</td>
</tr>
<tr>
<td>1990</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>1991</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>1992</td>
<td>600</td>
<td>0</td>
</tr>
<tr>
<td>1993</td>
<td>650</td>
<td>0</td>
</tr>
<tr>
<td>1994</td>
<td>700</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Statistics Canada

VIA Rail, a government-owned company, is the primary passenger railway in Canada. It carried 3.6 million people in 1994 and operates 435 trains weekly over CN and CP track serving 400 communities. Sixty-nine percent of its passenger revenues are earned on the Quebec City-to-Windsor corridor. Passenger rail services are heavily subsidized in Canada as shown in Chart 34.

Air Carriers . . .

There are 970 air carriers in Canada, the vast majority of which are quite small.4 Financial and operating statistics on the 243 largest are shown on line 12 of Chart 29. These carriers have operating revenues of $250,000 or more annually. There are also 933 foreign air carriers with licences to provide service into Canada, however, only 111 of these carriers were doing so as of 1993.

The Canadian industry is dominated by two large families of air carriers: one controlled by Air Canada and one controlled by Canadian Airlines. These two groups accounted for 79 percent of all air passenger revenues of the larger airlines (the ones on line 12 of Chart 29).

Chart 35 shows that the financial health of Canadian airlines over the past five years has been disastrous. Between 1990 and 1993, the total net loss of all 243 large air carriers was just over $2 billion. The worst now seems to be over. In 1994, the parent companies of the two major families had total revenues of $7 billion — a 6.2 percent increase over 1993 — and net income of $91 million — compared to a combined loss of $618 million in 1993.

The Canadian airline industry, at least in the southern part of the country, is unregulated. That is, there is no govern-

4 There were 933 in 1993 (Chart 29), but the latest count (1994) is 970.

Flights between Canada and other countries are still regulated but there has been a relaxation of late which should see the two main airlines competing more for international routes. The most significant development, however, occurred in February 1995 when Canada and the United States agreed to an "open skies" policy for the two countries. Canadian carriers gained unlimited route rights from any point in Canada to any point in the United States. US

Air Canada
- government-owned airline, privatized in 1988
- operates (1994) 109 jet aircraft
- owns a family of regional airlines with a fleet of 86 aircraft; has a significant stake in Continental Airlines in the US, and has commercial arrangements with other foreign airlines
- operating revenues in 1994 were $4.0 billion and net income was $129 million

Canadian Airlines
- publicly traded company in which AMR Corporation (American Airlines) has a significant stake
- operates (1994) 83 jet aircraft
- owns a family of regional airlines with a fleet of 72 aircraft and has commercial arrangements with other foreign airlines
- operating revenues in 1994 were $3.0 billion with a net loss of $38 million

Air Carriers, Financial Results, 1988 - 1993
carriers gained the same rights except that Canada protected its three biggest cities — Toronto, Montréal and Vancouver — during a three-year phase-in period.

**Marine . . . .**

A description of Canadian-based marine carriers has to limit its attention to activity in the coastal waters of Canada and the major inland waters. This is because almost all overseas trade, amounting to $70 billion in imports and exports in 1994, is handled by foreign-based ships. Although in saying this it might also be noted that 25 Canadian companies control a total of 98 foreign-flagged ships with a total deadweight tonnage of 3.7 million. For here, these operations as well as the over 19,000 other foreign-flagged ships visiting Canada every year are ignored.

In 1993, there were 191 Canadian-based carriers operating Canadian-based ships with total revenues of $2.7 billion. This understates the true size of the marine sector as some government and private carriers do not report revenues. The carriers included in this $2.7 billion all had revenues of at least $500,000, which leaves a number of small carriers (line 15 in Chart 29) about which little is known. One hundred and fifty-four of these 191 carriers, with $1.8 billion in revenues, are for-hire carriers transporting commodities, providing towing services or providing time charters to others. The financial health of this group is shown in Chart 36. A large portion of these revenues are earned on bulk shipments moving between Canadian ports and between Canadian and United States ports on the Great Lakes-St Lawrence. The industry’s financial health is volatile: twice in the last six years operating expenses have been greater than operating revenues (the two peaks in the operating ratio shown).

