The Conference Board of Canada

SASKATCHEWAN CHAMBER of COMMERCE

The Impact of Rail Access on Saskatchewan's Export Potential

Final Report

March 2015

About

The Conference Board of Canada

We are:

- The foremost independent, not-for-profit applied research organization in Canada.
- Objective and non-partisan. We do not lobby for specific interests.
- Funded exclusively through the fees we charge for services to the private and public sectors.
- Experts in running conferences but also at conducting, publishing and disseminating research, helping people network, developing individual leadership skills and building organizational capacity.
- Specialists in economic trends, as well as organizational performance and public policy issues.
- Not a government department or agency, although we are often hired to provide services for all levels of government.
- Independent from, but affiliated with, The Conference Board, Inc. of New York, which serves nearly 2,000 companies in 60 nations and has offices in Brussels and Hong Kong.

Contact

The Conference Board of Canada
Ottawa Headquarters
255 Smyth Road
Ottawa ON K1H 8M7

Contents

Executive Summary

Saskatchewan's economy is strong and growing. In the last seven out of 10 years, Saskatchewan's growth has exceeded the national average. The Conference Board of Canada forecasts that Saskatchewan's long-term growth will also be greater than Canada overall between 2014 and 2035. The province's growth has depended on international exports. In 2013, Saskatchewan had just over $32 billion in exports, which was the equivalent to 40 per cent of its nominal GDP. At $29,000, Saskatchewan's exports per capita in that year were highest in Canada.

At the same time, getting exports to market is a greater challenge for Canada than many countries and within Canada, a greater challenge for Saskatchewan than for other provinces. This is a function of the fact that ocean transport is the cheapest form of bulk freight transportation, but Saskatchewan is thousands of kilometres from Canada's major international ports.

Exports and Rail Transportation

Saskatchewan feeds and fuels many parts of the world through its exports of agri-food products and fertilizer inputs, along with crude oil and uranium. Crude oil remains the province's largest export by value, followed by potash and a variety of agricultural exports.

Table ES1. Export Values and Volumes of Saskatchewan's Ten Largest International Commodity Exports in 2013.

Commodity	Value ($CAD millions)	Volumes (thousand tonnes)	Value per Tonne ($CAD)
Crude oil	11,854	20,037	591.61
Potash (KCl)	5,580	15,342	363.71
Wheat	3,359	9,701	346.25
Canola seed	2,051	3,303	620.95
Canola oil	1,425	1,156	1,232.70
Lentils	1,149	1,767	650.25
Peas	1,110	2,576	430.90
Canola seed oil-cake and meal	686	1,768	388.01
Uranium	606	5.6	108,214.29
Other cereals: oats, barley; canary seeds	502	1,484	338.27

Traditionally, crude oil exports have found their way to markets in the United States (US) via pipeline while uranium exports are often trucked to port due in part to the high per-tonne value of uranium. The rest of the major exports, for the most part, rely on rail either to directly access the US market or to make their way to ports. As pipeline access becomes increasingly constrained, rail has also started to play a larger role in carrying crude oil. Using data from the 2012 Rail Commodity Origin and Destination Statistics survey (RCOD) and calculations of the approximate value of these rail shipments, it is estimated that over 30 million tonnes and over $14 billion of the province's exports rely on rail for at least part of their journey to their final destination. This is close to half of the province's exports by value.

Table ES2. Saskatchewan's Largest Rail Commodities, Quantity and Estimated Value, 2012.

Rail Commodity	Harmonized System Commodity	Quantity transported by rail (thousands of tonnes)	Total estimated value ($CAD millions)
Potash	Potash	12,548	5,399
Wheat	Wheat and durum	7,934	2,800
Canola	Canola seed	2,777	1,751
Canola oil	Crude and refined canola oil	1,297	1,631
Fresh, chilled or dried vegetables	Lentils and peas	1,804	923
Fuel oil and crude petroleum	Crude oil	1,439	857
Other cereals	Barley, rye, oats, corn, millet, canary seed, other cereals	1,833	562
Animal feed	Canola meal	836	292
Other refined petroleum and coal products	Bitumen, coal, peat, coke	87	88
Total		30,556	14,303

Rail Transportation Challenges

Nationwide, commodity shippers in particular have voiced concerns that the availability of rail transportation is not meeting shipper demand. For example, grain shippers have stated that they are frequently left with full grain elevators, and are unable to accept additional grain from producers as trains are not supplied in a timely fashion, or in sufficient quantity, etc. 2013-14 was a record year for crop production, and large quantities of harvested grain were unable to get to market because of the high demand for rail freight transportation and poor weather conditions. The railways simply did not have sufficient capacity to meet the significant spike in grain supply. As a result, much of the 2013 harvest had to be stored for prolonged periods of time on the farms as grain elevators were at maximum capacity, depriving farmers of anticipated income and reducing the value of the harvested crops. The grain industry bore the brunt of these costs, but it was by no means exclusive to them; potash shipment were also well behind where they could have been, triggering a decrease in production. Despite the challenges, railways collectively did deliver 22 per cent more grain from Western Canada in the 2013-14 crop year than they did in the previous year.

Plan for Growth

The Province of Saskatchewan has an ambitious Growth Plan that targets $59 billion in exports by 2020 – a doubling of 2011 export values. In order to meet this target, rail transportation will certainly have to play a key role. The extent to which rail transportation demand would increase depends on the mix of commodities that make up that growth, as well as how much price (rather than volume) increases contribute to export growth. Using a plausible set of assumptions, which addresses 71 per cent of the $59 billion target, it was possible to estimate the increase in railway originating tonnes for three broad categories of exports: potash, petroleum products and agri-food products (which includes canola oil and meal in addition to crop production). Overall, the minimum growth in railway originating tonnes from Saskatchewan implied by the Plan for Growth is over 20 million tonnes.

Table ES3. 2020 Projected Increase in Railway Originating Tonnes from Saskatchewan, Key Commodities (thousands of tonnes)

Commodity	2012 Actual	2020 Projection	Net Increase
Potash	12,548	21,575	9,027
Petroleum products	1,526	7,720	6,194
Agri-food products	16,481	21,340	4,859
Summed across commodities	30,555	50,635	20,080

Rail Freight and Logistics Costs

As noted above, the value of many of Saskatchewan's key exports range from roughly $300 to $700 per tonne (the main exception being uranium). But the value of a given commodity depends on where it is. For example, the value of canola at the farm gate is different than it is at the port of export and different again from the value at the port of import. Rail transportation and logistics costs are the key reasons for these price differences.

For many of Saskatchewan's key exports, logistics costs and particularly rail transportation account for significant portions of prices that buyers eventually pay. Rail freight costs alone can account for up to 20 per cent of prices and when including other logistics costs this can increase to 30 per cent or more. Reducing those costs then has the potential to lower prices to buyers, expand the global reach of Saskatchewan's exports, or return a higher portion of the export price to exporters.

Rail and Supply Chain Investments in Capacity

After what was a period of gradual decline, there have been significant ongoing and planned investments in key rail corridors, rolling stock, and inland and port storage facilities over the past several years. Perhaps one notable exception is investment in the hopper car fleet. The current fleet is aging and the replacement of the fleet would help to increase grain hauling capacity, since newer cars could increase the carrying capacity of grain unit trains by up to 25 per cent. For at least some international players who compete against Canadian and especially Saskatchewan-based exporters, fewer of these investments – and some not at all – are required. This is a function of the natural geographic advantage that many of these competitors have.

The Economic Impact of Rail Service on Saskatchewan's Economy

As previously noted, the implications of the province's Plan for Growth for the rail system is, at minimum, an additional 20 million tonnes of goods originating from the province by 2020 (relative to 2012). This represents almost a 50 per cent increase in originating tonnage. In order to estimate the potential economic impact resulting from a limitation of railway or rail-based supply chain infrastructure, two alternate scenarios were created where the rail-based supply chain was only able to handle up to 80 or 90 per cent (20 or 10 per cent of demand unmet) of the projected minimum growth in railway originating tonnes for 2020. The negative provincial economic impact (including direct, indirect and induced effects) in these scenarios is estimated to be approximately $3.6 billion and $1.8 billion, respectively.

Table ES4. Estimated Provincial Economic Impact of Rail Export Commodities from Saskatchewan, 2020 (millions $nominal)

Rail Commodity	NAICS Industries	Projected rail commodity export value	Projected GDP impact of rail exports	GDP Impact of Unmet Demand	
				10 per cent unmet	20 per cent unmet
Petroleum products	Non-conventional oil extraction; petroleum refineries	5,406	2,146	-215	-430
Potash	Potash mining	9,238	8,472	-847	-1,694
Agri-food products	Crop production; grain and oilseed milling; animal food manufacturing	11,180	7,438	-744	-1,487
Total		25,825	18,055	-1,806	-3,611

The 80 per cent scenario is considered to be particularly extreme, as it implies that only half of the projected growth in demand for originating tonnage is met by 2020. The 90 per cent scenario could also be considered unlikely; rather than strictly eliminating tonnage it is more probable that unreliable service issues would eat into the profitability of shippers by increasing their cost base or by reducing the price that they receive for their products. This lower profitability scenario would still negatively impact the GDP, the degree to which would be difficult to calculate but would likely be lower than the forecasted scenarios.

Conclusion

Potential recommendations for improving the efficiency of Saskatchewan's rail-based supply chains and ensuring that they will not be a constraint to export growth in the future include:

• *Investigating the full impacts of the Maximum Revenue Entitlement (MRE).* The MRE is a limit on the average revenue per tonne that railways can earn on the shipment of regulated grains from Western Canada to the Port of Thunder Bay or to ports in British Columbia. As 15 years have passed since the MRE was implemented, a full and public review is warranted.

• *Reducing the cost of shipping by rail to and from the province.* Railways pay nearly $40 million in fuel taxes annually to the Saskatchewan government as a result of a particularly high provincial fuel tax per litre (15 cents per litre). Given the dependence on railways to get products to market, it makes sense to at least bring fuel taxes in line with other provinces.

• *Encouraging greater and timelier communication across the logistics supply chain.* Better and timelier sharing of information can help shippers and railways prepare for disruptions. For example, faster real-time information from the railways to shippers when they become aware that delays will occur will help shippers avoid labour overtime costs.

• *Increasing coordination with governments and infrastructure providers outside of the province.* Saskatchewan and its economy has as direct an interest in investments and efficiencies at Port Metro Vancouver, Prince Rupert and Thunder Bay as it does in investments in freight infrastructure within the province. As a result, the Government of Saskatchewan has as much interest in being involved in supporting those investments either directly or indirectly.

• *Increasing supply chain options and redundancy.* For Saskatchewan – a province that is more landlocked than any other – any increased redundancy in terms of routing options to export markets is valuable. Whether this means helping to fund ice-breaking capacity on the Great Lakes and St. Lawrence Seaway or more indirect methods of enabling redundancy, it is a factor that should be considered if export growth continues to be a provincial priority.

• *Considering the full effects of legislative solutions while focussing efforts on long-term rather than short-term solutions.* Policies such as the Order-in-Council, which specified the minimum amount of grain to be moved may have unintended consequences. The possibility of such unintended consequences undermining supply chain efficiency should be considered and monitored.

• *Determining the current capacity and the "right size" of on-farm storage.* The extent of on farm grain storage is currently unknown, but the need for storage was painfully evident during the 2013-14 crop year. Policymakers should investigate the barriers, financial or otherwise, to investing in more on farm storage in order to determine the value in some solutions.

• *Determining the Impact of Pipeline Expansion Opportunities.* The growing role played by rail in transporting crude oil is largely a result of current pipeline access becoming increasingly constrained. Governments need to make a concentrated effort to work through the political intricacies that have bottlenecked pipeline expansions and determine the impact, if any, on rail service for other commodities.

• *Examining Alternative Hopper Car Purchasing Arrangements.* The grain hopper car fleet in Canada is aging and in need of replacement. Newer cars are both shorter and lighter and as a result contribute to an increase in the carrying capacity of approximately 25 per cent per train. The federal and provincial governments should identify and remove the barriers to new hopper car purchasing, as it relates to potential ownership by railways, shippers, or third-parties.

Chapter 1
Introduction

For much of Saskatchewan's history, there was little need to plan for growth.[1] To illustrate, Saskatchewan's population in 1931 was actually greater than it was in 1976. But due to its rich resource endowment, policy changes and a fundamental shift in global demand for resources, Saskatchewan is now positioned for long-term growth. In the last seven out of 10 years, Saskatchewan's growth has exceeded the national average. The Conference Board of Canada forecasts that Saskatchewan's long-term growth will also be greater than Canada overall between 2014 and 2035. Over that time, it is forecasted that the province will see its population increase from around one million to over 1.4 million people.

The Saskatchewan Chamber of Commerce was one of the first organizations to recognize that Saskatchewan had entered a new phase of sustained and high growth necessitating long-term planning. The Chamber's Sustainable Growth Strategy for the New Saskatchewan (2007) laid out a vision for sustained growth until the year 2030.[2] The strategy identified 21 key targets for growth ranging from broad indicators like population, population age structure and gross domestic product (GDP) to specific targets on private sector investment, medium-sized business formation and aboriginal educational attainment.

The idea was for the Chamber to use this strategy as a framework for encouraging governments and the private sector to position for long-term growth. This positioning would particularly influence public and private sector capital expenditure plans. Capital expenditure is inherently long term and creates the capacity for growth. Without new roads, schools and housing, population increases cannot be accommodated. Without increases in capital and population, Saskatchewan will not realize its growth potential.

Following the Chamber's lead, the Government of Saskatchewan issued the Saskatchewan Plan for Growth: Vision 2020 and Beyond in 2012.[3] The plan was projected over a shorter time period than the Chamber's plan, looking forward to 2020. However, similar to the Chamber's plan, it targeted a wide variety of indicators organized under six core growth activities including:

- Infrastructure investment
- Skilled workforce investments
- Competitiveness
- Increased trade activity
- Building on natural resource strengths
- Fiscal responsibility

1 Grant, *Green Machine*, 1.

2 See Saskatchewan Chamber of Commerce, *Sustainable Growth Strategy*.

3 Government of Saskatchewan, *Saskatchewan Plan for Growth*, 4.

One of the specific goals in the Plan for Growth was doubling the value of Saskatchewan's exports by 2020. The value of Saskatchewan's exports are determined by two factors: the prices of Saskatchewan's major exports and the volume of shipments to foreign markets. The volume of shipments is very much related to global demand for Saskatchewan resources and agricultural products. Under the right conditions, companies will put capital in place to meet this demand if they believe they can do so profitably. As shown in this report, the incremental demand (which matters most to growth) for Saskatchewan's exports are most likely to come from distant and emerging markets, especially the Asia Pacific and Brazil.

Clearly Saskatchewan's private companies are positioning to respond to global demand for Saskatchewan's products. For instance, Saskatchewan potash producers have averaged $2.8 billion in new capital expenditures (CAPEX) from 2010 to 2013.[4] Given the right price incentives, Saskatchewan's potash producers could easily double export values by 2020.

The countries driving higher exports are far flung from land-locked Saskatchewan. As explored in this report, the only economic way for Saskatchewan's resources to reach key export growth markets is through a lengthy, relatively expensive, rail journey followed by an even lengthier, relatively inexpensive ocean voyage. Saskatchewan mine and grain terminals are roughly 1,800 kilometers as the crow flies from Port of Vancouver and between 2,500 to over 3,000 kilometers by rail. It is not enough for Saskatchewan-based producers to put in productive capacity. If Saskatchewan is to reach its export target for 2020, Canada's two main rail carriers, Canadian National Railway (CN) and Canadian Pacific Railway (CP), need to match their shipment capacity to producers' production capacity. Moreover, other partners in the extended logistics supply chain – grain handlers, terminal operators, ports and ocean carriers among others – need to and have been making investments and operational improvements to match that capacity as well.

It is not just capacity that matters: it is also how the capacity is managed on a day-to-day basis. CN and CP are commercial enterprises that prioritize shipments in ways that may not always align with Saskatchewan's interests. Canadian railways also have common carrier obligations and are governed by federal legislation that shapes their incentives for investing in and managing capacity. Perhaps most importantly, beyond just the railways, the day-to-day decisions that are made by one supply chain partners have an impact on the operations of other partners and the capacity of the logistics supply chain as a whole.

4 Saskatchewan Ministry of Energy and Resources, Statistical Summary.

The rail system is increasingly coming under strain. This was most apparent during the severe winter of 2013, which resulted in very poor reliability and high levels of idle inventory. Even the President and CEO of CP Hunter Harrison acknowledges a need to improve system performance, recently commenting, in the context of merger discussions with CSX, that the North American rail system is "approaching a time when none of this works."[5] If Saskatchewan is going to reach its export target for 2020, it is imperative that it works with Canada's two major railways and supply chain logistics partners to ensure effective service to its exporters.

Purpose

The purpose of this report is to demonstrate the importance of the rail freight transportation system to Saskatchewan's economy and to analyze the extent to which disruptions in that system can act as a barrier to Saskatchewan reaching its export target by 2020.

Methodology

The report is based on a number of methodologies. This includes interviews with informed observers drawn from shippers, carriers and producers. A thorough review of the relevant literature was also conducted. In addition, data from a variety of sources including Statistics Canada (specifically the Canadian International Merchandise Trade Database and Rail Commodity Origin and Destination Statistics), the grain transport monitor Quorum Inc., CN and CP annual reports, and shipper reports was collected and analyzed.

Using interviews, literature, and data, a model that relates export demand to demand for railway capacity was constructed. This model allowed for an estimate of the extent to which Saskatchewan's export growth targets will rely on railway capacity. From this, the extent to which rail bottlenecks that fall short of that capacity may limit the economic growth of Saskatchewan's economy by 2020 was estimated.

Organization of the Report

The report is organized in a series of chapters. Chapter 2 develops a framework for understanding why exports are important and which exports will need to increase if Saskatchewan is to meet its export targets. Chapters 3 and 4 show why rail transportation is especially important to the realization of Saskatchewan's export targets. This helps to create an understanding of where discontinuities may arise between the production capacity of shippers and rail capacity to move shipper products. Chapter 5 looks ahead at rail capacity and Chapter 6 works through the implications for Saskatchewan's exports and the likelihood of Saskatchewan reaching its 2020 export target.

5 Krugel, *Rail Mergers*.

Chapter 2
Why Exports Matter

This chapter reviews the province's key exports and export markets. This sets the context for why exports matter to Saskatchewan and why rail transportation is so important to exports.

Why Care About Exports?

Exports are not an end in themselves. Exports are important if they contribute to value added or gross domestic product (GDP). GDP is closely related to private and public spending, which ultimately drives living standards.

Jurisdictions differ greatly in their dependence on exports to create domestic value added. Countries with large domestic markets and an abundance of resources are less reliant on exports than are countries with an abundance of resources, but relatively small domestic market. The United States is a good example of a country that actually does not depend on exports to drive domestic value added. According to the World Bank, in 2012 exports accounted for only 12 per cent of US GDP.[5] In that same year, exports were 30 per cent of Canada's GDP.

Overall, Canada is very dependent on exports to drive GDP. But within Canada, exports are even more important to particular low population/resource rich provinces like Saskatchewan. In 2013, Saskatchewan had just over $32 billion in exports, which was the equivalent to 40 per cent of its nominal GDP.[6] Put another way, Saskatchewan's exports per capita in that year were about $29,000 dollars. Saskatchewan's exports per person are the highest in Canada. This is a natural outcome of its rich resource endowment combined with its relatively small population, a matter of comparative advantage.

Clearly exports are key to Saskatchewanians' living standards.

Which Exports?

Saskatchewan's export economy relies predominantly on a relatively few very large export commodities that fall into three broad categories: grains and other agricultural products, crude oil, and potash. The top ten export commodities (by monetary value; as reported in Statistics Canada's Canadian International Merchandise Trade Database, CIMTD) are listed in Table 1, with their exported values and quantities for 2013.

5 World Bank, *World Development Indictors*.

6 Statistics Canada CANSIM table 228-0060.

Table 1. Export Values and Volumes of Saskatchewan's 10 largest International Commodity Exports in 2013.

Commodity	Value ($CAD millions)	Volumes (thousand tonnes)	Value per Tonne ($CAD)
Crude oil	11,854	20,037	591.61
Potash (KCl)	5,580	15,342	363.71
Wheat	3,359	9,701	346.25
Canola seed	2,051	3,303	620.95
Canola oil	1,425	1,156	1,232.70
Lentils	1,149	1,767	650.25
Peas	1,110	2,576	430.90
Canola seed oil-cake and meal	686	1,768	388.01
Uranium	606	5.6	108,214.29
Other cereals: oats, barley; canary seeds	502	1,484	338.27

Note: Crude oil tonnage was estimated from the volumes reported by Statistics Canada.
Sources: Statistics Canada; The Conference Board of Canada.