Another 19 of the 191 carriers are government-owned operations that provide most ferry services in Canada. This group, in 1993, accounted for 97 out of the 112 ferry boats operated by larger carriers in Canada, 87 percent of the 34 million ferry passengers and 89 percent of the 13 million

motor vehicles carried by ferries. The British Columbia Ferry Corporation, owned by the provincial government, is by far the biggest operator. It carried over 21 million passengers and 8 million motor vehicles in 1994.

The federal government has recently announced sweeping changes to its policies on marine transportation and this will result in changes to everything from the structure of the Canadian Coast Guard to the way the government recovers costs for the services it provides.

**Pipelines . . . .**

There are about 70 oil pipeline companies in Canada and, in 1993, these companies had revenues of just over $1 billion. The main carrier, Interprovincial Pipe Line Inc., operates the world’s longest crude oil and liquids pipeline. Its parent, IPL Energy Inc., earns close to 40 percent of industry revenues and, in 1994, had earnings of $397 million from its oil pipeline business. The IPL pipeline system extends over 3,700 kilometres, from Alberta in the west to Montréal in the east, running through the United States (south of the Great Lakes). This pipeline moves about 70% of total western Canadian petroleum production. In 1994, deliveries exceeded 1.5 million barrels per day.

There are approximately 100 companies transporting gas through pipelines in Canada but, unlike the oil pipeline companies, it is more difficult to separate out just the transportation activities of these companies. The financial data available includes activities related to the gathering, transporting, storing, distributing and marketing of gas. As a rough proxy for the long distance gas transportation activity, the figure shown in Graph 29 include only what the accounts show as gas transportation revenues less the cost of gas purchased. The largest company within this group, at least in terms of the main gas pipeline in Canada, is TransCanada Pipeline Ltd. In 1994, its main pipeline moved 2,220 billion cubic feet (62.9 billion m³) of gas. About 46 percent of this was exported and the rest went to domestic markets, mainly in Eastern Canada. The main pipeline, with 13,843 kilometres of pipe, starts in Alberta and, after crossing through northern Ontario, ends at the Québec/Vermont border. Other pipelines in which TransCanada has an interest move large volumes of gas south to the United States and as far east as Québec City.
SAFETY

Accident statistics are notoriously tricky. What constitutes an accident? Does a collision between a car and a train at a level crossing show up as a road accident or a rail accident? Are the definitions used from one agency to another or from one mode to another consistent? Even the concept of a fatality varies from one source of information to another. If a person dies two weeks after an accident, may or may not show up as an accident statistic in Canada. It depends on where it occurs.

The accompanying table provides an overview of transportation safety for the latest year for which there is information.

Whatever else the numbers suggest, and whatever conceptual or accuracy problems there are, one fact leaps off the page: transportation safety is very much an issue of how well drivers of road vehicles are performing. In fact the figures on the table minimize the true extent of the problem by showing only casualty collisions. In 1992, the latest figures available, there were 1.25 million road vehicles involved in reportable traffic collisions in Canada. These are the number of vehicles, not the number of collisions, and they include both casualty and property-damage collisions.

Chart 38 provides a breakdown of the 1991 road vehicles involved in collisions. Trucks with a registered weight of 4,500 kilograms are considered a category because this weight is a convenient demarcation between heavy trucks used primarily to move freight and those smaller trucks used more often as a trade vehicle or a substitute for an automobile. Trucks over 4,500 kilograms also come under special safety regulations.

ROAD ACCIDENTS, A CLOSER LOOK, 1991
(vehicles involved in reportable traffic collisions)

<table>
<thead>
<tr>
<th></th>
<th>Fatal Collision</th>
<th>Injury Collision</th>
<th>Property Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>trucks &gt;4,500 kg</td>
<td>531</td>
<td>8812</td>
<td>37221</td>
</tr>
<tr>
<td>buses</td>
<td>62</td>
<td>2126</td>
<td>7036</td>
</tr>
<tr>
<td>all other vehicles</td>
<td>4563</td>
<td>296662</td>
<td>904355</td>
</tr>
</tbody>
</table>

Source: Transport Canada

There were 1,185 rail accidents in 1994 and 114 fatalities.1 A comparison with figures for years prior to 1992 is difficult as there was a change in reporting requirements. More rail incidents are now reported as accidents. The largest number of accidents in 1994 was accounted for by collisions and derailments in yards, spurs and sidings.

ACCIDENT RATES, 1984 - 1994
(accidents/exposure)

However, for most of the past decade, the largest number of accidents has usually occurred where roads cross railway tracks. According to the Transportation Safety Board of Canada, “approximately half of the deaths in any one year involve motor vehicle occupants in crossing accidents. The other major category of railway-related deaths involves trespassers.”

There were 438 air accidents in 1994 or 380 if only Canadian registered aircraft larger than ultralights are considered.2 The largest proportion of these 380 accidents involved private planes.

In 1994 there were 799 “shipping accidents” (something happened to a commercial boat) and 61 “accidents aboard a ship” (something happened to a person on or associated with a commercial boat) for a total of 860 accidents.3 There were

1 Federally regulated railways only.
2 Oversimplifying. “Accidents” are any occurrence with the operation of an aircraft that involves a serious injury or death, a major damage to or failure of the aircraft, or a missing aircraft.
41 fatalities associated with these accidents. Both figures, the number of accidents and the number of fatalities, are down from the average over the past decade. Over half the accidents and three-quarters of the fatalities in 1994 occurred on fishing vessels.

The number of accidents or fatalities associated with commodity pipelines is very small. The Transportation Safety Board of Canada writes: “A total of 13 pipeline accidents were reported. . . . in 1994, up from 7 in 1993. However, the 1993 figure was unusually low, and the 1994 total is comparable to the annual average of 14 accidents during the preceding three years. . . . There have been no fatalities in reported accidents since 1988.”

In Chart 39, accident rates for each mode of transportation, except marine, are shown over the past decade. The level of these curves is not an indication of the relative safety of one mode in comparison to another. It is simply a function of the scale used. It is not the relative level of the curves that is important; it is the slope of the line. Is the accident rate falling or rising? The best way to answer this is to compare the number of accidents, or fatalities, with some measure of “exposure”—miles of travel, tonnes hauled, hours of flying, etc. Unfortunately, good data on exposure are not always available. That’s why the marine sector is not shown in Chart 39.

For roads, the measure of exposure used here is the number of registered vehicles. It’s a poor measure as it doesn’t reveal how often vehicles are used. One alternative is to use the number of licensed drivers, but this suffers from the same limitation. The figures in Chart 39 suggest that road transportation is becoming somewhat safer, as the number of casualty collisions has now fallen below 100 per 10,000 registered vehicles. In the 1960s and early 1970s, it was usually around 150 casualty accidents per 10,000 vehicles. Chart 40, showing the number of fatalities per 10,000 registered vehicles, confirms this trend. In the 1950s and 1960s, there were 6 to 8 fatalities per year per 10,000 vehicles. This rate dropped steadily during the 1970s to about 4 per year. Now, in the 1990s, the rate is down to about 2 fatalities per 10,000 vehicles and still appears to be falling.

Safety experts speculate on the reasons why roads are becoming safer. They point to the improvements in the road itself (paved shoulders, guard rails, etc.), motor vehicle performance standards (e.g., crashworthiness), the greater use of seatbelts and stricter enforcement of laws against drunk-driving.

The accident rate for railways is shown as the number of accidents per million train kilometres or, in the case of chart 40, the number of fatalities per million train miles. It is difficult to see much of a trend in either Chart 39 or Chart 40.

For aircraft, the accident rate shown excludes the ultralight category as there is no measure of flying hours for these aircraft. Chart 39 suggests that there are between 12 to 15 accidents per year for every 100,000 flying hours. Most of these are accidents involving private planes. In fact, 1993 information shows that the larger commercial carriers (roughly 50,000 or more passengers per year) had an accident rate of only 0.8 for every 100,000 hours. Private airplanes, on the other hand, had an accident rate of 35 for every 100,000 hours. The curves—for all aircraft except ultralight—on either Chart 39 or 40, suggest that both the accident rate, at 12 to 15 per 100,000 hours, and the fatality rate

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4 Accidents and fatalities for the marine sector are those occurring on inland waters or the territorial sea of Canada, or those involving a ship registered or licensed in Canada (plus a few other occurrences). They exclude pleasure craft unless, of course, a pleasure craft is involved with a commercial ship.