Collectively, the value of the exported commodities listed in Table 1 was $28.2 billion (nominal), meaning that these commodities accounted for 88 per cent of the $32.4 billion of international exports from Saskatchewan in 2013.

Volumes and tonnage are highlighted in Table 1 because this is important in understanding how exports relate to rail capacity. Essentially, railways are high fixed cost businesses. Value is important because it is an indicator of a shipper's ability to pay fixed costs. But volumes are also important because of the way rail shipments are organized and the stress that tonnage places on the system in terms of locomotive power, railcar and labour requirements.

Railways are most economical when they have high volumes and, all things being equal, will lean toward assigning capacity to high volume and high value shipments. During our interviews, shippers claimed that their shipments were giving lower priority due to increased shipments of crude by rail. One might point to the higher value of crude per tonne as an explanation. In this light it is also interesting to note that pulses and oil seeds also have high value per tonne.

Petroleum Products

Two rail commodities are considered in this section: fuel oil, crude oil, and other refined petroleum and coal products.

According to the National Energy Board of Canada (NEB), Saskatchewan produced 0.47 Mbbl/d (million barrels per day) of crude oil in 2012, of which 0.16 Mbbl/d was conventional light oil and 0.31 Mbbl/d was conventional heavy oil.[7] The NEB maintains low, reference, and high crude oil production forecasts by province by oil type until 2035. Other organizations, such as the Canadian Association of Petroleum Producers (CAPP), provide forecasts as well.

According to the Government of Saskatchewan:

> *Saskatchewan produces significant petroleum volumes from four major regions: Lloydminster, Kindersley-Kerrobert, Swift Current, and Weyburn-Estevan.*
>
> *The province has an . . . refinery owned by Federated Co-op at Regina, an asphalt refinery at Moose Jaw, as well as two upgrading operations for heavy oil: one in Lloydminster, owned by Husky Energy, and one in Regina, owned by Federated Co-op. The upgraders process heavy oil into a light synthetic oil which is easier to transport and has a higher value.*

The upgrader in Lloydminster is run by Husky Energy, and converts 82,000 bbl/d[8] of heavy oil "from deposits in northeastern Alberta and western Saskatchewan and bitumen from Husky's Tucker oil sands project" into light crude oil. The refinery produces petroleum coke as a by-product, which Husky sells both in North America and abroad.[9]

The Federated Co-op refinery has a capacity to upgrade and refine approximately 135,000 bbl/d.[10] It produces refined petroleum products as well as a variety of by-products.[11]

The refinery in Moose Jaw is run by Gibsons and "processes over 6.3 million barrels (1,000,000 cubic metres) of crude per year, which produces approximately 2.80 million barrels (445,000 cubic metres) of asphalt."[12]

Table 2 lists the major crude oil loading facilities in Saskatchewan (as well as an additional facility in Manitoba that is in close proximity). The Canadian Association of Petroleum Producers (CAPP) notes that as of Q2 2014, approximately 50 per cent of loading capacity in Western Canada is currently used (with the rest expected to ramp up over time).

7 National Energy Board, *Canada's Energy Future 2013*.

8 CAPP, *Canadian and U.S. Crude Oil Pipelines and Refineries*.

9 Husky Energy, *Lloydminister Upgrader*.

10 CAPP, *Canadian and U.S. Crude Oil Pipelines and Refineries*.

11 E-mail confirmation with representative from Federated Co-operatives Limited.

12 In other words, the Gibsons plant processes 0.17 Mbbl/d of crude oil and produces 0.077 Mbbl/d of asphalt averaged over the whole year. Gibsons, *Moose Jaw Refinery*.

Table 2. Major Crude Oil Loading Facilities in Saskatchewan

Company	Location	Capacity (bbl/d)	Status	Oil type
Crescent Point	Dollard	27,000	Operating; expansion Q2 2014	WCSB (heavy)
TORQ Transloading	Kerrobert	168,000	Q3 2014	WCSB (heavy)
Altex	Lashburn	90,000	Operating; Expansion Q1 2015	WCSB (heavy)
TORQ Transloading	Lloydminister	22,000	Operating	WCSB (heavy)
Ceres Global	Northgate	35,000	Q2 2014 (expandable to 70,000 bbl/d)	Bakken (light)
Crescent Point	Stoughton	45,000	Operating	Bakken (light)
Altex	Unity	19,000	Operating	WCSB (heavy)
TORQ Transloading	Unity	36,000	Operating	WCSB (heavy)
Tundra	Cromer, MB	60,000	Operating; Expansion Q2 2014	Bakken (light)

Sources: CAPP, Crude Oil Forecast; United States Department of State, Final Supplemental Environmental Impact Statement, Table C-10.

Where there is disagreement between the CAPP and US DoS source, the CAPP source is used. Cromer, MB facility is listed as it is connected to Enbridge's pipeline network in the Bakken.

Key Export Markets

Crude oil is, by a wide margin, Saskatchewan's largest export when measured by value.[13] This has become increasingly true over the past decade as oil prices have increased, and production and exports have increased as a result. The oil exported from Saskatchewan is predominantly heavy crude. In 2012, 65 per cent of crude oil produced in Saskatchewan was conventional heavy crude, with the remaining 35 percent composed of conventional light crude.[14]

North American markets are hungry for crude and Saskatchewan's exports are small in relationship to total oil demand. Moreover, there is a well-developed pipeline system to ship crude within North America, although bottlenecks have developed because of political intransigence on pipeline expansions such as the Keystone XL Pipeline. As such, crude producers are shipping more crude via rail than has traditionally been the case.

Crude oil produced in Canada either remains in Canada or is transported to the US. As shown in Chart 1, most crude oil that is exported from Saskatchewan by rail is transported to the US. In this figure the significant growth in rail transport of crude oil from Saskatchewan between 2011 and 2012 is also visible. Most of the additional rail shipments were destined to the US, but additional oil was also transported to Atlantic Canada (such as the Irving Oil Refinery in Saint John, NB) and Ontario.

13 For each commodity, data were extracted from Statistics Canada's *Canadian International Merchandise Trade Database*, which provides customs-based statistics on provincial commodity exports (both volumes and values) and the destinations of these exports.

14 Statistics Canada, CANSIM Table 126-0001.

Chart 1. Rail Transport Destinations of Fuel Oil and Crude Petroleum

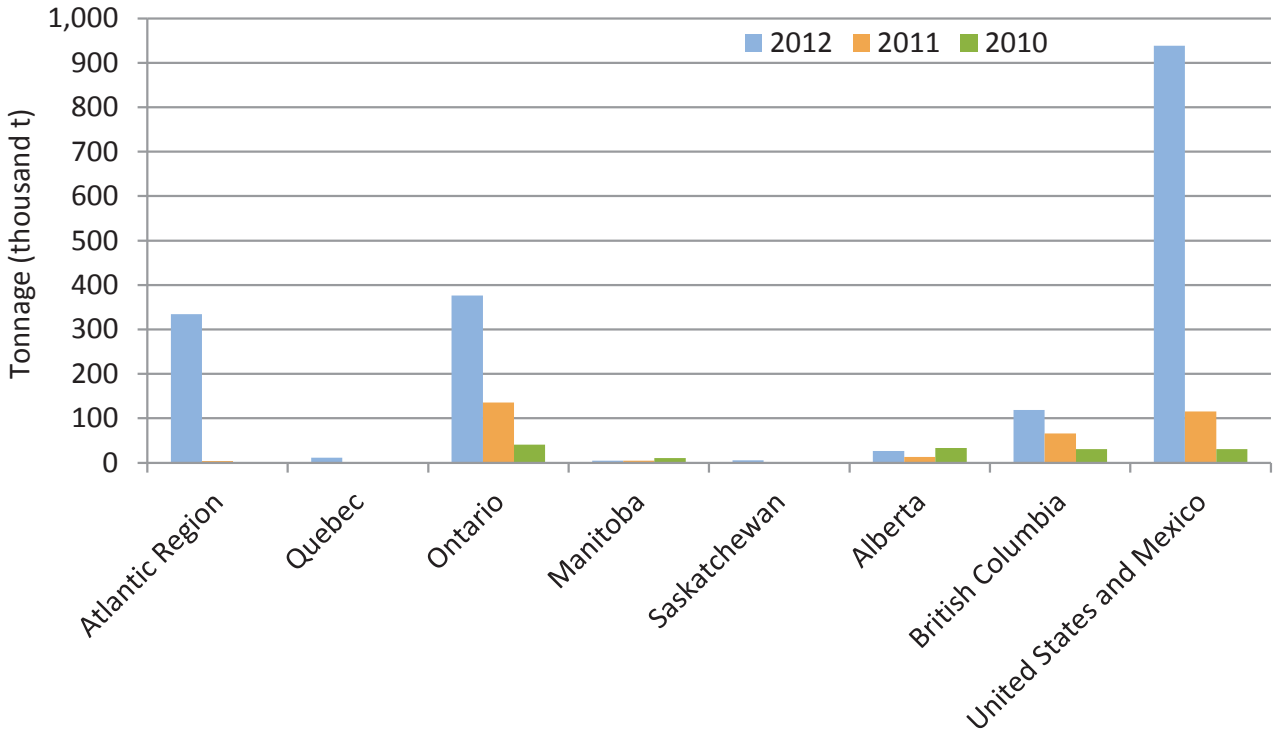
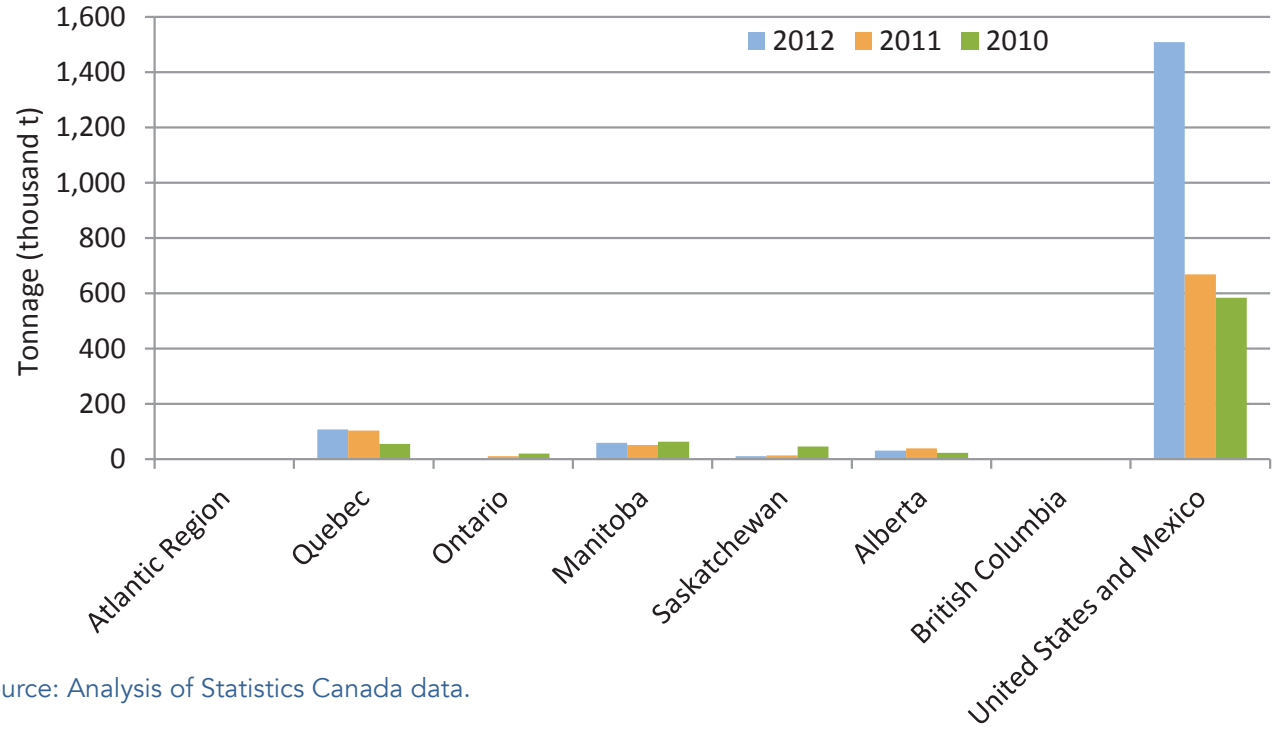


Chart 2 shows that most other refined petroleum and coal products transported by rail are shipped to the US. There was a large jump of exports to the US in this category between 2011 and 2012.

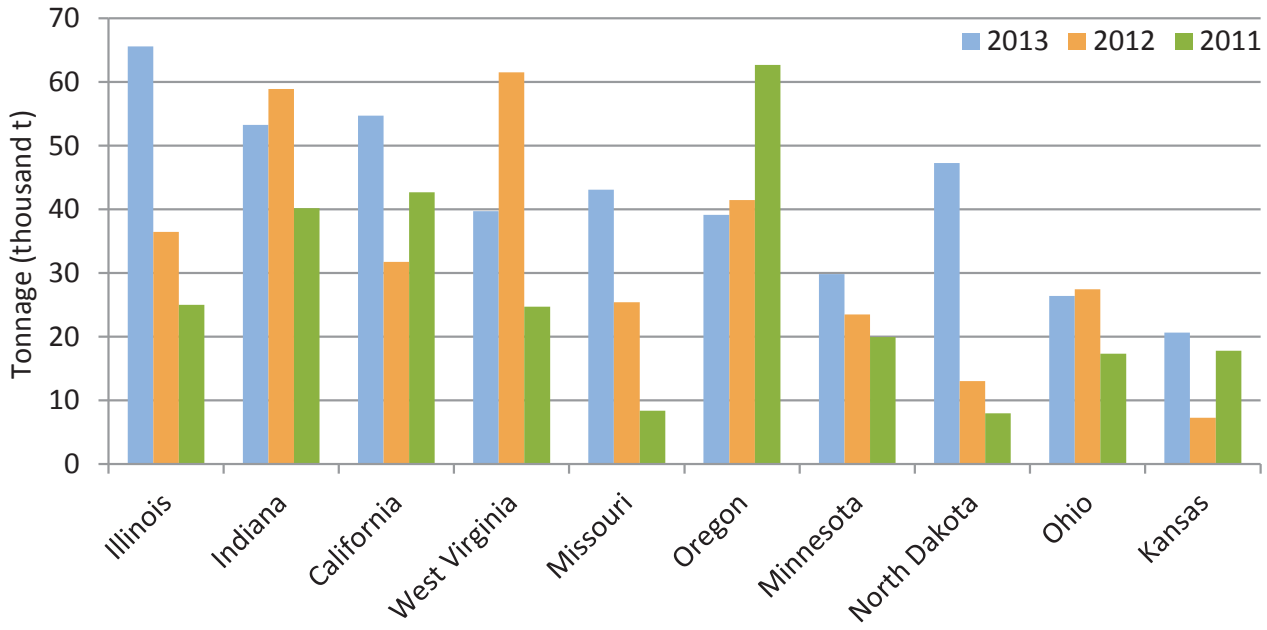
Chart 2. Rail Transport Destinations of Other Refined Petroleum and Coal Products



Source: Analysis of Statistics Canada data.

In 2012, 413,625 tonnes of petroleum bitumen was exported from Saskatchewan, all of it to the US. Chart 3 shows the destination of these exports by US state.

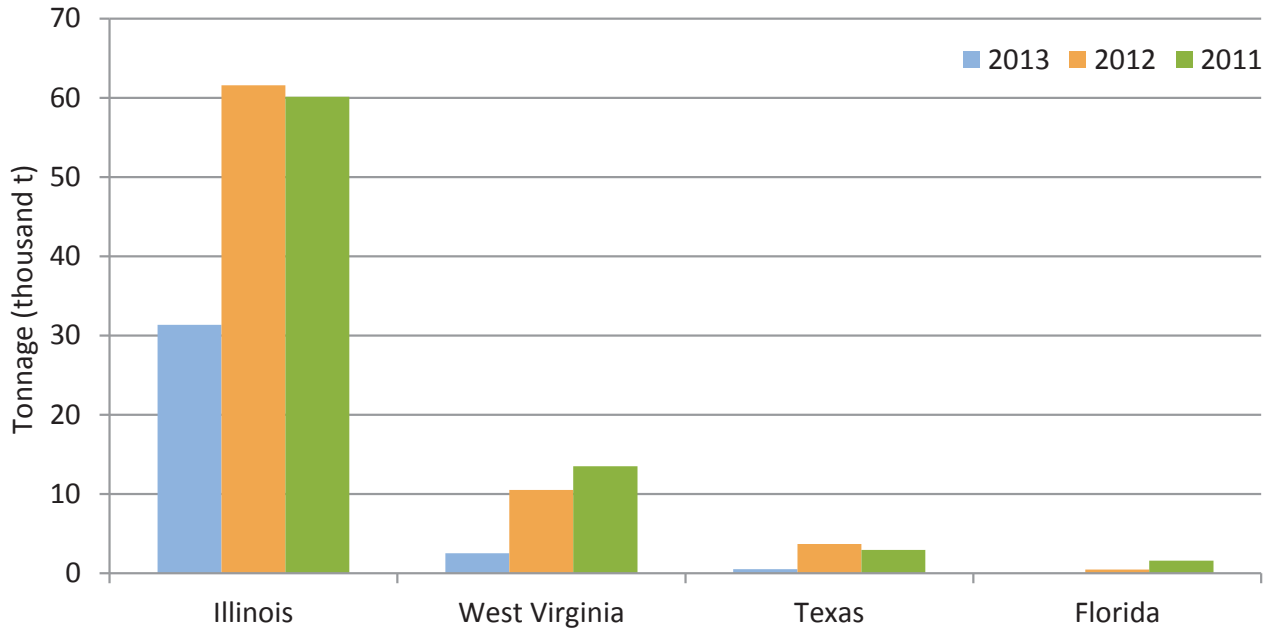
Chart 3. Top 10 Destinations of Saskatchewan "Petroleum Bitumen" Exports



Source: Analysis of Statistics Canada data.

In 2012, Saskatchewan exported 96,650 tonnes of petroleum coke, not calcined. Chart 4 provides the US destinations of petroleum coke exports. Most of the petroleum coke produced in Saskatchewan is transported to Illinois.

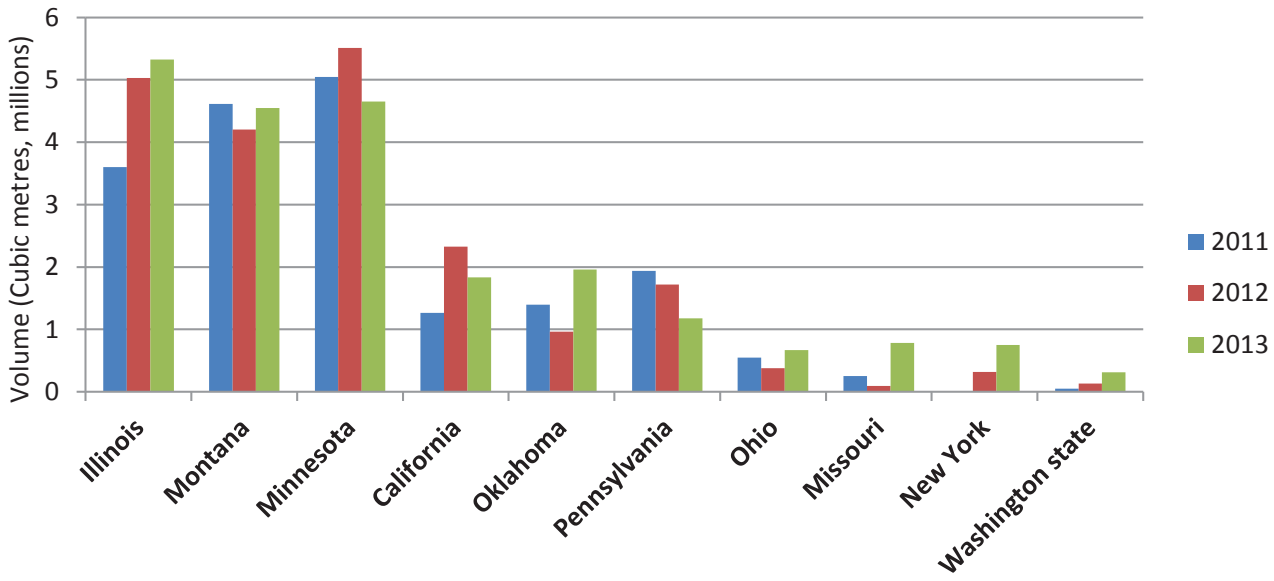
Chart 4. Top Four Destinations of Saskatchewan "Petroleum Coke" Exports



Source: analysis of Statistics Canada data

Given the infrastructure and demand, all crude oil produced in Saskatchewan is destined for one of two markets: Canada and the US. So, all of Saskatchewan's 20 million tonnes of international oil exports from 2013 (roughly 380,000 barrels per day) were exported to the US. Chart 5 details the 10 individual states that imported the largest amounts of Saskatchewan crude oil during 2011-2013.

Chart 5. Quantity of Crude Oil Imports, by US State, from Saskatchewan, for the 10 Largest Importers (by 2013 value), 2011-2013.



Source: Statistics Canada.

The three largest importers, Illinois, Montana, and Minnesota, are all geographically close to Saskatchewan, and have extensive oil pipeline networks, enabling them to import Saskatchewan oil relatively easily. These three states imported 64 per cent of Saskatchewan's oil exports in 2013; combined with the next seven largest importers, they accounted for almost all of the exports (97 per cent).

Because there is currently little available infrastructure to allow the export of Saskatchewan crude oil outside of North America, it is likely that most of the growth in Saskatchewan's international crude exports in the near term would go to the United States. Total oil consumption in the United States has decreased notably since the mid-2000s, dropping from a high of nearly 21 million barrels per day (bpd) in 2005 to fewer than 19 million bpd in 2012, with a small uptick in 2013.[15] During this time, the US has substantially decreased its reliance on crude oil imports, from 10 million bpd in 2005 to 7.6 million bpd in 2013. Since 2005, the US has reduced imports from overseas producers, and increased the proportion of its imports obtained from Canada, which have doubled from 16 per cent of total imports in 2005 to 32 per cent in 2013,[16] and have simultaneously increased in quantity by over 30 per cent.

This growing reliance on Canadian crude oil suggests that any increase in crude oil production in Saskatchewan could be met by demand from the US in the near term. However, as US domestic consumption stagnates and US production continues to increase there is an obvious need to reach other international markets in order to absorb Saskatchewan's new production. Due to the geographic flexibility offered by rail transportation (not being tied to specific origin and destination pairs like pipelines), it can play a key role in helping the province's petroleum exports reach new markets.

15 U.S. Energy Information Administration, *United States.*

16 US Energy Information Administration, *U.S. Net Imports by Country*.

Potash

Saskatchewan is the world's largest producer of potash– an important component of fertilizer. "Potash" is a word used for many types potassium salts, but the most commonly used potash is potassium chloride (KCl). This is the predominant chemical composition of the potash mined in and exported from Saskatchewan.

Saskatchewan produces the majority of Canadian potash as 9 out of 10 potash mines[17] in Canada are located in Saskatchewan.[18] There are three producers in Saskatchewan: Potash Corporation of Saskatchewan (PotashCorp), The Mosaic Company, and Agrium. All 9 mines were initially completed by 1970, their locations and operational capacities are listed in Table 3.

In 2012, 13.5 million tonnes of potash were exported by rail from Saskatchewan. Almost all potash is transported by rail from the mines, with much of it being transported by unit trains.[19][20] Potash is primarily used as fertilizer, but also to make products ranging from food to soaps."[21]

Table 3. List of Potash Mines in Saskatchewan and Their Associated Approximate Capacity

Mine	Nearby municipality	Ownership	Operational Capacity (million tonnes per year)
Belle Plaine	Regina	Mosaic Company	2.8
Colonsay	Vanscoy	Mosaic Company	1.9
Esterhazy	Esterhazy	Mosaic Company	5.3
Allan	Allan	PotashCorp	2.5
Lanigan	Lanigan	PotashCorp	2.2
Patience Lake	Saskatoon	PotashCorp	0.3
Rocanville	Rocanville	PotashCorp	2.6
Cory	Saskatoon	PotashCorp	1.7
Vanscoy	Vanscoy	Agrium	*1.2

Sources: CPCS; analysis of PotashCorp website; Hatch, Mosaic Belle Plaine Expansion Project; Hatch, Mosaic Colonsay Expansion Project; CKOM, Agrium Potash Mine.

* This value is a production value.

17 Natural Resources Canada, *Canada's Potash Industry*.

18 The Canadian Encyclopedia, *Potash.*

19 Agrium, *New Video.*

20 A unit train carries a single commodity from its origin to its destination. This is opposed to a manifest train which carries multiple commodities and therefore makes multiple stops and/or is split up en route to multiple destinations.

21 Approximately 95 per cent of world potash production is used as fertilizer. Saskatchewan Mining Association, *Potash.*

Potash destined for international markets other than the US is transported by Canpotex, which is owned by the Potash Corporation of Saskatchewan, the Mosaic Company, and Agrium.[22] Canpotex takes possession of potash at mines using its fleet of 5,400 dedicated railcars, and ships them by unit trains up to 170 cars long to Portland, Oregon or Neptune Bulk Terminals at the Port of Vancouver.[23] A small amount also goes through Thunder Bay onwards to the St. Lawrence Seaway.[24] CP transported all of Canpotex's potash up until 2012, at which time CN secured approximately 20 per cent of the transport contract according to some estimates.[25] CP works with the Union Pacific Railroad (UP) to transport potash to Canpotex's Portland, Oregon terminal.[26] Canpotex has been considering adding a third terminal in Prince Rupert, British Columbia.[27] The capacities of the existing terminals are detailed below in Table 4. Canpotex transports 95 per cent of its potash to its customers on a CFR (cost and freight basis) and charters its own vessels. Canpotex maintains storage facilities worldwide. This arrangement appears to align with the need to serve customers distributed across Asia.

Potash sold to domestic and US destinations from Saskatchewan is handled by the potash companies themselves. While data is available on transborder shipments from Saskatchewan to US states from the US Bureau of Transportation Statistics (BTS) – listed under "fertilizers" – there is less information is available on the US-bound potash supply chain.

Table 4. Canpotex Export Capacity

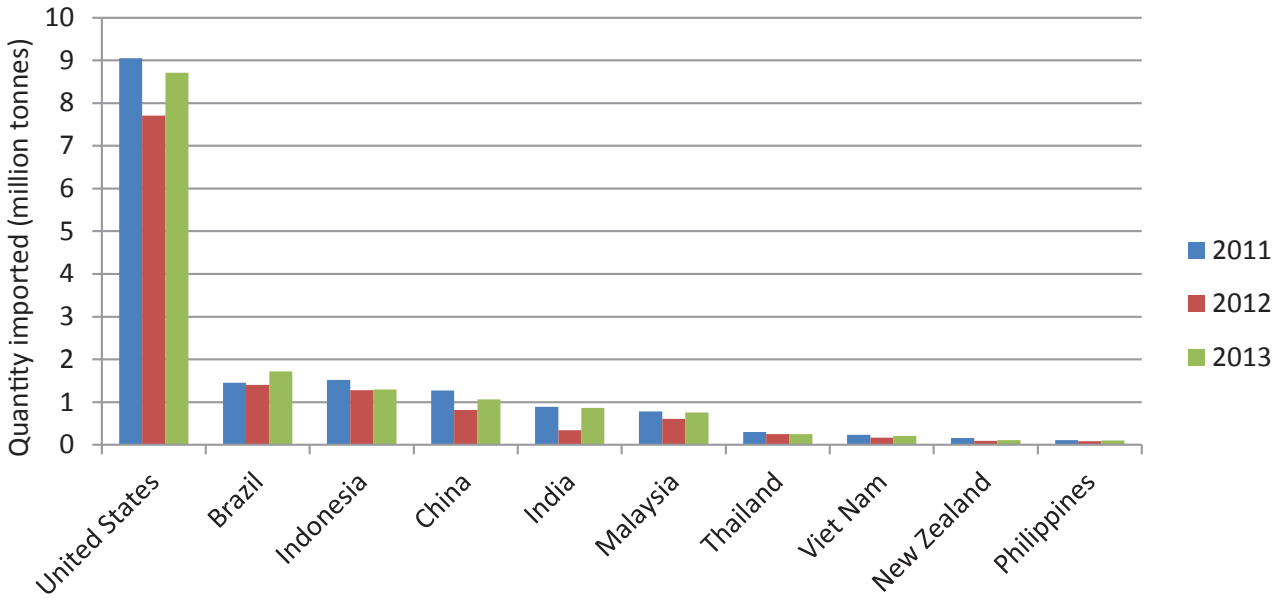
	Neptune (Vancouver, BC)	Portland (Portland, OR)
Rail	• Rail tracks can accommodate two potash unit trains on-site, or 340 railcars • Two enclosed gravity-fed dumper pits can accommodate four railcars each	• Three loop tracks can accommodate three Canpotex unit trains on-site, or 390 railcars • Two on-site locomotives and two traction slugs (7,000 HP combined) • Enclosed gravity-fed dumper pit can accommodate four railcars
Storage	• An A-frame shed, with 110,000 metric tons of potash storage capacity, can be subdivided into several sections . . . • A separate cathedral shed . . . with 100,000 metric tons of storage capacity, has a fertilizer portal reclaimer which automatically delivers potash to either Berth 2 or Berth 3 at a rated capacity of 6,000 MT/hour	• A storage shed, with approximately 135,000 Million Tonnes of potash storage capacity, has six separate storage bays – four bays for specialty white potash products, and two for red potash • Separate portal reclaimers for red and white potash, each with a rated capacity of approximately 3,000 MT/hour
Ship loading	• Berth 2 has two quadrant shiploaders that can operate simultaneously, each with a rated capacity of 2,500 MT/hour • Berth 3 has a single linear shiploader capable of loading 2,500 MT/hour	• Single covered linear shiploader with a rated capacity of 3,000 MT/hour
Sources: CPCS; Canpotex, Logistics.		

22 Grant, Burt, and Ai, *Saskatchewan in the Spotlight.*
23 Canpotex, *Logistics.*
24 Ibid.
25 Jang, "CN Muscles in on CP's Potash Deal."
26 Ibid.
27 Ibid.

Key Export Markets

Potash exports are primarily destined for the US. However, there are a variety of other international markets that together consume a significant share of potash exports. Chart 6 shows largest importers of Saskatchewan potash.

Chart 6. Quantity of Potash Imported from Saskatchewan by the 10 Biggest Importers (by 2013 value), 2011-2013



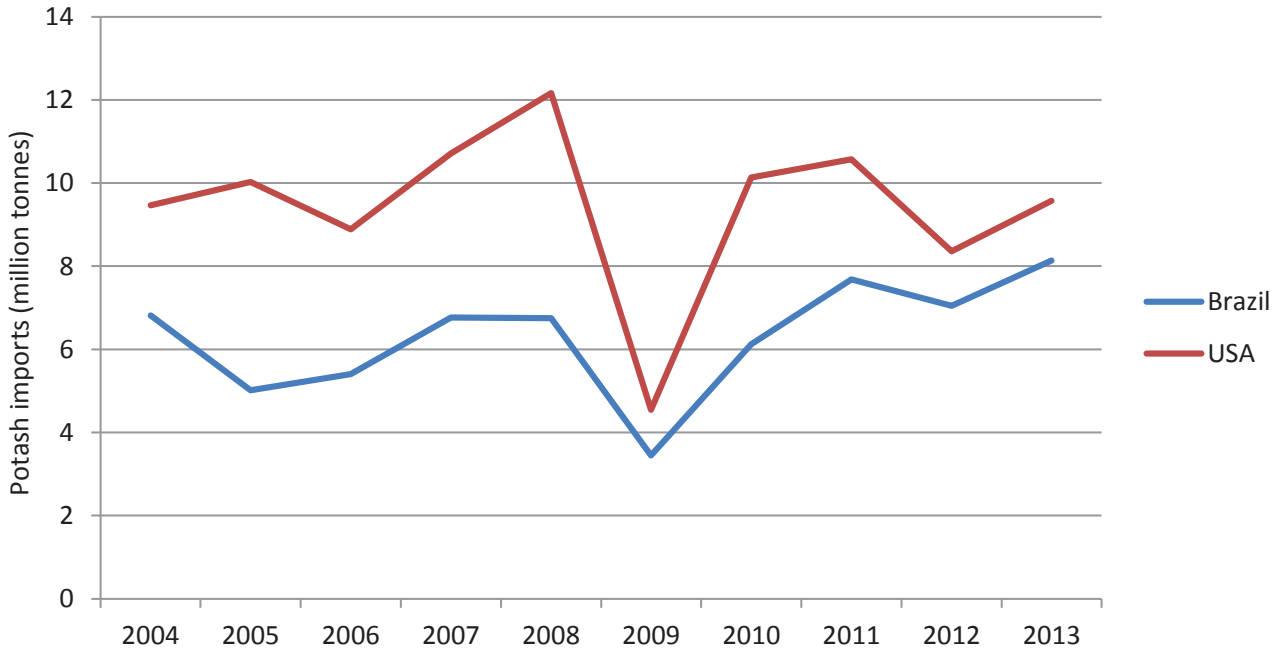
Source: Statistics Canada

As can be seen from the chart, the bulk of Saskatchewan's potash exports (over 50 per cent by quantity and value) go to the US, while smaller quantities exported to Brazil and Asia.

The quantities of potash imported by Brazil and the US have fluctuated heavily over the past decade (see Chart 7), due at least in part to the volatility of potash prices, which have ranged from below $150 per tonne to nearly $900 (USD) per tonne since 2005.[28] US imports are purchased predominantly from Canada; Canada has supplied over 85 per cent of American potash imports each year since 2005. While Canada is currently Brazil's largest supplier of potash, it represents much less of Brazil's total imports, generally ranging from 25-30 per cent since 2005.

28 World Bank, *Overview of Commodi*

Chart 7. Total Potash Imports, Brazil and USA, 2004-2013.



Sources: The Conference Board of Canada; UN COMTRADE database.

Due to proximity, Russia has an advantage for supplying the Asian market, while Saskatchewan has an advantage for supplying the United States and perhaps Brazil, which are the largest global importers of potash. Therefore, these latter countries are the natural marginal market for Saskatchewan potash. However, more efficient transportation and logistics could lead to a larger share of the Brazil and Asian markets.

Because of the volatility of potash consumption in Saskatchewan's primary export market, it is not clear that there would be a market for this potash in the absence of some sort of driver to increase demand. Some additional production might be consumed by the US, reducing the imports from Russia (the second largest producer of US-imported potash). Additional production could be bought up by Brazil, whom are much less reliant on Canadian potash, and for whom a smaller price differential between Canadian and European/Asian potash exists.

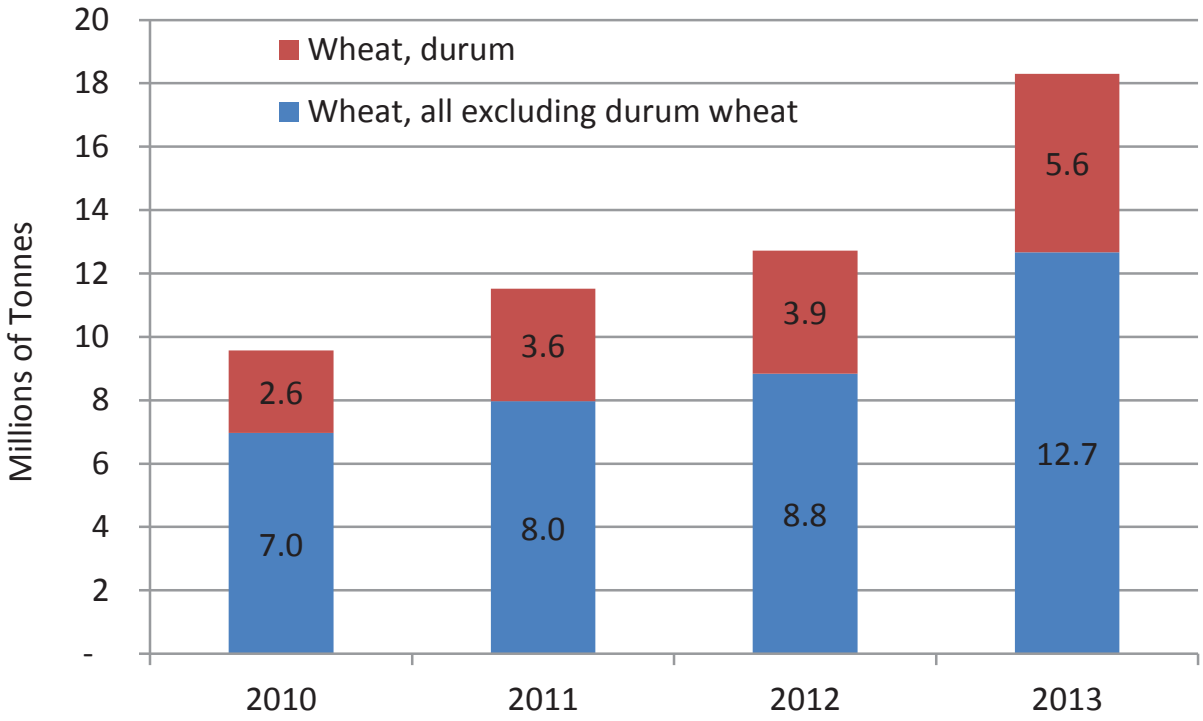
Industry representatives indicate however that there is growth potential in BRIC[29] countries (particularly India and China) and Pacific Rim countries. Having recently invested heavily in new mining operations, it is believed that potash exports could double by 2020 in large part through export growth to these markets. Due to the distances involved in reaching these markets, efficient transportation and logistics will be key to supplying them.

Wheat and Other Cereals

In 2013 Saskatchewan produced 18.3 million tonnes of wheat (12.7 million in 2012) including 12.7 million tonnes of non-durum wheat and 5.6 million tonnes of durum (8.8 million tonnes of wheat and 3.9 million tonnes of durum in 2012) (Chart 8). Saskatchewan accounted for 34 per cent of Canada's total wheat production and 87 per cent of durum production.

29 Brazil, Russia, India and China.

Chart 8. Wheat Production in Saskatchewan



Source: Statistics Canada.

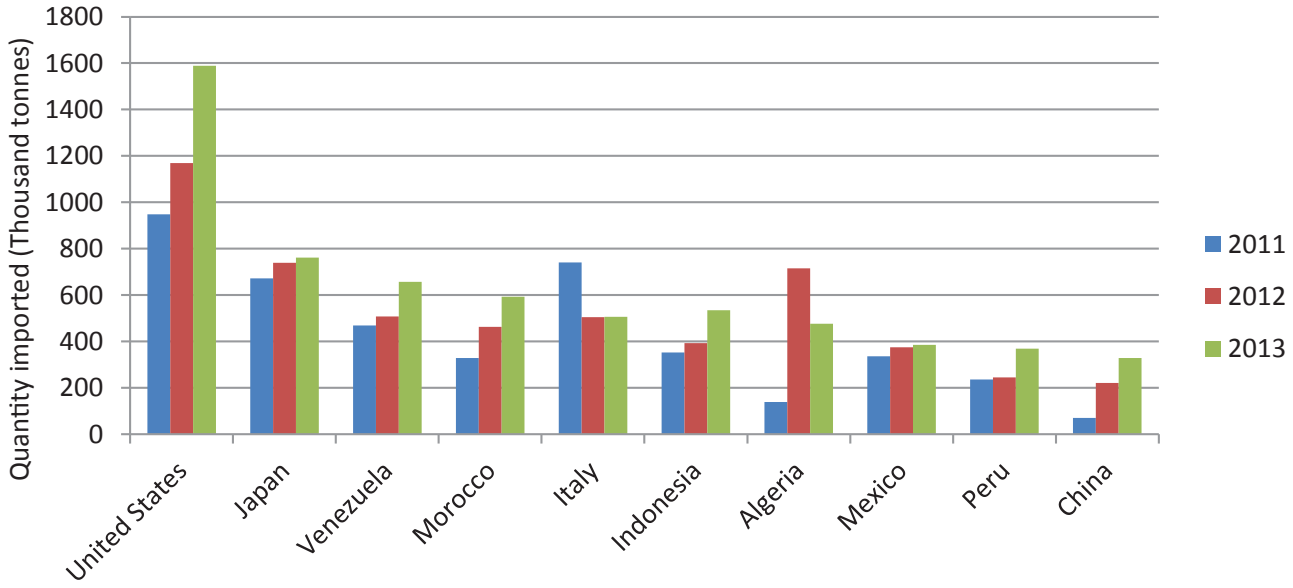
From the period 2005 to 2009, approximately 7-8 million tonnes (or 24 per cent of Canadian production) of wheat (excluding durum) was used domestically across Canada. Over the same period, approximately one million tonnes (or 20 per cent of Canadian production) of durum was used domestically. About 45 per cent of domestic use wheat and 50 per cent of durum is used as animal feed. Damaged and downgraded wheat is also used in ethanol production. According to a 2011 report, there "are currently seven ethanol production plants in Western Canada with a combined capacity of 500 million liters, requiring about 1.3 million tonnes of wheat at full capacity."[30]

30 Agiculture and Agri-food Canada, *Wheat Sect*

Key Export Markets

Saskatchewan produces more wheat than any other province, and has a diverse export market. Both durum and common wheat are exported from Saskatchewan in large quantities. Chart 9 shows the quantities of wheat exported from Saskatchewan for the biggest importers, summed for both durum and regular wheat.