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4 The scale used in Chart 39 is the number of casualty accidents per 1,000 registered vehicles. This allows the road mode to be shown in the same graph as other modes.
rate, at 2 to 4 per 100,000 hours, have been relatively constant over the past decade. That is, they have been relatively constant except for the “spike” in the fatality rate in 1991.

The measure of exposure for pipelines is an exajoule\(^5\) of energy which allows natural gas and crude oil to be combined by their respective energy contents. If anything, Chart 39 shows an upward trend in the number of pipeline-related accidents over the last decade. There have been so few fatalities that Chart 40 doesn’t show much at all. The curve on the graph is almost flush with the horizontal axis and, for eight of the eleven years shown, is on the axis (there were no fatalities).

There are no meaningful measures of exposure available for marine vessels, so Chart 41 simply shows the absolute number of fatalities, accidents and vessels lost over the past decade. There is not much of an apparent trend in any of these curves. If it could be shown that marine activity — however measured — had been increasing, this would actually mean the accident or fatality rate had been falling. But, and while this may be likely, it is not possible to prove with available data.

As a final comment on transportation safety — and one that concerns just intercity passenger transportation — a frequently asked question is, “how safe am I when I travel?” The 1992 Royal Commission tried to answer this, but had to admit there is a degree of guesswork in the numbers it developed. Chart 42 shows these numbers. Travelling by air on a major carrier — one fatality every 20 billion passenger-kilometres — is the safest way to get around Canada. The chances of a fatal passenger accident on an airplane operated by a small carrier are 280 times as great. Travelling by car — one fatality every 100 million passenger-kilometres — is 200 times more likely to involve a fatal accident than travel on a major airline.

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\(^{5}\) An exajoule is \(10^{18}\) joules of energy, or roughly 26.2 million cubic metres of crude oil or 26.9 billion cubic metres of gas.
Transportation accounts for thirty percent of energy use in Canada. And most of this energy is from petroleum-based fuels. About 89 percent of all transportation energy comes from refined petroleum products and liquified petroleum gas. Close to eleven percent comes from natural gas but most of this is accounted for by the pipeline companies using the gas themselves.

Given transportation’s dependence on petroleum-based fuels, it is not surprising that transportation accounts for almost two-thirds of all petroleum consumption in Canada. Most of this consumption is by road users and, in particular, automobile owners. Chart 44 shows how the use of petroleum fuels is split among the different sectors of transportation.

Transportation’s demand for petroleum-based fuels peaked in 1980 at 1,958 petajoules of energy (321 million barrels of oil equivalent). This includes all petroleum products used by road transport, rail, air and marine, including fuel used by foreign vessels (planes, vehicles) purchasing fuel in Canada. Since 1980, total demand has fallen — particularly immediately after the two recessions that Canada experienced, but also because the transportation sector is gradually becoming more efficient. This energy efficiency gain can be shown by dividing total energy use (petroleum fuels) by the population. Chart 45 shows this in billions of joules of energy per capita. While it is true that there has been some substitution — natural gas and other alternative fuels — much of the decline is thought to have occurred because newer vehicles are more efficient than older ones.

A major concern about transportation is the pollution associated with this use of petroleum fuels. The figures in Chart 46 show what proportion of total pollutants in Canada arise because of transportation activities.

Carbon monoxide ("CO"), the first emission shown, is a concern because it is bad for human respiratory and cardiovascular systems and is also a contributing factor in the creation of low-level ozone. Road users account for over half of all carbon monoxide emissions in Canada. Volatile organic compounds ("VOC") include the volatile hydrocarbons of unburned fuel. These also contribute to the creation of low-level ozone. Transportation, mostly on the road, accounts for 31 percent of total VOC emissions. The main source of oxides of nitrogen ("NO\_x") is the burning of diesel in internal combustion engines — hence transportation accounts for most of the NO\_x emissions. Nitrogen dioxide is harmful to human health and vegetation. NO\_x also reacts chemically in the formation of ozone and nitric acid, one of the factors in the formation of acid rain. Particulates are little bits of soot from engine exhaust. Some of the material attached to this soot is thought to cause cancer. Most of the transportation sources of particulates is from diesel engines in large trucks and from the use of tires (tire use is included in "other" on the table).