Chart 9. Saskatchewan's Largest Wheat (regular and durum) Markets, 2011-2013

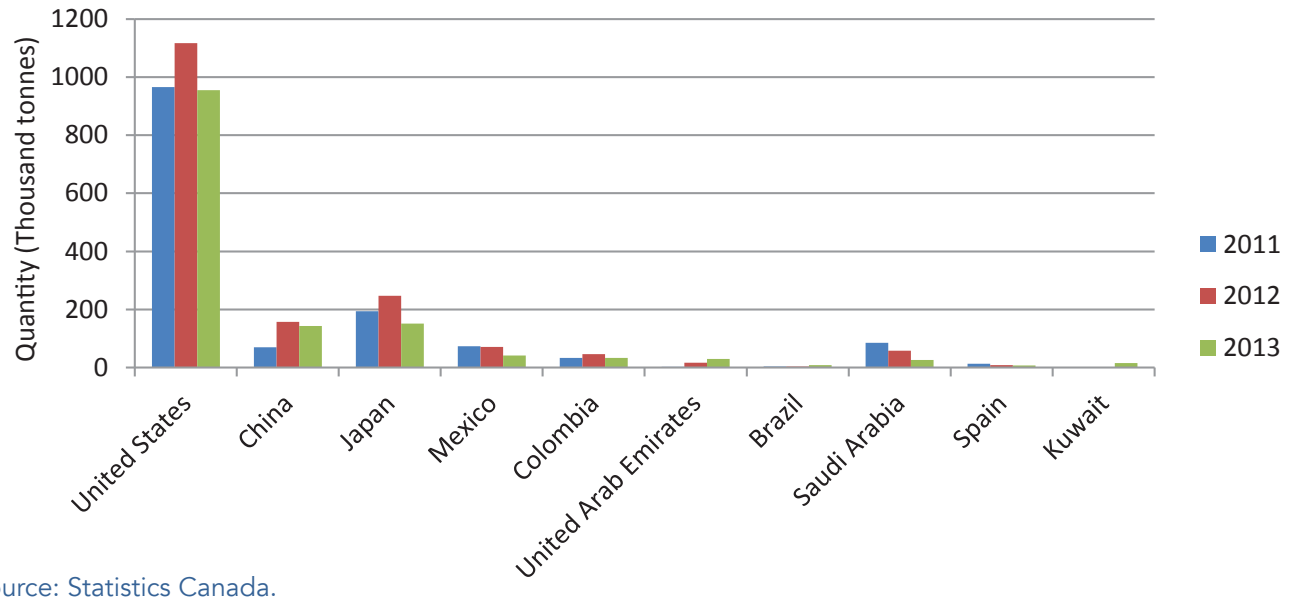


Source: Statistics Canada

Chart 10 makes clear that while the US imports more of Saskatchewan's wheat than any other country, Saskatchewan wheat is shipped all over the world. Substantial quantities are shipped to central and South America, east and Southeast Asia, northern Africa, and Europe. The ten largest importers consumed only 64 per cent of Saskatchewan's wheat exports in 2013.

The other cereals primarily exported by Saskatchewan include oats, barley, and canary seed. Additionally, the province also exports rye, as well as seeds for barley, rye, and oats, but these commodities are shipped in much smaller quantities than the other cereals presented here. Like wheat, the other cereals are shipped to countries all over the world. Chart 10 shows the 10 largest importers and the quantities of other cereals they have imported from Saskatchewan since 2011.

Chart 10. Quantity of Other Cereal Grains (oats, barley, canary seed) Imported from Saskatchewan by the 10 Largest Importers (by 2013 value), 2011-2013



Source: Statistics Canada.

Although Saskatchewan's ten largest importers are found in different regions of the globe (North and South America, Europe, the Middle East, and East Asia), the United States imports the bulk of these cereals. It should be noted that while barley and oats have similar values per tonne, the per-tonne value of canary seed is considerably higher – almost three times as high during 2012-2013.[31]

As the previous charts illustrate, Saskatchewan's wheat export market is more geographically diverse than that of other cereals. This diverse market means there are many potential countries that could comprise Saskatchewan's marginal (growth) market. As with many commodities, the US is still the largest importer of Saskatchewan wheat. Imports of Saskatchewan wheat have grown substantially over the past few years, nearly doubling in quantity from 2011 to 2013. The US produces far more wheat than it consumes, and has exported approximately half of its total production since the 2008-09 crop year.[32] Much of the wheat that the US exports is white wheat. The wheat that it does import (such as spring wheat and durum), amounts to roughly 10 to 15 per cent of local consumption. This comes primarily from Canada. Approximately 90 per cent of US wheat imports since 2009 have come from Canada, and 99 per cent in 2013.

Japan is the next largest importer. While only 27 per cent of wheat imports came from Canada in 2013, Canada's proportion of Japanese wheat imports has increased rapidly in recent years. In 2009, Canada comprised only 20 per cent of Japanese wheat imports, and since then, exports to Japan have increased by over 50 per cent in quantity. Canada's primary competitors are the United States (which provides over half of Japanese wheat imports) and Australia (15 to 20 per cent of imports). Because Japan is geographically small, imports comprise the bulk of its consumption (about 85 per cent).[33] Since 2009, Japan's wheat consumption has appeared volatile, but with an overall increase of around ten per cent relative to the period of 2001-2009, where wheat consumption was relatively stable.

In general, because of the wide variety of potential destinations for Saskatchewan's cereals and growing demand in those markets, the province should be able to sell what it can grow as long as it can reach those markets efficiently.

31 The distribution of exports by value still looks similar because the key trading partners (US, China, and Japan) mostly import oats and barley. Thus, it is clear that these three countries comprise the bulk of Saskatchewan's other cereal export customers.

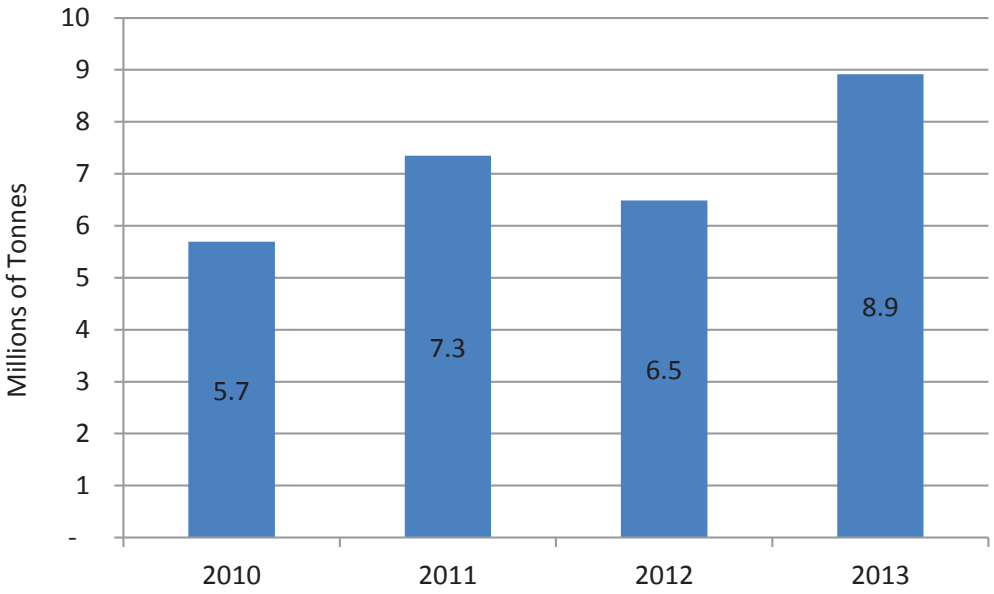
32 United States Department of Agriculture, *Wheat Outlook*, 15.

33 IndexMundi, *Japan Wheat Domestic Consumption by Year*; IndexMundi, *Japan Wheat Production by Year.*

Canola

Canola is a cultivar of rapeseed, bred to reduce the amount of erucic acid contained within the oil it can produce.[34] The seeds it produces can be used to produce oil, livestock feed, and fertilizer. Canola production in Saskatchewan has risen steadily in recent years to reach 8.9 million tonnes in 2013 (Chart 11), which makes Saskatchewan the world's largest producer of canola.[35]

Chart 11. Canola Production in Saskatchewan



Source: Statistics Canada.

Much of Saskatchewan's canola seed production is processed (crushed) into canola oil in the province. Canada wide, there are 13 crushing plants (four in Saskatchewan) with capacity to crush around eight million tonnes of canola seed per year. The locations of these four plants are listed in Table 5. In the 2011-12 harvest year, these plants produced 3.1 million tonnes of oil and 3.9 million tonnes of meal,[36] which is primarily used as animal feed.

Table 5. Location of Oilseed Crushing and Refining Plants in Saskatchewan (as of July 2012)

Location	Owner	Processing
Nipawin	Bunge Canada	Crushing and refining
Clavet	Cargill	Crushing
Yorkton	LDM Yorkton Corp	Crushing and refining
Yorkton	Richardson Oilseed	Crushing
Source: Canadian Oilseed Processors Association (COPA).		

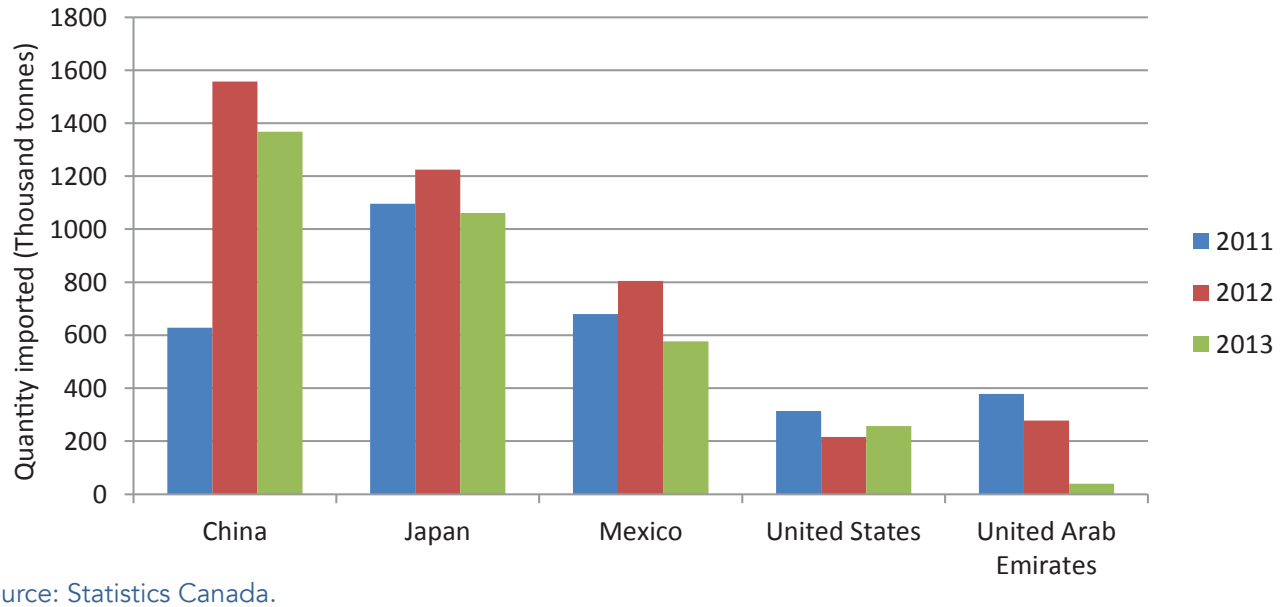
While Saskatchewan exports more Canola seed than any other country – let alone a single province or state – it has a relatively limited number of destination markets (see Chart 12).

34 Canola Council of Canada, *Canola Meal,* 3.

35 Saskatchewan Canola Devlopment Commission, *Canola Quick Facts.*

36 Canola Council of Canada, *Industry Overview.*

Chart 12. Saskatchewan's Largest Canola Markets, 2011-2013

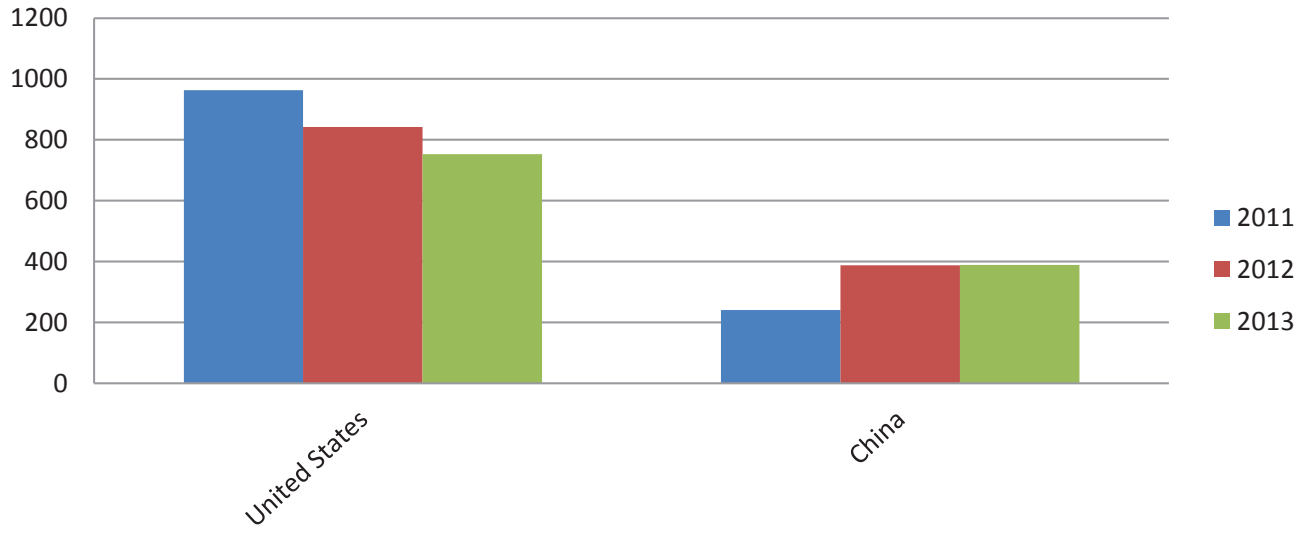


Source: Statistics Canada.

The five countries included in Chart 5 comprise over 99 per cent of Saskatchewan's canola seed exports. With exports to the United Arab Emirates decreasing dramatically over the past couple of years, Saskatchewan's canola seed market is limited almost exclusively to North America and East Asia.

Canola oil is the most valuable product of canola seed, so much of the canola seed harvested in Saskatchewan is processed into oil. Saskatchewan exports large quantities of both crude and refined canola oil. Chart 13 combines the exports of both, and reports canola oil exports to the United States and China, which account for the large majority of Saskatchewan canola oil exports.

Chart 13. Quantity of Canola Oil (crude and refined combined) Imported from Saskatchewan by the United States and China, 2011-2013

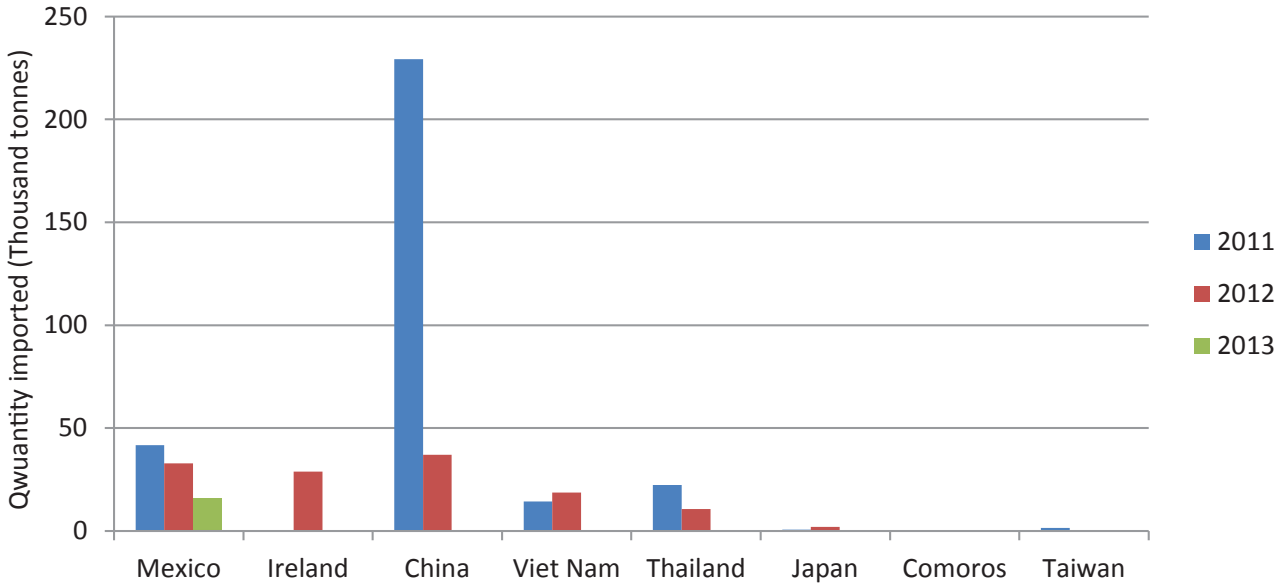


Source: Statistics Canada.

The market for canola oil is less diverse than that of canola seeds. While Saskatchewan has had more than 10 trading partners since 2011, over 98 per cent crude and refined canola oil is sold to either the US or China as of 2013. The US alone imports approximately 90 per cent of all Saskatchewan's refined canola oil. While China has increased its imports of crude canola oil in recent years, they have simultaneously decreased their imports of refined canola oil.

During canola oil extraction from canola seeds, the seed, after cooking and flaking, is crushed and the oil poured off. The remaining components of the seed are compressed, forming a "cake"[37] composed of canola meal. This meal is a popular component of livestock feed, as it is high in protein. Because Saskatchewan produces very large quantities of canola oil, it produces, as a byproduct, a lot of canola meal in the form of these oil-cakes. The market for canola meal exports has recently become dominated by the US where it is an important input for the California dairy herd in particular. Overall, the US market accounts for over 99 per cent of Saskatchewan canola oil-cake and meal exports. The other countries that have imported canola meal since 2011 are presented in Chart 14.

Chart 14. Quantities of Canola Oil-Cake Imported from Saskatchewan (excluding US), 2011-2013.



Source: Statistics Canada.

Since US imports are excluded from the chart (in order to show the variation among the other countries) it is not obvious that the market for canola oil-cakes has recently decreased in breadth. In 2011, the US accounted for only 81 per cent of canola meal exports. Since then, shipments to the US have increased, while shipments to other countries have declined. In 2013, the only other country to import canola meal from Saskatchewan was Mexico, which accounted for only one per cent of the value.

As noted, the largest importers of canola seed are China, Japan, and Mexico, each of which imports substantially more canola seed that the US. After increasing quickly prior to 2009, China's canola seed imports have fluctuated heavily in recent years, dropping by over 50 per cent between 2009 and 2010, before climbing back up to 2009 levels by 2013. Few countries provide canola seeds to China, and Canada is consistently the largest supplier. It was the sole exporter of canola seeds to China during 2011-2012, and supplied over 75 per cent of China's imported canola seeds in 2013, with the remainder coming from Australia.[38] However, despite this recent up-tick in quantity demanded, China is expected to cut imports of canola seed for the 2014/15 crop year, following an increase in domestic

37 Canola Council of Canada, *Canola Meal*, 6.

38 United Nations, *UN Comtrade Database*.

production.[39] This, combined with the large recent presence of Australia in the market, indicates that increased production from Saskatchewan will not necessarily be snapped up by China, given Australia's proximity.

Japan, contrarily, has had stable canola seed imports over the past five years. Canada's exports to Japan have likewise remained relatively stable, and have comprised over 90 per cent of Japan's imports each year since 2009. It is forecasted that Japan's imports for the 2014-15 crop year will be comparable to prior years.[40] Given, the recent import history, and the fact that Japan is not currently undergoing population growth, it seems unlikely that it would substantially increase imports from Saskatchewan in the event of increased production from the province.

Mexico, like China, has exhibited varying canola seed imports in recent years, after a rapid increase in imports from 2004 to 2006. It too relies predominantly on Canada for this commodity; Canada has supplied over 90 per cent of imported canola seed since 2005. Given the recent volatility in imports, and Canada's already high supply rate, it is difficult to predict whether Saskatchewan could increase exports to Mexico simply by increasing production.

An additional possibility for increased canola seed production would be for the province to increase its canola oil production capacity. This would then lead to an increase in oil exports, rather than seed exports. Clearly, it makes economic sense to export much of Saskatchewan's canola in seed form, rather than as oil and meal, otherwise, seed exports would not be so large. In reality, a substantial increase in canola seed production would likely result in increased exports of seeds, oil, and meal, but the degree of increase experienced by each export would depend on the economics of production and transportation of each. However, since canola export markets in general are not as diverse as they are for wheat, growth in global demand will be a bigger factor in finding new buyers of Saskatchewan's growing canola production.

Pulses

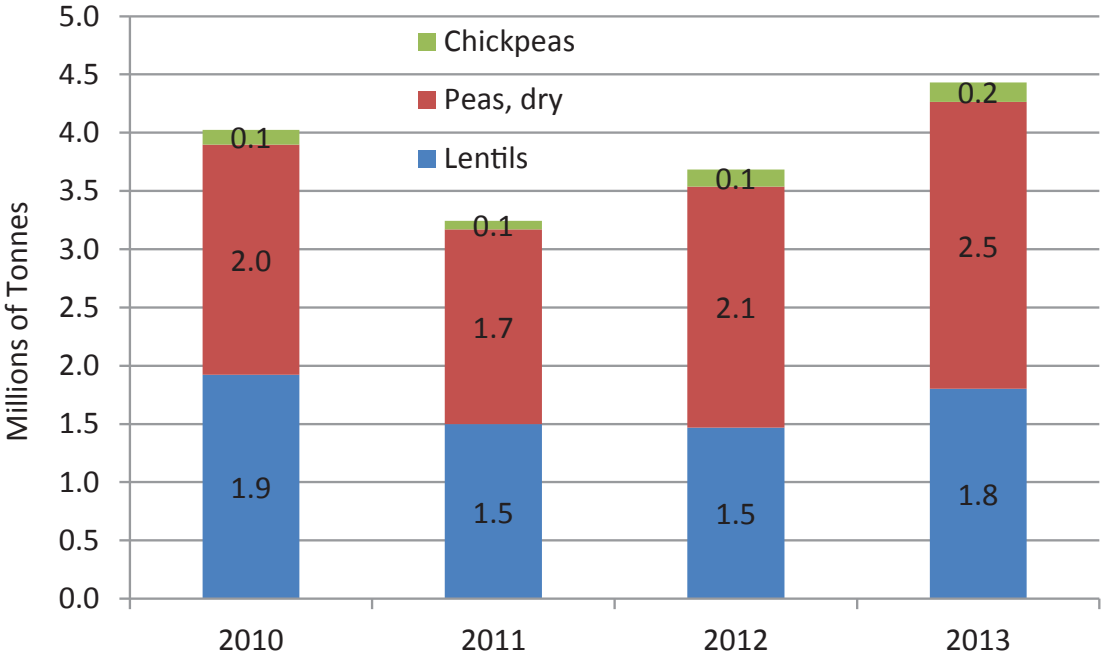
As shown in Chart 15, Saskatchewan produced approximately 4.4 million tonnes of pulse crops in 2013 (3.7 million tonnes in 2012). According to Saskatchewan Pulse Growers: "In 2012, Saskatchewan farmers grew 96 per cent of Canada's lentil crop, 90 per cent of Canada's chickpea crop and 70 per cent of Canada's dry pea crop."[41] Most of the tonnage produced in Saskatchewan is of lentils and peas, which is the focus of the remainder of the discussion.

39 United States Department of Agriculture, *Oilseeds*, 2.

40 Ibid.

41 Saskatchewan Pulse Growers, *Pulse Industry.*

Chart 15. Pulse Production in Saskatchewan

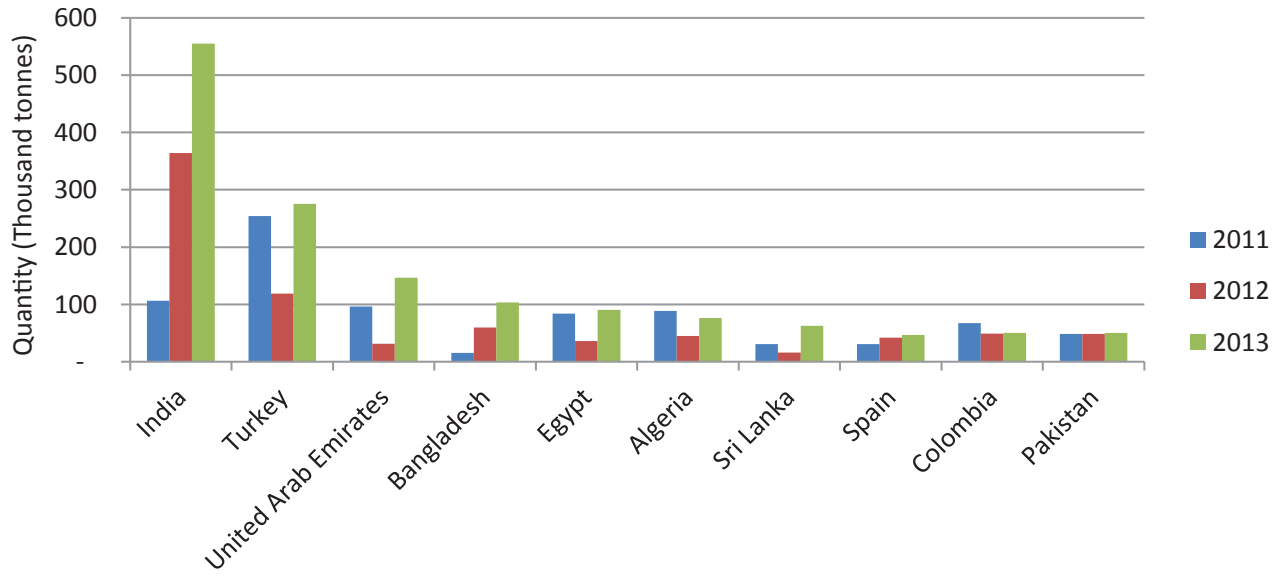


Source: Statistics Canada.

Key Export Markets

A staple food in the Middle East and the Indian Subcontinent, lentils are an inexpensive pulse that is an excellent source of protein and fibre. Saskatchewan produces a variety of lentils, differing in shape and colour, but red and green lentils are by far the most common in the province, accounting for over 98 per cent of total production in 2013.[42] Chart 16 shows Saskatchewan's 10 largest export markets.

Chart 16. Quantity of Lentils Imported from Saskatchewan by the 10 Largest Importers (by 2013 value), 2011-2013



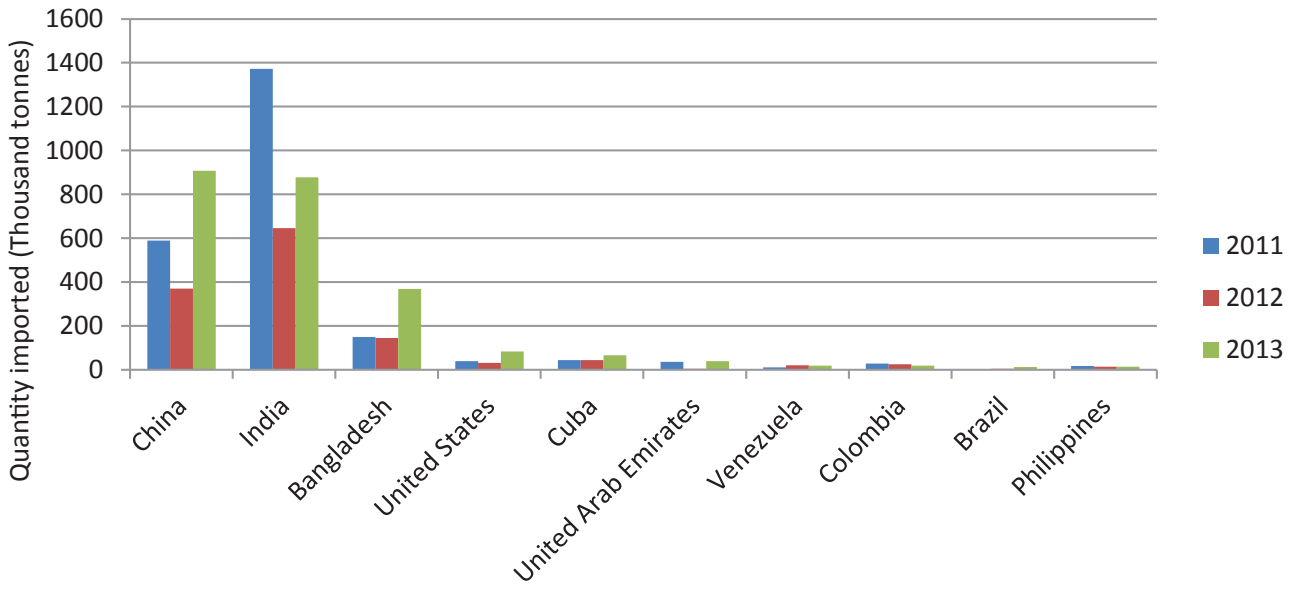
Source: Statistics Canada.

42 Calculated based on production data from Saskatchewan Ministry of Agriculture, 2013 *Specialty Crop Report*, 2.

While India and Turkey have recently been importing the lion's share of Saskatchewan's lentils (46 per cent by volume, in 2013), there remains a relatively diverse export market for these crops. These top ten countries are responsible for approximately 82 per cent of 2013 exports. However, it is notable that the Saskatchewan's lentil market is predominantly in the Middle East and the Indian Subcontinent.

The other major pulse crop produced in Saskatchewan is peas. Like lentils, they are high in protein and fiber, and grow in a variety of colours and sizes. Most of Saskatchewan's production is devoted to yellow peas (84 per cent in 2013),[43] with the bulk of the remainder being composed of green peas. China and India are the largest customers of the province's peas. See Chart 17 for Saskatchewan's ten largest export markets.

Chart 17. Quantity of Peas Imported from Saskatchewan by the 10 Largest Importers (by 2013 value), 2011-2013



Source: Statistics Canada.

Compared with lentils, Saskatchewan's pea market is much less diverse: over 83 per cent of the 2013 exports went to China, India, or Bangladesh, and over 93 per cent to one of the top 10 countries. Most peas are exported to South and East Asia, but there are markets for Saskatchewan peas in central and South America as well.

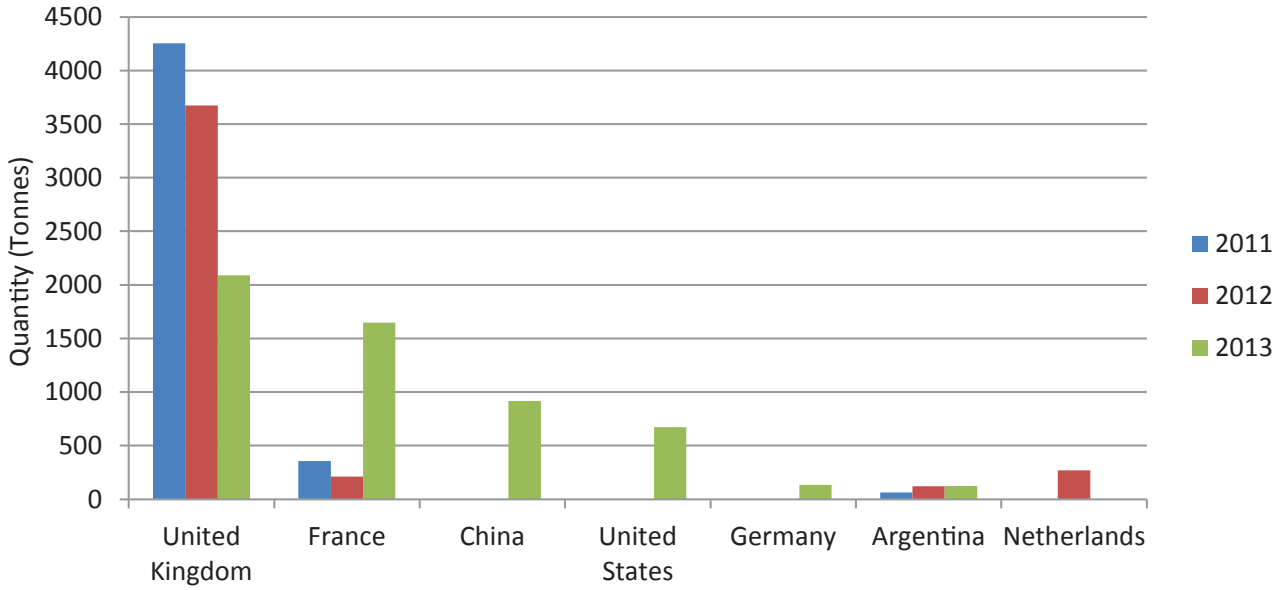
Unlike the other agricultural products, pulse crops are not exported in significant quantities to the US. Due to the wider variety of buyers, lentils are perhaps more likely than peas to grow in the markets that Saskatchewan exporters already serve. However, both lentils and peas are exported primarily to developing economies whose growing middle class will likely demand larger quantities of pulse crops in the future.

Uranium

The primary use of uranium is as a fuel for nuclear fission plants to generate electricity. This somewhat limits the potential export market, as many countries do not operate nuclear fission plants. The quantities of uranium imported from Saskatchewan for all recent importers are contained in Chart 18.

43 Ibid.

Chart 18. Quantities of Uranium Imported from Saskatchewan by All Importing Countries, 2011-2013



Source: Statistics Canada.

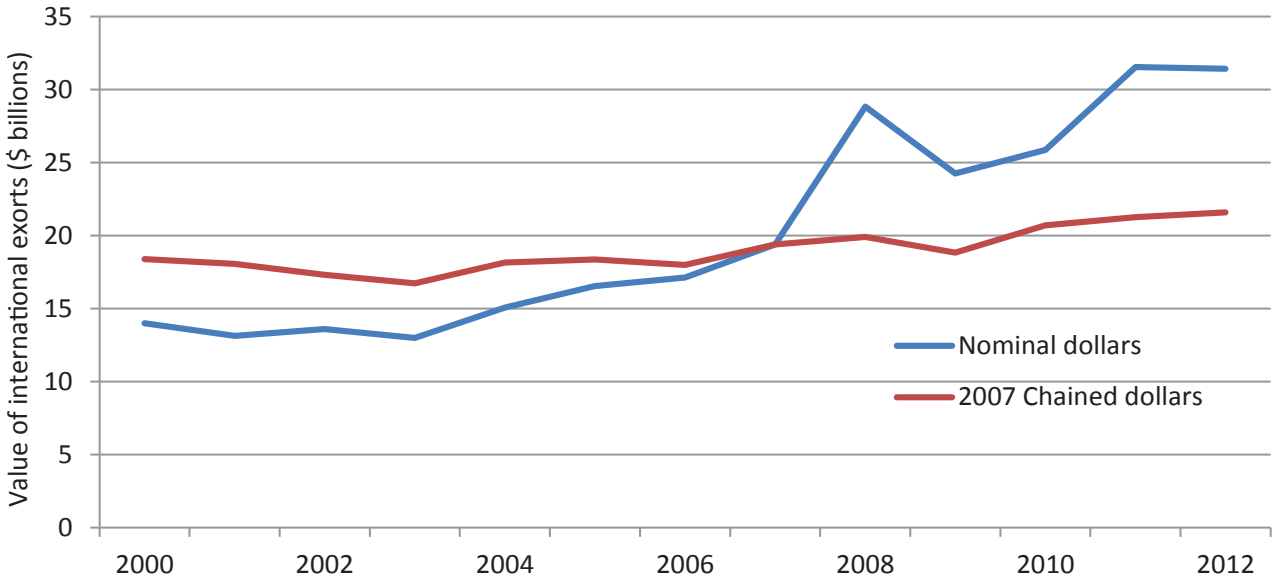
While the United Kingdom appears to be scaling back imports of Saskatchewan's uranium, this loss in export market over the past couple years has been matched by increased exports to other countries. Regardless, Saskatchewan's export markets for uranium are currently confined to the US, Europe and China.

As noted earlier, uranium has an exceptionally high value per tonne. Therefore, even if it was to be shipped in larger quantities by rail, it is unlikely to demand a significant portion of rail service (in terms of locomotives, crews, etc.). It is noted that uranium shippers would like to make greater use of rail transportation at least for domestic movements. However, CN Rail does not handle Class seven (radioactive) goods.

Saskatchewan Export Growth Target

Overall, Saskatchewan's exports have experienced growth since 2003, when measured in either real and nominal terms (see Chart 19).

Chart 19. Saskatchewan's Export Growth



Sources: The Conference Board of Canada; Statistics Canada.

The Government of Saskatchewan (GoS) is planning for significant growth in exports in the future, and listed targets for export increases in the Saskatchewan Plan for Growth: Vision 2020 and Beyond. The Growth Plan outlines a variety of economic and other societal goals of the government leading up to 2020. While this plan contains no commodity-specific goals for provincial exports, there are some broad goals that are relevant to this report. First, the GoS wishes exports to double in nominal terms by 2020. Using 2011 export values as the baseline ($29.5 billion), this would indicate that the goal is to reach $59 billion (nominal) in annual exports by 2020. Within this increase, the GoS plans Saskatchewan to increase exports of agricultural and food products from $10 billion from 2011 to $15 billion in 2020. In terms of tonnage, crop production is planned to increase by 10 million tonnes. To put this 10 million tonnes into perspective, Saskatchewan produced about 27 million tonnes of crops in 2011 and 2012, and about 38 million tonnes in 2013,[44] a banner year for grains. This proposed 10 million tonne increase represents nearly 40 per cent of the average tonnage harvested annually between 2000 and 2013.

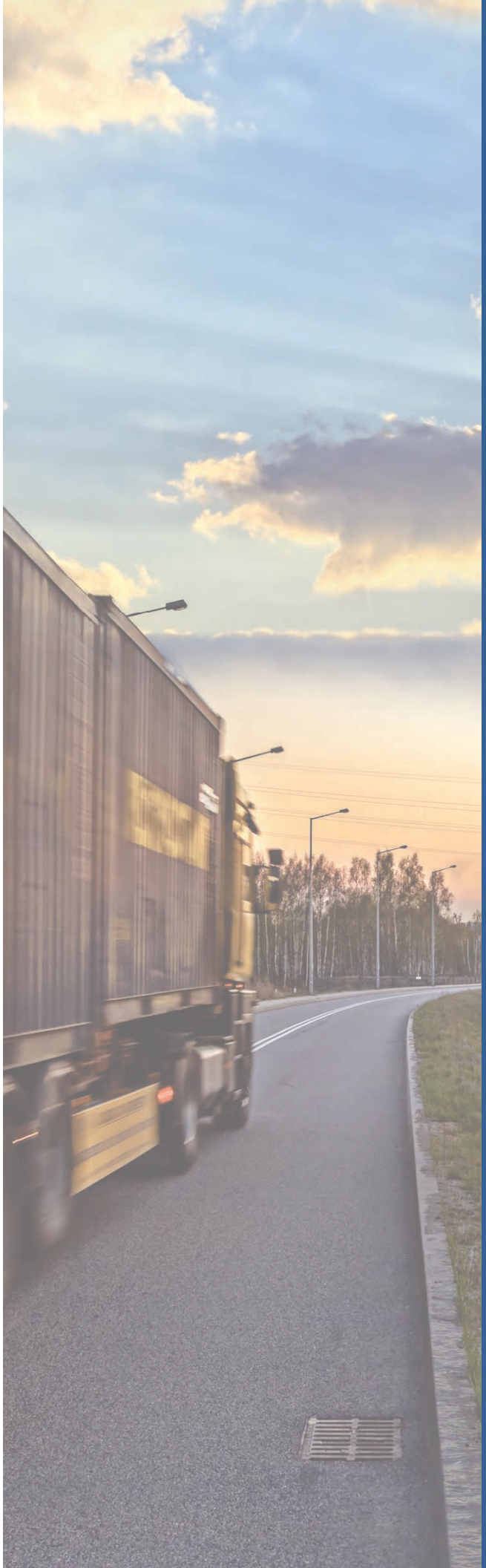
Since the *Plan* was released, Saskatchewan's exports have increased, to $31.4 billion in 2012 and $32.2 billion in 2013. In addition, crop and other agricultural exports have increased from about $10.2 billion in 2011 to $11.7 billion in 2013.