Carbon dioxide is the major cause of global warming and transportation activities account for just over 30 percent of total emissions. Because of Canada’s commitment to stabilize greenhouse gas emissions at 1990 levels by the year 2000, it is anticipated that the transport sector will have to improve its performance, either by reducing the amount of fuel used through a lowering of transportation demand, or by increasing its fuel efficiency. Another possibility is the widespread adoption of programs such as British Columbia’s “Air Care” whereby automobiles and light trucks are inspected annually to ensure they meet clean exhaust standards. Ontario has followed British Columbia’s lead with an voluntary program in the Toronto area.
### TRANSPORTATION’S RESPONSIBILITY FOR AIR POLLUTION

(emissions as percent of total pollutants in Canada)

<table>
<thead>
<tr>
<th></th>
<th>CO</th>
<th>VOC</th>
<th>NO_x</th>
<th>Particulates</th>
<th>CO_2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>autos &amp; small trucks</td>
<td>53.4</td>
<td>22.6</td>
<td>19.4</td>
<td>0.6</td>
<td>15.4</td>
</tr>
<tr>
<td>large trucks</td>
<td>3.0</td>
<td>1.8</td>
<td>15.9</td>
<td>2.5</td>
<td>5.3</td>
</tr>
<tr>
<td>sub-total</td>
<td>56.4</td>
<td>24.4</td>
<td>35.3</td>
<td>3.1</td>
<td>20.7</td>
</tr>
<tr>
<td>Rail</td>
<td>0.5</td>
<td>0.3</td>
<td>6.6</td>
<td>1.7</td>
<td>1.3</td>
</tr>
<tr>
<td>Air</td>
<td>0.5</td>
<td>0.3</td>
<td>0.9</td>
<td>0.1</td>
<td>2.5</td>
</tr>
<tr>
<td>Marine</td>
<td>0.9</td>
<td>1.2</td>
<td>2.3</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Other*</td>
<td>15.2</td>
<td>4.8</td>
<td>15.2</td>
<td>5.1</td>
<td>4.6</td>
</tr>
<tr>
<td>TOTAL Transportation</td>
<td>73.5</td>
<td>30.9</td>
<td>60.4</td>
<td>10.4</td>
<td>30.5</td>
</tr>
</tbody>
</table>

Emission levels for 1990, except 1993 for CO_2.

* Includes propane and natural gas powered vehicles, emissions from tires, off-road use of gasoline, and diesel engines used in various machines (forestry equipment, etc.).

Source: Environment Canada, Pollution Data Branch

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"Canada will encourage and implement opportunities to reduce energy consumed and emissions released in transporting people and goods."

*Canada’s National Action Program on Climate Change - 1995*
2. Transportation and the Economy
   - Chart #3: calculated from Chart #2.
   - Chart #4: RCNPT, Vol 2, Table 2.1; the quotation is from Vol 1, p 2.

3. Transportation Volumes
   - Ferry passenger-km: Leore, Table C-5.3.
   - Chart #5: RCNPT, Vol 2, Table 2(2)-5.
   - Annual growth rate in passenger-km per capita: calculated from RCNPT, Vol 2, Table 2(2)-8. Annual growth rate in passenger-km: Leore, Table C-6.1.
   - Chart #6: StatsCan #87-504.
   - Chart #7: StatsCan #66-201.
   - Intercity trips per capita: calculated from the 1992 data in Charts #6 & #7, divided by the July 1/92 population shown in StatsCan #91-002, Vol 8, no 4.
   - Chart #8: bus - StatsCan #53-215; rail - StatsCan #52-216; air - StatsCan #51-206; ferry - StatsCan #54-205.
   - Chart #10: Canadian Urban Transit Association
   - Chart #11: truck - StatsCan’s #50-002, Vol 11, no 1; rail - StatsCan’s #52-216, Table 5.1 ("transborder" = tonnes rec’d from US rail + tonnes delivered to US rail - tonnes rec’d from US rail and also delivered to US rail); air - StatsCan #51-206; marine - StatsCan #50-002, Vol 11, no 5; oil pipelines - StatsCan #55-201 “net receipts of crude oil into pipelines”; gas pipelines - StatsCan #57-205, Table 4 “total gross receipts”
   - Chart #12: truck - StatsCan #53-222; rail - StatsCan #52-216, Table 5.1; air - 1991-1993 as reported in StatsCan #51-206, 1980-1990 as reported in Leore, Tables C-1.2, C-1.3 and C-1.4.
   - Preliminary 1994 rail data: NTA 1994 Annual Review

4. Infrastructure and Vehicles
   - Chart #14: survey of provinces, territories and federal departments
   - Chart #15: StatsCan & TAC data shown in Leore, Table C-4.1 plus, for 1995, data from Chart #14 converted to route km.
   - Chart #16: from Chart #14
   - Information on km of road per thousand people: International Road Federation and the World Bank, reported in The Economist, June 10/93, p 72. Calculation for Canada is based on the estimated route lengths from Chart #14 divided by the 1995 population estimated in StatsCan #91-002, Vol 8, no 8. The 1992 information from the United States is calculated from US Bureau of Transportation Statistics data.
   - Chart #17: road lengths from Chart #14; Jan 1/95 population from StatsCan #91-002, Vol 8, no 8; vehicles for 1993 from StatsCan #53-219
   - Estimate that the top 5% of the network accounts for half of the VKT: author’s own. The two estimate of total VKT are from RCNPT staff estimate (Vol 2, p 72) and Nix, Boucher & Hutchinson, Vol 4 of the RCNPT report, p 1017.
   - Chart #18: from tables put together by Christian Beauregard of Transport Canada.
   - Chart #19: StatsCan’s #53-219.
   - Chart #20: StatsCan #53-219.
   - Chart #21: StatsCan #52-216.
   - Chart #22: StatsCan #52-216.
   - Rail & road crossing: TSBC’s 1993 report on rail (p 3).
   - Chart #23: StatsCan #52-216.
   - Number of certified airports, information on 26 NAS airports, and description of air navigation services: Transport Canada, 1995.
   - Chart #24: StatsCan #51-005.
TRANSPORTATION IN CANADA:

- Total registered aircraft: TSBC
- Chart #25: (thanks to A. Mathieson) column 2 - Transport Canada TP2468; column 3 - large carrier fleet from StatsCan #51-206, small carrier fleet is the residual; column 4 - Air Canada and Canadian Airline’s, plus affiliates, from NTA 1994 Annual Review, “other” is a residual.
- Chart #26: StatsCan #54-205, Table H7.
- Number of registered vessels and total vessel movements: TSBC.
- Description of Canadian merchant fleet and Canadian-based companies that register ships abroad: NTA 1994 Annual Review, p 147 & 223.
- Chart #28: StatsCan in #55-201 & StatsCan in #57-205.