44 Saskatchewan Ministry of Agriculture, *Agriculture Statistics Fact Sheet.*

Chapter Summary

Saskatchewan's exports are concentrated on a relatively few products. In addition, some of those products are destined for relatively few markets – meaning that their export growth rates are likely dependent on growth in overall consumption. However, wheat, durum wheat and lentils in particular have diverse export markets.

Other than perhaps the US market, Saskatchewan does not have a geographic advantage when it comes to serving these markets. At best, geography is perhaps as much of a limiting factor for Saskatchewan as it is for its competitors (such as getting potash to Brazil). However, in many or most Asian and Middle Eastern markets, Saskatchewan exporters are at a geographic disadvantage relative to their competitors. That means that in order to take full advantage of those markets the efficiency of their rail-based supply chains will be key.



Chapter 3
Why Rail Transportation Matters to Exports

The previous chapter summarized the importance of exports to Saskatchewan's economy, and highlighted the province's major exports. In 2013, Saskatchewan exported over 50 million tonnes of goods. This estimate is conservative, as it includes only the 10 largest exports discussed in the previous chapter, which were worth about 88 per cent of the province's 2013 exports. Regardless, the high tonnage of exports means that much of Saskatchewan's economy is reliant on the ability of large-scale transportation services to get its export goods to market.

In part because a large portion of Saskatchewan's exports have a low value to weight ratio (e.g. potash and wheat, valued at less than $0.40 per kg), Saskatchewan relies on rail for much of its goods transportation. The other contributing factor is the distance between production sites and ports. Rail is simply the most economical way to move bulk commodities over land. On a tonne-km basis (moving one tonne of goods over one kilometre), rail is cheaper than other modes of transport typically available for most export goods traveling over land (truck and airplane).

Most of the growth for Saskatchewan commodities comes from overseas markets that can only be reached (both physically and economically) by ocean vessel. Saskatchewan is far from all major ocean ports, making over-land transportation an important aspect of the logistics of exporting goods from the province.

In Canada, average rail revenue per tonne-km of freight transported was $0.028 in 2012.[45] Trucks, on the other hand, are an order of magnitude more expensive for shippers on a tonne-km basis; in 2011, the Canada-wide average revenue per tonne-km of freight transported via truck was $0.137.[46] For truck freight originating in Saskatchewan, the average revenue was higher, at $0.147/tonne-km. Air freight transportation is more expensive again. In 2012, the Canada-wide average revenue per tonne-km of freight was $0.384 for scheduled service, and $0.867/tonne-km for charter service.[47] Clearly, rail is the most economical option for getting Saskatchewan's export goods to market.

Value and Quantity of Rail Exports

Previously, Table 1 highlighted Saskatchewan's largest export commodities by all modes of transportation. The following discusses the largest commodities (by quantity) that are transported out of Saskatchewan by rail. Table 6 shows the quantities of these commodities for 2012 (the most recent available year), as reported in the Rail Commodity Origin and Destination Statistics survey (RCOD), and the Conference Board's' calculations of the approximate values of these shipments.[48]

45 Railway Association of Canada, *2013 Rail Trends*, 26.

46 Calculated from Statistics Canada, *Trucking Commodity Origin and Destination Survey*.

47 Calculated from Statistics Canada, *Civil Aviation, Quarterly Operating and Financial Statistics*, 4–5.

48 The figures do not include the quantity and value of interprovincial exports. Interprovincial exports by rail were estimated from the commodity Origin/Destination data in conjunction with provincial Input-Output tables.

Table 6. Saskatchewan's Largest Rail Commodities, Quantity and Estimated Value, 2012

Rail Commodity	Harmonized System Commodity	Quantity transported by rail (thousands of tonnes)	Total estimated value ($CAD millions)
Potash	Potash	12,548	5,399
Wheat	Wheat and durum	7,934	2,800
Canola	Canola seed	2,777	1,751
Canola oil	Crude and refined canola oil	1,297	1,631
Fresh, chilled or dried vegetables	Lentils and peas	1,804	923
Fuel oil and crude petroleum	Crude oil	1,439	857
Other cereals	Barley, rye, oats, corn, millet, canary seed, other cereals	1,833	562
Animal feed	Canola meal	836	292
Other refined petroleum and coal products	Bitumen, coal, peat, coke	87	88
Total		30,556	14,303

Note: Quantities of rail commodities are those shipped out of Saskatchewan by rail, regardless of destination. Values were estimated using the CIMTD values for representative HS commodities.

Sources: The Conference Board of Canada; Statistics Canada.

Because the RCOD does not use the HS commodity codes or commodity groupings, estimating the value of the commodities transported by rail had to be done indirectly, by using representative commodities for which values can be estimated from the CIMTD. For crude oil, which CIMTD measures in cubic metres rather than by mass, the value per tonne was calculated after estimating the average density of Saskatchewan crude oil, and converting crude oil quantities reported by CIMTD into tonnes.[49]

The largest quantity rail commodities are closely aligned with Saskatchewan's highest value exports. Of the top 10 exports (by value) listed in Table 1, the only commodity that is not on the top rail commodity list is uranium. Because uranium is a high-value commodity relative to its weight, the quantity of uranium exported by the province is dwarfed by the other commodities, and of the exported uranium, only a small portion is transported by rail. Further, it is not given its own commodity category within the rail data, but falls within a broader commodity category, within which the tonnage of uranium transported by rail would be minimal compared to the other commodities.

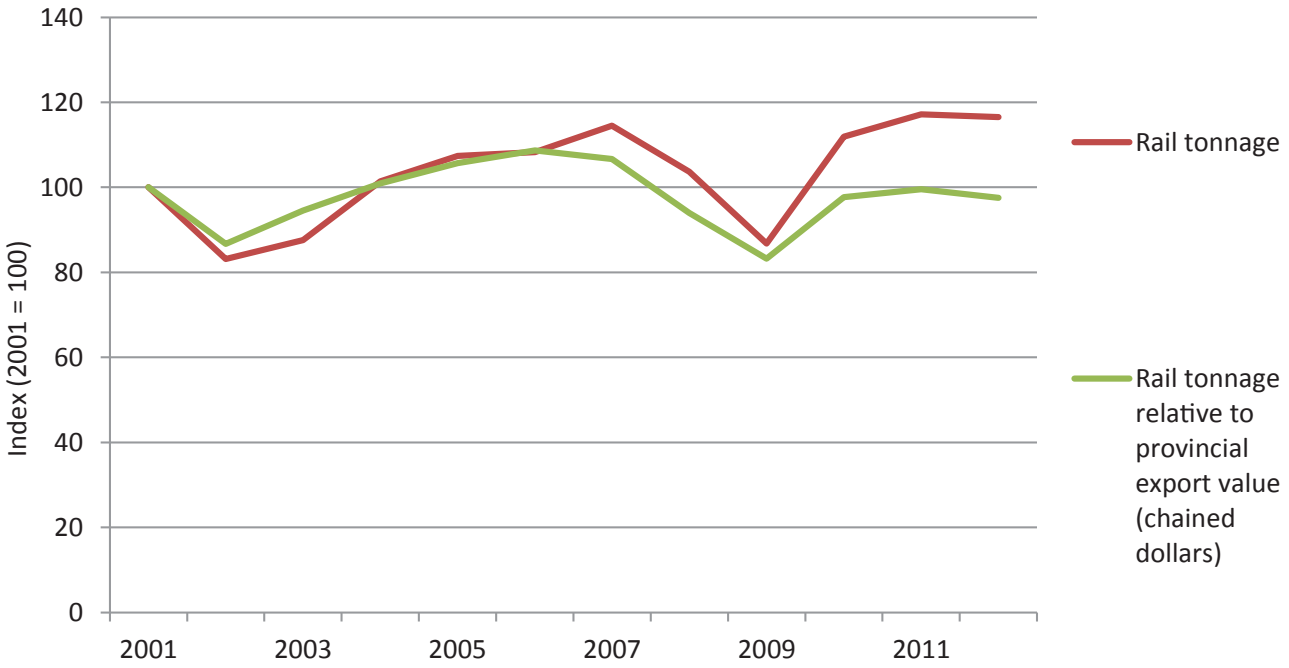
Summing together the value of the rail commodities listed in Table 6 provides a value of $14.3 billion. This is close to half of the value of Saskatchewan's exports in 2012. Much of the remaining value of Saskatchewan's exports is transported by pipeline. Crude oil and petroleum exports from Saskatchewan were valued at $11.5 billion in 2012, and only about $1 billion of this was shipped via rail. Including the remaining oil exports with the rail commodities would bring the collective value to about $25 billion, or 83 per cent of the value of total international exports for 2012. This suggests that, other than oil, most of Saskatchewan's exports rely on rail to get to market.

49 The density of Saskatchewan crude oil was estimated using oil densities reported by crudemonitor.ca and that the oil was composed of the same proportions of light and heavy crude oil as reported to be produced in Saskatchewan during 2012 by Statistics Canada in CANSIM table 126-001.

Export Reliance on Rail

Not only does Saskatchewan currently rely heavily on rail transportation for its exports, but it has throughout its history. The chart below shows the total tonnage of goods transported out of Saskatchewan by rail in the recent period between 2001 and 2012, indexed, as well as an index of the rail tonnage relative to the value of exports.

Chart 20. Index of Goods Shipped from Saskatchewan by Rail Relative to the Value of Saskatchewan's Exports (in $2007 constant)



Sources: The Conference Board of Canada; Statistics Canada.

There has been noticeable fluctuation in the quantity of goods exported from Saskatchewan by rail since 2001. This fluctuation has been mirrored by the tonnage relative to the value of exports, suggesting that there is a relatively tight relationship between rail tonnage and exports. However, the relationship appears to have weakened since 2009; the quantity of goods transported out of Saskatchewan by rail has increased more slowly than the value of Saskatchewan's exports.

This dissociation is the result of the increasing prominence of crude oil within Saskatchewan's exports. Between 2009 and 2012, the value of crude oil exports has increased 45 per cent (constant dollars), while the total value of Saskatchewan's exports increased by 15 per cent. This indicates that oil exports grew three times as fast as the Saskatchewan average during this time. Because the bulk of Saskatchewan's crude oil exports are not transported by rail, and oil exports formed an increasingly large portion of the total value of Saskatchewan exports (growing from 29 per cent in 2009 to 37 per cent in 2012), the increased exports resulting from oil would not translate into comparable increases in rail tonnage (unlike other commodities, such as potash, which are transported predominantly by rail).

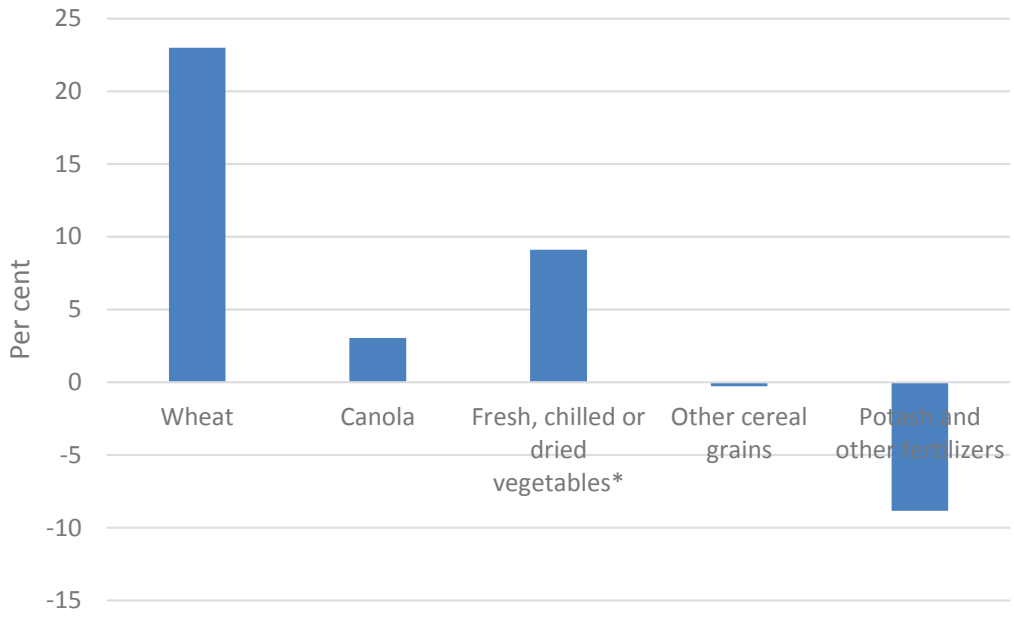
Collectively, these data indicate that much of Saskatchewan's exports are closely tied to rail transportation. This suggests that commodity exports from Saskatchewan can be constrained by the availability of rail service, but at the same time can also increase demand for (and eventual capacity of) rail service.

On a nationwide scale, commodity shippers in

particular have voiced concerns that the availability of rail transportation is not meeting shipper demand.[50] For example, shippers have stated that they are frequently left with full grain elevators, and are unable to accept additional grain from producers as trains are not supplied in a timely fashion, or in sufficient quantity etc. During 2013 – a record year for crop production – huge quantities of harvested grain were unable to get to market because of the high demand for rail freight transportation and poor weather conditions, which forced the railways to reduce the overall length of trains and reduce capacity as a result. The railways simply did not have sufficient capacity to meet the significant spike in supply. As a result, much of the 2013 harvest had to be stored for prolonged periods of time on the farms as grain elevators were at maximum capacity, depriving farmers of anticipated income and reducing the value of the harvested crops.[51]

Despite the challenges, railways collectively did deliver more grain from Western Canada in the 2013-14 crop year than they did in the previous year. During the 2013-14 crop year, railway originating tonnes of wheat from Western Canada equaled nearly 23.9 million. With 19.4 million originating tonnes in the previous crop year the resulting year-over-year growth rate was 22 per cent.[52] For the crop year originating tonnes of other grains and oilseeds were typically higher as well. However, over the same period of time originating tonnage of fertilizers was down nearly 9 per cent (Chart 21).

Chart 21. Year-Over-Year Percentage Growth of Railway Originating Tonnage in Western Canada, Selected Commodities (2013-14 crop year)



*Includes lentils and peas

Sources: The Conference Board of Canada; Statistics Canada.

The aggregation of other cereals may mask the impacts on other specific cereals. For example, US oats millers ran into oat supply shortages (which are predominately sourced from Saskatchewan and Manitoba) in 2014, with some of the gap being filled by the greater use of the more expensive trucking mode. The emphasis on moving grain to ports for

50 See Transport Canada, *Rail Freight Service Review*.

51 See The Economist, "Prairie Pile-Up."

52 Derived from Statistics Canada, CANSIM table 404-0002. The monthly carloading data are aggregated by Western and Eastern division and as a result, the provincial totals cannot be isolated. For methodological reasons these data do not necessarily conform to annual railway origin/destination data. However, they are more timely and useful for direct year-over-year comparisons.

export to other international markets may have been a contributing factor.[53]

Nonetheless, this suggests that in 2013 at least, the upside growth of Saskatchewan exports have been limited by the availability of rail freight infrastructure. Whether or not this is true in typical years cannot be inferred from these data. Furthermore, to the extent that the crop is properly stored and not allowed to rot, it is still available for export in the following year, albeit at potentially lower prices and at the cost of additional time in storage. It is, however, clear that rail infrastructure deficiencies can limit or at least delay Saskatchewan exports in some situations as capacity catches up to growing export volumes.

The *Plan for Growth* and Projected Rail Volumes

The *Saskatchewan Plan for Growth: Vision 2020 and Beyond* provides ambitious export targets for the province to hit by 2020. Given that Saskatchewan depends on rail to transport a large volume of its exports, rail transportation must play a significant role in the province's ability to reach these goals.

It is estimated that the potential increase in demand is a result of the growth in Saskatchewan's exports here. Relatively few specifics were proposed for individual commodities when the Plan set the goal of doubling the value of exports by 2020. As a result, the implications for rail freight service demand are somewhat ambiguous. For example, if increased value of exports were to come primarily from increased commodity values, this would require no additional freight transportation. However, assuming that increased export value is going to come, at least in large part, from increased quantity of exports, additional transportation services would be required.

Of note, the *Plan* did indicate that the Government of Saskatchewan wished to increase the value of agricultural exports from $10 billion to $15 billion. This does not, however, suggest that the total quantity of agricultural exports are planned to increase by 50 per cent. Agricultural goods, like everything else, are subject to inflation, and so it is likely that much of the proposed increased value of the exports would be due to inflation. In other words, the $5 billion dollar increase is in nominal dollars, rather than in real dollars. To estimate the growth in the real dollars, forecasts of price changes of the relevant commodities from The Conference Board's national forecasting model were used. From these forecasts, it is expected that prices of the relevant commodities will grow by a total of 14 per cent. This leaves the volume of the commodities to account for 36 per cent of the agricultural export goal.

By considering the tonnage of agricultural products shipped from Saskatchewan by rail in 2011, the necessary increases in rail freight movements necessary to meet this goal can be estimated. To simplify, only the agricultural commodities appearing in Table 6 were included. In 2011, a collective 20.1 million tonnes of these commodities were exported out of Saskatchewan by rail. An increase of 36 per cent would require the rail system to be able to handle an additional 7.3 million tonnes of agricultural exports by 2020. This is the equivalent of 17 per cent of the 42.3 million tonnes of all commodities transported by rail out of the province in 2011, the highest-quantity year on record to that date.[54]

Any growth in potash exports would require additional rail freight transportation. In order to project potash volumes for 2020, The Conference Board's forecast of the potash' industry's GDP out to 2019 (extrapolating the trend for one more year in order to arrive at the 2020 total) was used. The expected growth in GDP was applied to the actual 2011 rail volumes in order to arrive at an estimate of the 2020 rail volumes. The price forecast was applied to the volumes in order to arrive at an estimate of the nominal value of those exports in 2020.

Over the past several years, much of the growth in Saskatchewan exports has been driven by increased crude oil sales. Since most of Saskatchewan's crude oil is transported out of the province via pipeline, a large increase in oil quantities exported would not necessarily require

53 Heppner, "US Millers Desperate for Oats."

54 Statistics Canada, CANSIM table 404-0021

much or any additional rail capacity. Statistics Canada reports that 21.4 million litres of crude oil were transported from Saskatchewan via pipeline in 2012,[55] which dwarfs the roughly two million litres of crude transported out of Saskatchewan by rail. However, oil transported by rail (oil-by-rail; OBR) is increasing in Saskatchewan: 2012 OBR was over five times larger (in quantity) than OBR in 2011, and over 12 times larger than OBR in 2010. This extremely fast growth in OBR is partly the result of the constraints on Canada's oil pipeline network. Therefore, increases in the quantity of crude oil exported from Saskatchewan (or Alberta) may be accompanied by increased demand for rail freight transportation if additional pipeline infrastructure does not come online in the meantime.

However, whether or not crude oil exports from Saskatchewan will continue to increase, as in recent years, is uncertain. The National Energy Board (NEB) predicts that, by 2020, Saskatchewan crude oil production will have decreased from 2012 levels. The NEB formulated three production scenarios, based on different possible trajectories (low, reference, and high) for oil prices, with final WTI crude oil prices of $80, $110, and $140 (2012 USD) per barrel in 2035. The crude oil production decreases are predicted to be 14.8 per cent, 6.4 per cent, and 2.4 per cent from 2012 production levels.[56] Even assuming that oil prices rise more quickly than anticipated, the NEB predicts that Saskatchewan will decrease the quantity of oil produced. This viewpoint is supported by OPEC's demand forecast, which shows almost no growth in North American oil demand from 2012-2018.[57] While global demand is forecasted to increase by nearly 10 per cent, if Saskatchewan is unable to diversify its crude oil export market, it may be unable to take advantage of the increased demand predicted for Asian countries.

The Canadian Association of Petroleum Producers (CAPP) takes an opposing view. Rather than predicting a decrease in crude oil production, CAPP predicts that tight oil will drive an increase in Saskatchewan crude production. Relative to 2012 output, CAPP estimates that by 2020, the quantity of crude oil produced in Saskatchewan will have increased by 19.6 per cent.[58]

The recent decline in global oil prices is yet another uncertainty regarding the future growth of crude oil exports. Moreover, it obviously creates some uncertainty in terms of the value of those exports in nominal terms by 2020.

These broadly divergent forecasts and trends give us a wide range of potential crude oil production in Saskatchewan by 2020 – from a 15 per cent reduction to a 20 per cent increase – which indicates that the amount of pressure that future oil production will put on Saskatchewan's rail system is unclear. However, current estimates by CAPP indicate that this is likely to be substantial. CAPP indicates that approximately 100,000 barrels of crude oil per day were loaded onto rail cars in Western Canada.[59] According to the monthly railway carloadings data, Western Canadian carloadings of fuel oils and crude petroleum have reached close to 250,000 bpd in the first seven months of 2014.[60] This is an increase of over 40 per cent relative to the same period in 2013.

CAPP predicts rail loadings in western Canada to increase to over 700,000 barrels per day by the end of 2016. Notably, CAPP further predicts that this quantity will be half of the loading capacity available in Western Canada at that time, as loading capacity is also predicted to increase substantially in the next couple of years.

55 Net of oil transferred from other provinces. Statistics Canada, CANSIM table 133-0003.

56 Calculated from NEB, *Canada's Energy Future 2013*, Appendix A3.3– A3.5.

57 OPEC, *World Oil Outlook 2013*, 55.

58 Calculated from CAPP, *Crude Oil: Forecast, Markets, and Transportation*, 39.

59 CAPP, *Transporting Crude Oil by Rail in Canada*, 6.

60 Estimated from Statistics Canada, CANSIM table 404-0002, assuming an average of 600 barrels per railcar.

If Saskatchewan were to maintain its current share of oil tonnage transported by rail, CAPP's forecast suggests that the amount of oil transported by rail in Saskatchewan could increase seven-fold by 2016, noting that this forecast was generated prior to the recent collapse in oil prices. This would equate to over 12 million tonnes of oil being transported by rail – a quantity higher than any commodity currently transported by rail other than potash. Such an increase would almost certainly put substantial pressure on Saskatchewan's current rail infrastructure. However, a more conservative scenario is applied by first using The Conference Board's forecast of the province's oil and gas extraction out to 2020 and assuming that the railway share of the implied crude oil volumes will grow to one-third. This results in a more conservative rail tonnage estimate of 7.5 million tonnes. However, it is noted that the actual amount could be significantly more or less due to the uncertainty explained above.

For both potash and petroleum products a forecast of prices is applied in order to arrive an estimate of the nominal value of these products by 2020.[61] Note that the estimate started with a subset of export commodities that accounted for approximately 83 per cent of Saskatchewan's exports in 2012 (the sum of the railway commodities in Table 6 plus the approximately $10.5 billion in petroleum products that were exported by pipeline). When the total of the projected agriculture, petroleum products and potash as described by the method above are summed, the total nominal value of exports is $41.7 billion, or just 71 per cent of the $59 billion export target implied by the Growth Plan.

It is also noted that the overall $59 billion target is more aggressive than The Conference Board's own export forecast of $51 billion. This suggests that Province's implied volume or price forecasts for potash or petroleum products are more aggressive than Conference Board's' own. Or, it could mean that the growth of the residual products – non-agricultural, potash or petroleum products such as manufactured goods – is expected to far outpace the growth in what makes up the base of the province's current exports.

Tables 7 and 8 provide the resulting estimate of 2020 export tonnage and values versus the most recent year actuals.

61 An aggressive target for uranium exports was set with the impact in tonnage terms being relatively small due to the very high value per tonne. The aggressive target is in part due to the fact that the assumed increase in the base commodities falls well short of the $59 billion export goal, as described above. Also note that the price forecasts were generated ahead of the recent decli

Table 7. 2020 Projected Volumes of Key Saskatchewan Export Commodities (thousands of tonnes)

Commodity	2013 Actual	2020 Projected	Net Increase
Crude oil	20,609	22,694	2,086
Potash	15,342	22,941	7,599
Wheat	9,701	12,236	2,535
Canola seed	3,303	4,165	863
Canola oil	1,156	1,458	302
Lentils	1,767	2,228	462
Peas	2,576	3,250	673
Canola meal	1,768	2,230	462
Uranium	6	10	5
Other cereals	1,474	1,859	385
Refined petroleum products	85	155	69
Total	57,787	73,227	15,439
Source: The Conference Board of Canada.			

Table 8. 2020 Projected Values of Key Saskatchewan Export Commodities (thousands $nominal)

Commodity	2013 Actual	2020 Projected	Net Increase
Crude oil	11,855	15,855	4,000
Potash	5,580	9,823	4,243
Wheat	3,359	4,783	1,424
Canola seed	2,051	2,847	795
Canola oil	1,425	1,977	552
Lentils	1,149	1,559	410
Peas	1,110	1,506	396
Canola meal	686	952	266
Uranium	606	1,595	989
Other cereals	500	679	178
Refined petroleum products	58	121	63
Total	28,380	41,696	13,316
Source: The Conference Board of Canada.			

Finally, the implications for railway demand by applying the estimated railway share of export traffic by commodity in 2012 is estimated. The exception as noted above is for crude oil exports, where it was estimated that the rail share will grow to approximately 7.5 million tonnes. Table 9 summarizes these results, aggregated into the three broad categories of potash, petroleum products (which includes a small amount of refined products) and agri-food products (which includes canola oil and meal in addition to crop production).

Table 9. 2020 Projected Increase in Railway Originating Tonnes from Saskatchewan, Key Commodities (thousands of tonnes)

Commodity	2012 Actual	2020 Projection	Net Increase
Potash	12,548	21,575	9,027
Petroleum products	1,526	7,720	6,194
Agri-food products	16,481	21,340	4,859
Summed across commodities	30,555	50,635	20,080
Source: The Conference Board of Canada.			

Chapter Summary

Overall, the growth in railway originating tonnes from Saskatchewan implied by the Plan for Growth is over 20 million tonnes. Note that the base tonnage shown here for 2012 includes only our estimate of originating tonnes of the commodities destined for export. It does not include the estimate of the residual commodities not shown here or the originating tonnage of domestic movement or interprovincial trade.

As noted, since the share of the commodities that have been considered here accounted for 83 per cent of the province's exports in 2012, but only 71 per cent of the Growth Plan's target for 2020, there will likely need to be significant growth in exports of products that the province does not currently export in large quantities, such as manufactured goods (or services). This would likely increase the demand for railways services, above the 20 million additional tonnes, although not necessarily to a proportionate degree as manufactured goods generally have a higher value per tonne and are also more likely to be transported by truck.

Chapter 4
Rail Service and the Competitiveness of Saskatchewan Exports

Saskatchewan commodity exports are largely undifferentiated from those produced in other jurisdictions. For undifferentiated commodities, the ability to deliver product in a reliable and efficient way is key to competitiveness. Our interviewee shippers mentioned time and again that buyers are very willing to switch suppliers if a supply source becomes too expensive or unreliable. That may result in lost market share.

This section analyzes how rail service affects the competitiveness of Saskatchewan's main exports. This effect is directly related to the cost of rail service as part of total landed costs and the amount of time that Saskatchewan exports spend on the rail system in relationship to total time to market. Transportation costs are especially important for low-value by volume goods. Because the cost of transportation comprises a large portion of the total value, producers of low-value by volume goods are particularly affected by transportation costs, as the relative price difference between otherwise competitive producers is very high.

This chapter explores the cost and service considerations for Saskatchewan's main export products.

Understanding Supply Chain Logistics

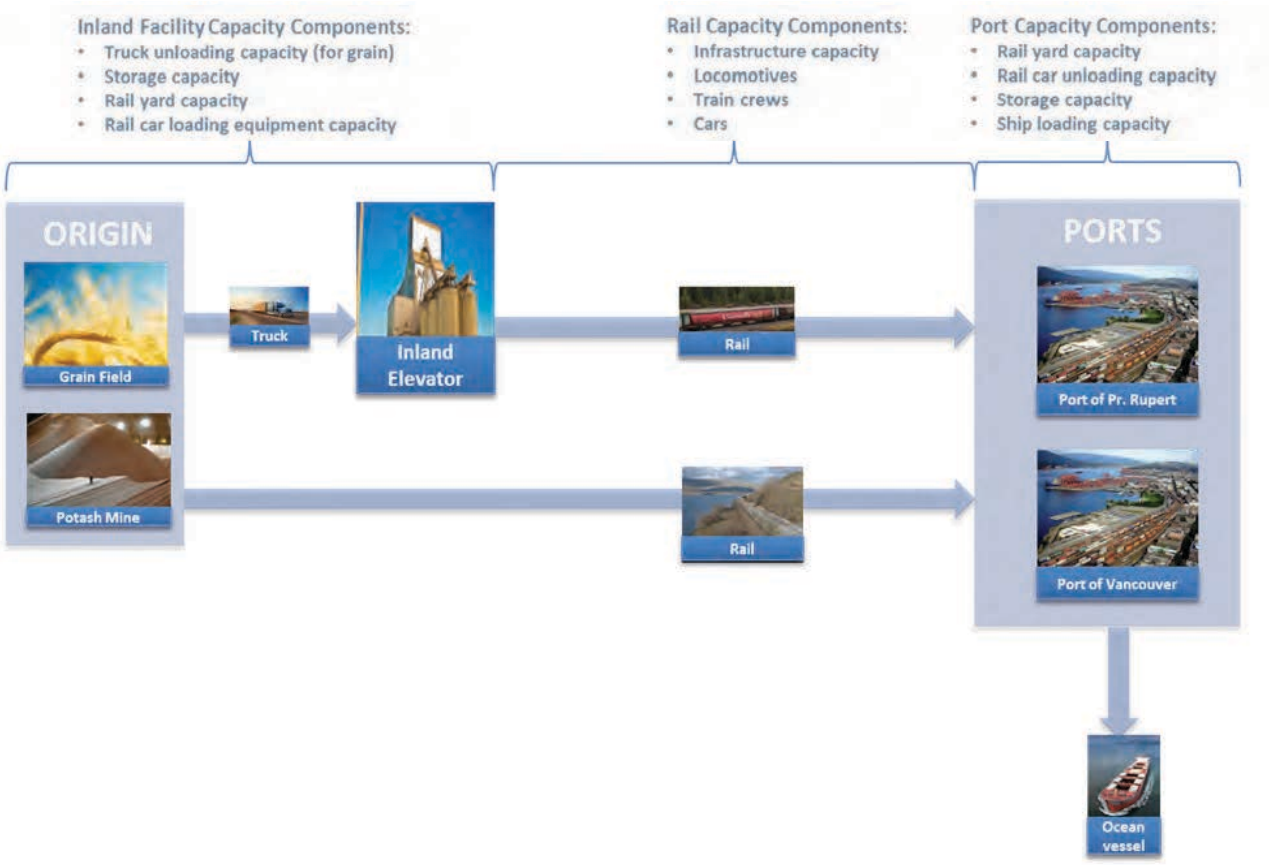
Rail freight costs vary substantially across commodities. Because rail tariffs are set on a per-car basis, the rail freight cost per tonne depends on the density of the commodity, as well as the car rental price. Additionally, because the value of each commodity varies substantially, the proportion of the value that is comprised of rail costs varies heavily, from as low as five per cent for canola oil,[62] to 20 per cent in potash and some cereal grains. For commodities on the high end of that scale, changes to rail rates can substantially impact the netbacks of producers.

The cost of rail transportation is, of course, merely one component of the total cost of getting goods to export markets. The logistics supply chain capacity depends on the nature of commodities and destination, but always involves multiple steps. For grain commodities being exported out of North America, the intermediary steps involve: trucking the grain to grain elevators near a rail line; loading the grains into grain elevators and unloading them into rail cars; transporting them to the destination port; unloading the grains into port elevators, and unloading from port elevators onto ships for overseas transport (Figure 1).

62 This refers to the outbound rail costs. Since canola oil requires the delivery of canola, there is also a significant inbound transportation cost that is in addition to this 5 per cent.

Figure 1

Aspects of Supply Chain Capacity: Grain Example



Source: CPCS.

There are many physical elements that determine the capacity of the rail-based supply chain from Saskatchewan to West Coast ports. These elements must work together in a system to create export capacity for commodities from Saskatchewan. For example, if elevator/terminal capacity is lower than the ability of railways to deliver cars to a terminal, then railways may be forced to have locomotives and crews wait longer than necessary, or depart with shorter trains, meaning that railway capacity is not used to its full potential. Similarly, if railways are not able to deliver or pick up rail cars quickly enough at a terminal, then loading and unloading facilities cannot operate at their maximum possible throughput. Ultimately, aligning and coordinating each of these elements is crucial to ensuring that there is sufficient export capacity for commodities from Saskatchewan.

The nature of storage (or inventory) is very important and varies by commodity. For instance, potash cannot be stored in open air and as a result, inventories are only around one per cent of supply.[63] Although the grain elevator system can hold higher volumes of inventory than for potash, during bumper crop season the elevator system can become overloaded. This may necessitate releasing grains into the spot market which may have an adverse effect on prices, and therefore, supplier returns. Or it can mean that growers hold their own inventory on farm. If stored in open conditions this could lead to rotting and a loss in the value of the crop. Even if the integrity of the product is maintained, the delay in sales could mean higher financing costs for the grower or cash flow issues as they are unable to payback their short-term loans on time – one of the outcomes of from the logistical problems that occurred during the 2013-14 crop year.

63 Grant, Burt, and Ai. *Saskatchewan in the Spotlight*.

Participants in the supply chain include public and private sector entities involved in physically moving goods, entities supporting this physical movement, and regulatory authorities:

- Producers
- Truckers
- Inland terminal operators
- Brokers
- Third-party logistics providers
- Railways
- Shipping line
- Port terminals
- Port Authorities
- Government departments and agencies

These entities will have greater or lesser roles to play and supply chain decisions to make depending on the origin and destination and nature of the goods being shipped.

Rail service is a critical component of the supply chain because it plays a linking role between the production and temporary storage near the source of production or at the port and the ultimate ocean voyage. For example, unreliable railway service will cause shippers to hold more inventory at their production facilities or in port terminals. So railway service can affect the producers' net return on shipments both directly through freight rates and indirectly through service reliability.

Most supply chain participants make capacity decisions based on expected financial returns. Every company faces a cost of capital and will only generate sustainable profitability if it invests in projects that are expected to have returns exceeding their cost of capital. Well-managed companies scale back or eliminate existing uses of capital that no longer generate returns in excess of their cost of capital. The discontinuance of rail lines is an example. Within this environment, decisions about how much capacity to provide will be driven by the return a participant expects to earn on an investment.

Risk is critically important in capacity decisions as well. Decisions on investments are not solely based on expected returns (the average forecast return adjusted for risk). The less risk around the return that an investment will generate, all else being equal, the lower the threshold rate of return required to justify the investment. For example, if a mine asks a railway to build a spur line to provide service, the railway will only do so if it is confident the mine will produce the promised traffic over the length of time it will take the railway to make its required return on the investment. Railways might insist on such a traffic commitment before building the spur. Alternatively, the mine owner may assume the risk by building the spur itself, leaving the railway with very little risk, but in a competitive market, less profit, since the railway would not be able to charge for use of the rail spur; i.e. it would effectively be providing fewer services.

Different supply chain participants may have a different assessment of the risk and return associated with an investment decision. This disconnect might mean that it makes sense for different participants to shoulder differing amount of risk. For instance, rail cars used to transport potash for export to countries other than the United States are owned by Canpotex, the marketing company for three potash companies operating in Saskatchewan (Potash Corporation of Saskatchewan, Mosaic Company, and Agrium Inc.). Canpotex has taken on the risk and return associated with investing in this equipment. The railways provide the locomotive power, crews and line capacity.

Where competitive markets do not exist, supply chain capacity decisions become vastly more complex. Continuing the mine example above, assuming the mine has only one railway in proximity (is a captive shipper) a railway may try to charge the mine owner higher-prices, even if the mine owner has paid for the rail spur. The mine owner is of course aware of this possibility, and before building the mine and the spur, will negotiate a contract with the railway. However, if

the mine truly has no other transportation option (e.g. competing railway), then it may have to settle for higher prices because the railway will have more negotiating power.

On the other hand, if the mining company is in the process of choosing between multiple mine sites in which to invest it may be able to leverage that in its negotiations with the railway. Particularly if the alternate mining sites are located in close proximity to another railway, or perhaps close enough to a port in which case rail services would not even be required, the mining company can negotiate rail rates down to make that mine site the more profitable one. If it cannot, the railway risks losing the traffic entirely if an alternate site is chosen.

For a variety of reasons, governments are involved in regulating transportation, both explicitly through policies such as the Maximum Revenue Entitlement (MRE) for grain and interswitching rules, final offer arbitration (FOA),[64] and also implicitly by subsidizing transportation infrastructure. This intervention is, in principle, desirable to improve the competitive functioning of transportation markets which are compromised by the geographical nature of activity, such as the fact that some production areas are only served by one railway. Geography and environmental regulation also mean that the number of deep-water ports is to some degree limited.

In sum, supply chain decisions are made under varying degrees of competition. Regardless of the level of competition, supply chain participants are always seeking to generate an expected return greater than their cost of capital.

Governments and their agencies make supply chain decisions for a different, and usually less well-defined set of reasons, but generally with the goal of improving the overall well-being of the city, province, or Canada as a whole. Well-being takes into account a large number of factors beyond risk-adjusted returns such as environmental effects, economic inequality, historical traditions, and partisan political considerations.

The following discussion considers how costs vary for Saskatchewan's main exports.

64 See discussion on key railway-related policies later in this chapter.

Rail Costs and the Competitiveness of Supply Chains

The cost to shippers of transporting goods by rail varies widely depending on the origin-destination and commodity. For example, interviewees from the potash sector told us that total transportation costs vary from 15 to 30 per cent of total landed costs (the cost of the product including delivery costs to the buyer) depending on the market in question. Likewise, grain shippers indicated that transportation costs can account for as much as 35 per cent of total costs while pulse shippers indicated average shipping costs amounting to 20 per cent of landed costs.[65] What this means is that transportation costs in general, and rail costs in particular, are a major factor in the competitiveness of Saskatchewan's major exports.

Rail costs are the dominant form of transportation costs for most of Saskatchewan's major exports because it is much more cost effective to ship bulk commodities by rail than it is by truck. One grain shipper interviewee reckoned that it would cost three times as much to ship grain to western ports by truck compared to rail.[66] That reflects the fact that trucks are limited in their capacity to handle large loads and that they share the road network with non-commercial vehicles and must travel through densely populated areas. Anyone who has driven on the westbound TransCanada toward the Port of Vancouver can easily verify that rail is a more effective way to reach the port. This fundamental economic reality has meant that the bulk commodity shipments to growing overseas markets have been configured around rail/ocean vessel voyage.

Rail is especially cost effective over long distances because the cost per kilometer falls over long distances. In order to simplify a comparison between commodities, rail rates (from CP) are presented for the commodities discussed in Chapter 1, when transported between Regina, a major hub in Saskatchewan, and Vancouver, a port which handles more than half of Saskatchewan grain exports.[67] These rates can be considered as the upper-range of rates by commodity, as large shippers will typically negotiate rates with the railways that are lower than the public rates. More specific alternate rates by commodity based on various sources are discussed in the ensuing sections. Those rates may be closer to what larger shippers pay but are perhaps less useful for comparing across commodity groups.

65 Various telephone interviews with Saskatchewan shippers by Michael Grant during September 2014.

66 Interview with Michael Grant on September 18, 2014.

67 Government of Canada and Quorum Corporation, *Annual Report: 2012–2013 Crop Year*, 1.

Table 10. Posted Rail Rates from CP to Transport Saskatchewan's Top Export Commodities, Transported from Regina to Vancouver

Commodity	Rail cost per tonne ($)	Rail cost proportion of value	Rail cost per carload ($)
Crude oil	74.30	13 per cent	6,115
Potash (KCl)	71.39	20 per cent	7,025
Wheat	63.87	18 per cent	6,074
Canola seed	63.28	10 per cent	5,227
Canola oil*	59.87	5 per cent	5,227
Lentils	64.34	10 per cent	6,074
Peas	64.34	15 per cent	6,074
Canola seed oil-cake and meal	57.19	15 per cent	5,227
Other cereals: oats, barley; canary seeds	68.67	20 per cent	5,611
Sources: The Conference Board of Canada; Canadian Pacific; Statistics Canada.			

Note: This cost is also estimated as a fraction of the per-tonne value of each commodity, based on Saskatchewan-wide average export values for 2013.

*As noted earlier, the rail cost as a share of canola oil values would be significantly higher if were to include the inbound rail cost (delivery of canola seed to crushing facilities).

Oil

The Canadian Association of Petroleum Producers (CAPP) maintains a map of North American refineries, pipelines, and pipeline rates.[68] The Keystone XL Final Supplemental Environmental Impact Statement (FSEIS) by the US Department of State, Appendix C, has some details on railway rates for transporting crude oil from Canada, though not specific to Saskatchewan.[69] CAPP summarizes some of this information, including transit times, in Figure 2. However, this information is not specific to Saskatchewan origins.

A report by ICF International in Appendix C of the FSEIS also provides a breakdown of some cost components for transporting bitumen from Alberta to the US Gulf of Mexico Coast, which includes:

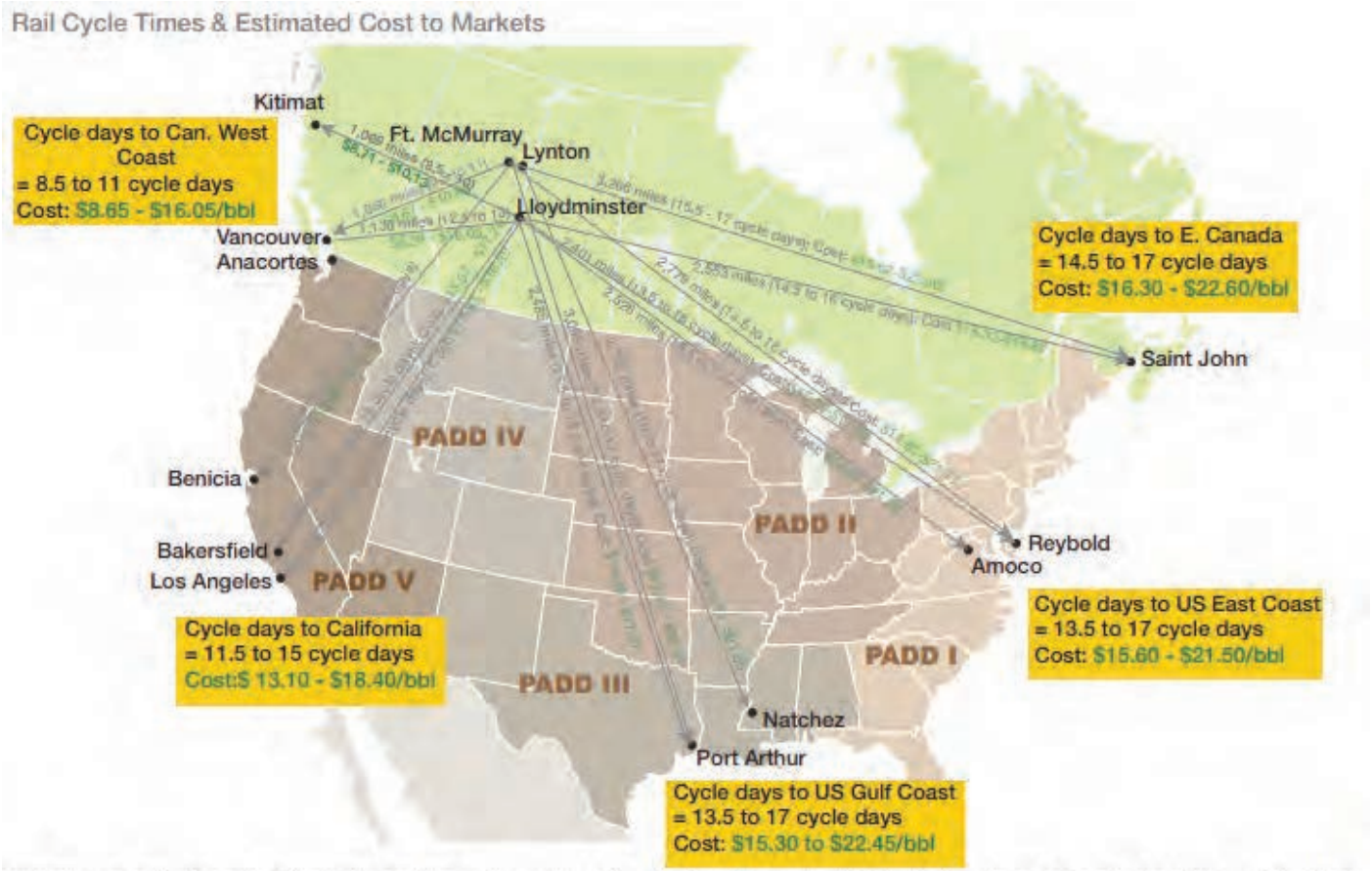
- Rail loading: $1.75/bbl
- Rail freight: $12.44/bbl
- Railcar lease: $1.13/bbl
- Rail fill/inventory costs: $0.09/bbl

In total this suggests total rail freight costs of roughly $15/bbl. While the characteristics of the oil are different in Saskatchewan than bitumen from Alberta, these figures should provide an estimate of the order of magnitude of these costs.

68 CAPP, *Canadian and U.S. Crude Oil Pipelines and Refineries*.

69 United Stated Department of State, *Final Supplemental Environmental Impact Statement.*

Figure 2. Summary of Rail Transport Costs and Transit Times (Source: CAPP 2014)



Tank cars used to transport petroleum products are typically owned or leased by the oil companies, though BNSF, which serves the Bakken formation in North Dakota (which also extends into Saskatchewan), recently purchased around 5,000 tank cars.[70] Tank cars can typically hold about 525 barrels of heavy crude and between 600 and 650 barrels of light crude.[71] The latter is produced from the Bakken shale. As of May 2014, tank cars were being leased for between $1,500 and $2,000 per month.[72]

Potash

Table 11 contains CP's fertilizer and coal product tariff. Based on an approximate distance of 1,125 miles from Regina to Vancouver, the approximate rate per car is $7,025 per car, for example. Assuming a car capacity of 100 tonnes,[73] the cost per tonne would be around $70. Other estimates suggest transport costs between $45 and $55 per tonne.[74] CN's Transit Calculator indicates that a rail car would take about 132 hours to travel from Saskatchewan (Allan Mines) to North Vancouver. These values do not account for the fact that potash is usually transported in unit trains.

70 Vantuono, "BNSF Taking Bids."

71 Cairns, *Crude Oil by Rail.*

72 Tita, "Railcar Shortage."

73 Canpotex notes that its 170-car unit trains can transport approximately 17,500 tonnes of potash, which means that each car can hold approximately 100 tonnes. Canpotex, *Logistics*.

74 A Salman Partners research brief suggests the estimated transport cost for a similarly located mine would be around $55 per tonne. Salman Partners, *Potash Transportation.* A potential potash company estimated the transport costs from a Saskatchewan mine to a location in Vancouver to be around $45/tonne in an undated posting. Gensource Potash Corp, *Typical Saskatchewan Solution.*

Table 11. CP Tariff CPRS 0030 for Fertilizer and Coal Products

Mileage	Fixed	Variable
≤ 100	$ 3,200 Minimum Charge	
> 100 ≤ 500	$ 3,200 Minimum Charge +	$ 5.00 /mile over 100
> 500 ≤ 1000	$ 5,200 Minimum Charge +	$ 3.00 /mile over 500
> 1000	$ 6,700 Minimum Charge +	$ 2.60 /mile over 1000

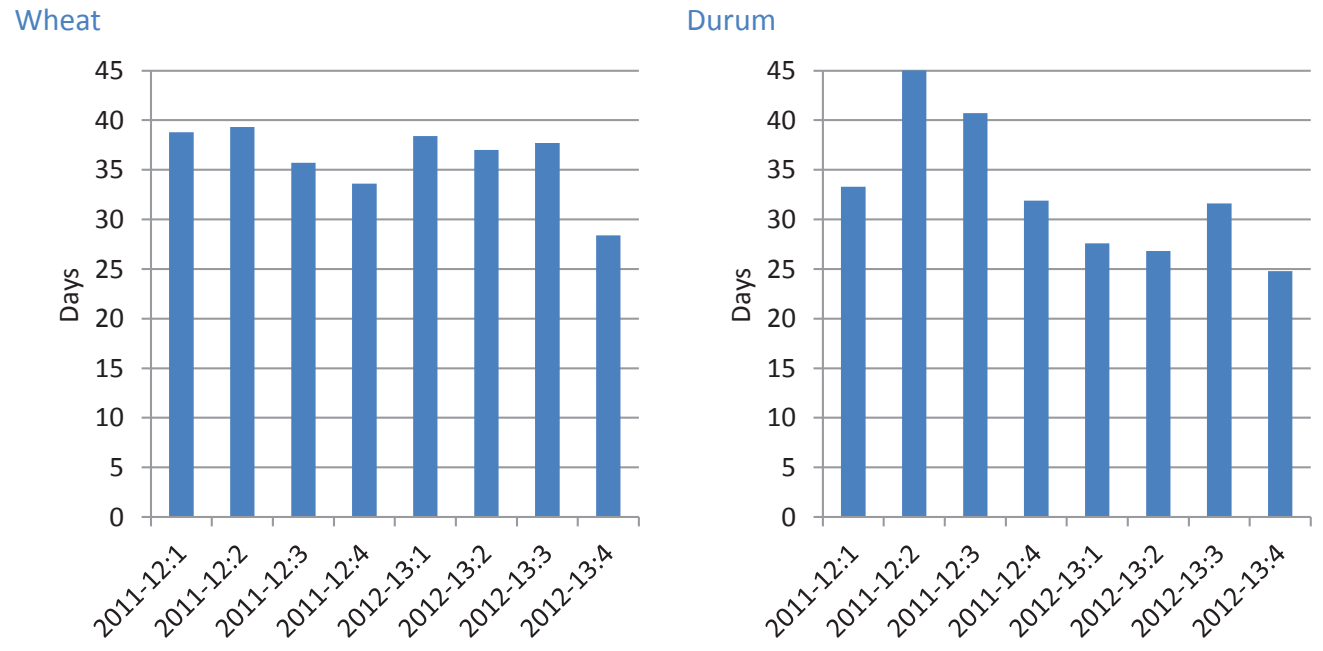
Source: CP Rail.

Wheat

Quorum Corporation, which acts as the Government of Canada's Grain Monitor, publishes quarterly and annual reports on grain movements.[75]

Using Quorum data, the following charts show average numbers of days that wheat is stored in Saskatchewan, prior to shipment, and at ports, respectively. While aggregate data for all ports are presented, days in store for Vancouver, Prince Rupert, Churchill, and Thunder Bay are all available.

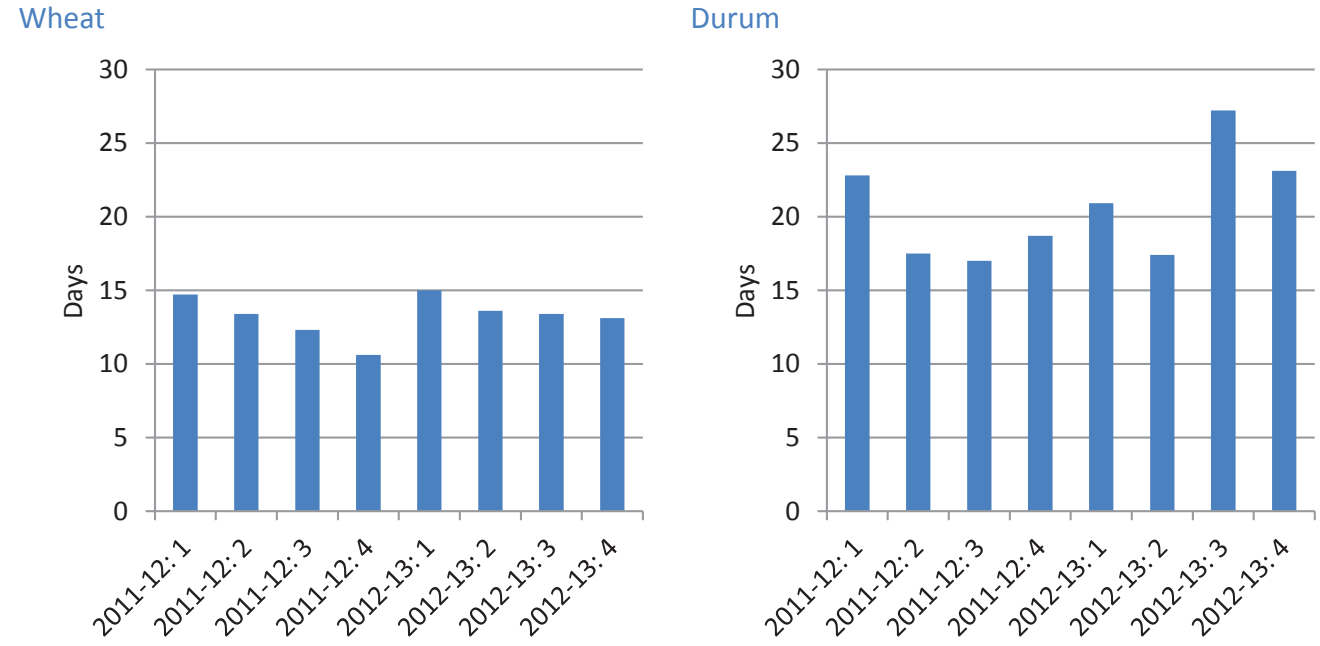
Chart 22. Storage in Saskatchewan, Wheat



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

75 See Quorum Corporation, *Reports*.

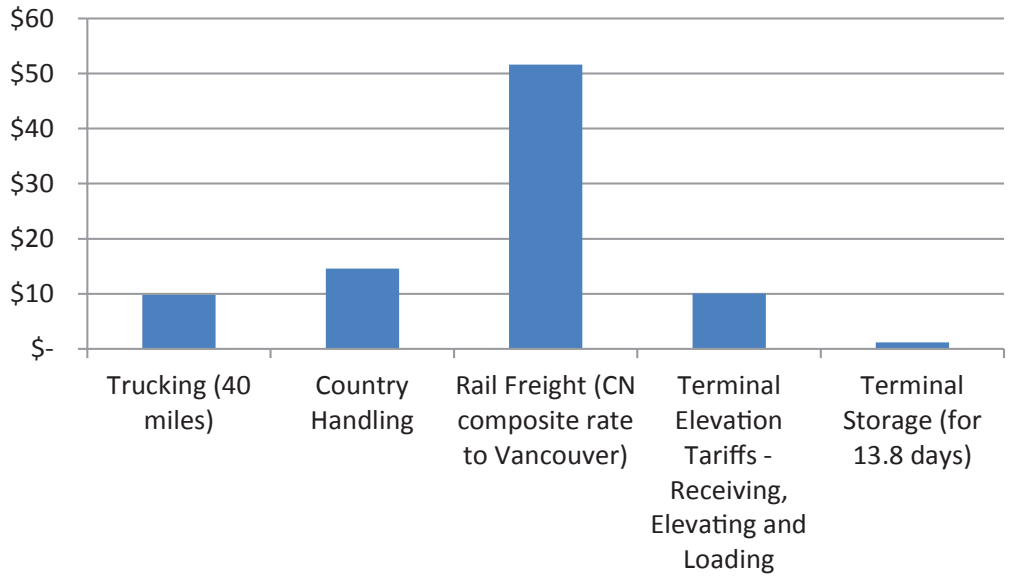
Chart 23. Storage in Port, All Ports, Wheat



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Chart 24 presents representative supply chain cost data for wheat carried by CN to the Port of Vancouver. In total, a representative export basis for wheat at the Port of Vancouver is $87/tonne. Of this, rail freight is by far the most costly component at $52/tonne.[76] In order to estimate trucking costs, an average distance of 40 miles from farm gate to country elevator was assumed. It was also assumed that wheat is stored at the Port of Vancouver for 13.8 days, the average for 2012-13.

Chart 24. Wheat Supply Chain Costs



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

76 The same estimate for rail freight cost per tonne was applied to subsequent grains. Note that this estimate differs from the estimate of $63.87/tonne (wheat) provided earlier in this chapter. As mentioned, the former estimate could be considered as an upper-bound estimate since it is based on posted rail rates.

The Quorum Annual Report also provides estimates of the export basis calculated from the difference between spot prices in the production region and the export price. For instance, in 2012-13, 1CWRS Wheat from Northeast Saskatchewan had a spot price of $285/tonne and an export price of $328.76/tonne. With an assumed 40-mile truck haul costing $9.82/tonne, the remaining export basis is largely captured in a price differential of $43.76/tonne. From this analysis Quorum calculates a netback (the amount that the producer sees) of $275.60/tonne.

Quorum reports that the "majority of grain is stored on the farm." Trucks used to transport grain from the farm have payloads per truck of 35-43 tonnes and are often owned by contractors instead of the producers.[77] When moving by rail, wheat tends to move as unit trains, as compared to special crops, which tend to move in smaller blocks of cars.[78] Railroads provide discounts for grain to move in blocks of about 50 cars or more.[79]

Recent reports have commented on the use of containers, particularly 20-foot containers, to export grain. Twenty-foot containers are used because they "can accommodate up to 26-28 tonnes of grain where a 40 foot container is limited [because of structural issues] to slightly more than 30 tonnes."[80]

There have been several recent regulatory changes that affect the grain handling and transportation system. In 2011, the passage of the Marketing Freedom for Grain Farmers Act resulted in the end of the Canadian Wheat Board monopoly over the export of western Canadian wheat.[81] Additionally, an amendment to the Railway Interswitching Regulations extended the limit for rail interswitching[82] from 30 kilometres to 160 kilometres in the provinces of Alberta, Saskatchewan and Manitoba for all commodities. The aim of this amendment was to increase competition among railway companies and give shippers access to alternative rail services.[83] Because these changes are relatively new, there are limited data with which to understand the expected impact of these changes.

Canola

Using data from Quorum reports, Chart 25 provides data on the storage duration of canola in Saskatchewan and in port (aggregate for all ports). The former has varied from about 14 days to 34 days since the 2011-2012 crop year. The latter has varied from eight to 10 days.

77 Government of Canada and Quorum Corp, *Traffic and Logistical Changes*.

78 Government of Canada and Quorum Corp, *Annual Report: 2012–2013 Crop Year*.

79 Gill and Schulman, *From Earth to Berth*.

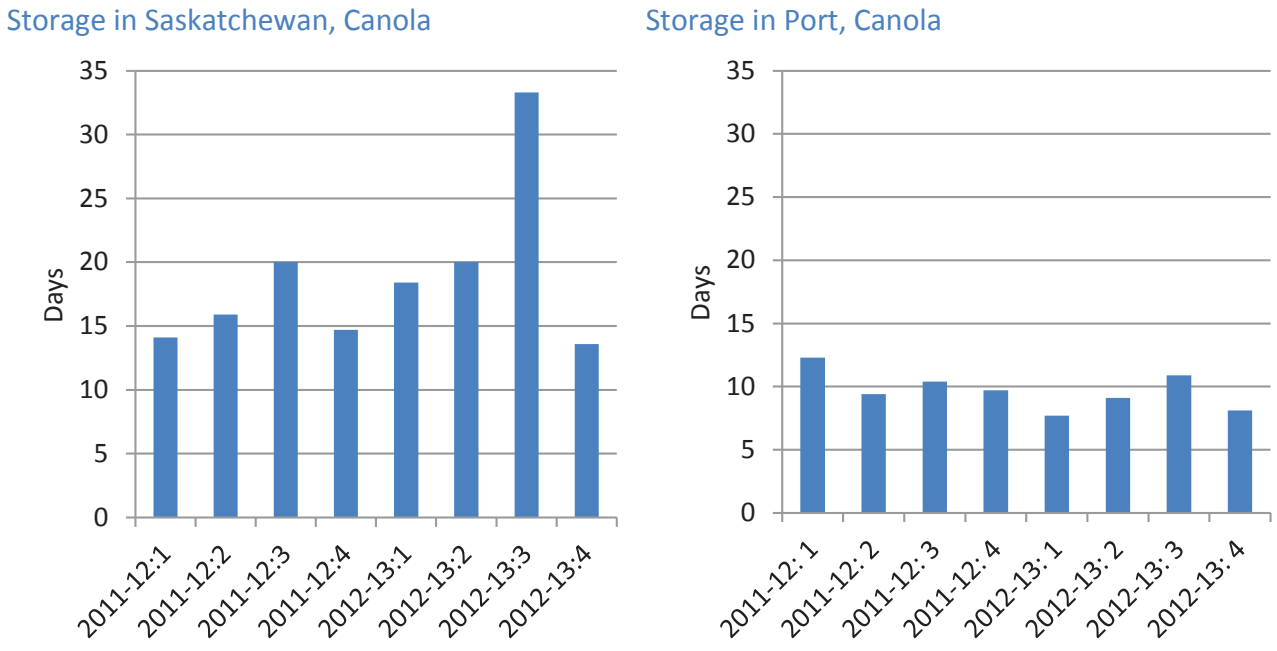
80 Government of Canada and Quorum Corp. *Container Use in Western Canada*.

81 Government of Canada and Quorum Corp, *Annual Report 2012–2013 Crop Year.*

82 Interswitching is an operation performed by railway companies (carriers) where one carrier performs the pickup of cars from a customer (shipper) and hands off these cars to another carrier that performs the "line haul" (the majority of the linear distance of the overall railway movement).

83 Canadian Shipper.com, *Feds Announce New Regs*.