5. Transportation Businesses
- Chart #29: line 1 - StatsCan #53-222; line 2 - StatsCan #50-002, Vol 9, no 3 as revised in Mathieson & Leduc, 1993 and as still further revised by Gilles Paré (telephone); line 3 - StatsCan #50-002, Vol 11, no 4; line 5 - StatsCan, #53-222, Sect 6; line 6 - StatsCan #53-215; line 7 - StatsCan #53-215; line 8 - StatsCan #53-215; line 9 - StatsCan #53-215; line 10 - RCNPT, Vol 2, p 4; line 11 - StatsCan #52-216 (number of rail companies based on information from Friend & Moore, 1995); line 12 - StatsCan #51-206; line 13 - total airlines from NTA 1994 Annual Review, leaving 727 as a residual; total aircraft from Chart #25; line 14 - StatsCan #50-002, Vol 11, no 4; line 15 - the number of vessels shown is the difference between the total fleet (excl. fishing) shown by the TSBC (23,953) and StatsCan number in #50-002; line 16 - StatsCan #55-201 & #57-205. Revenues, in the case of gas pipelines, includes only “transportation system revenues” ($5.58b), less the cost of gas purchased ($2.89b) for a net of $3.29 in gas transportation services.
- Canada Post Corp revenues: Financial Post.
- Chart #30: StatsCan #53-222 & #50-002 (Gilles Paré provided some of the large-carrier numbers.)
- Number of farm trucks included in the +500,000: Nix, 1994.
- Chart #31: StatsCan #53-215.
- Number of communities served by bus: Long, 1994; number of bus passengers: StatsCan #53-215; most recent information (for carriers with $1 million or more in revenues): StatsCan #53-003, Vol 46, no 12; operating ratio for school bus operators: StatsCan #53-215.
- Chart #32: StatsCan #53-215.
- Chart #33: StatsCan #52-216.
- Number of railways: the 3 major plus those listed by Friend & Moore, 1995; CN & CP share of total freight revenues in 1993: StatsCan #52-216; length of mainline track: StatsCan #52-216, Table 3.2; CN financial results for 1994: Financial Post; CP Rail financial results: annual report; the 90% of tonnage on 40% of the track: Moore & Long, 1995; number of new short-lines: Friend & Moore, 1995; government paper quoted: Transport Canada, 1995; increase in ton-km per employee: NTA 1994 Annual Review.
- Chart #34: StatsCan #52-216 & Kolaitis, 1995.
- Number of air carriers: NTA 1994 Annual Review (p 45); number of licensed foreign air carriers: NTA 1994 Annual Review (p 45); foreign air carriers serving Canada: StatsCan #5-005 (A. Mathieson); financial results for 1994: Financial Post.
- Chart #36: StatsCan 54-205 and (for 1993) StatsCan #50-002.

6. Transportation Safety
- Vehicles involved in fatal, injury or property damage accidents: Paul Gutowski, Transport Canada.
- All other road safety references are from Transport Canada and all safety references to other modes are from the TSBC except for Chart #42 which is from RCNPT, Vol 1, p 183.
7. Energy and the Environment

- Chart #43: StatsCan #57-003.
- Chart #44: StatsCan #57-003. Note that the petroleum consumption figures have been adjusted by adding non-transport sector's use of certain fuels back to various transport modes.
- Chart #46: 1990 information supplied by Environment Canada, Pollution Data Branch in a paper dated Jan 20, 1995. The 1993 CO\textsubscript{2} figures are from a paper with the date March 9, 1995.

Description of each emission: based on the RCNPT's description (Vol 2, pp 191-195) and on the VHB paper in Vol 4 of the RCNPT report. A large portion of the "other" category shown in the table is, in fact, road vehicles. However, as there is no ready way to split this between cars and small trucks, large trucks, and other non-road vehicles, these numbers have been shown without associating them with a mode. SO\textsubscript{2} has not been included in the discussion as transportation sources only account for 4.1\% (1990) of the total.
REFERENCES


Canada’s National Action Program on Climate Change - 1995, draft.


{NTA} Canada. National Transportation Agency:


Statistics Canada:

Canadian Economic Observer, Historical Statistical Supplement, Cat #11-210
Gross Domestic Product by Industry, Cat #15-001
Gross Domestic Product by Industry, Cat #15-512
Surface and Marine Transport - Surface Bulletin, Cat #50-002
Air Carrier Traffic at Canadian Airports, Cat #51-005
Canadian Civil Aviation, Cat #51-206
Rail in Canada, Cat #52-216
Passenger Bus and Urban Transit Statistics, Cat #53-003
Passenger Bus and Urban Transit Statistics, Cat #53-215
Road Motor Vehicles - Registrations, Cat #53-219
Trucking in Canada, Cat #53-222
Shipping in Canada, Cat #54-205
Oil Pipeline Transport, Cat #55-201
Quarterly Report on Energy Supply - Demand in Canada, Cat #57-003
Gas Utilities, Cat #57-205
International Travel, Travel Between Canada and Other Countries, Cat #66-201
Domestic Travel, Canadians Travelling in Canada, Cat #87-504
Quarterly Demographic Statistics, Cat #91-002
Transport Canada:

{TSBC} Transportation Safety Board of Canada:


TRANSPORTATION IN CANADA: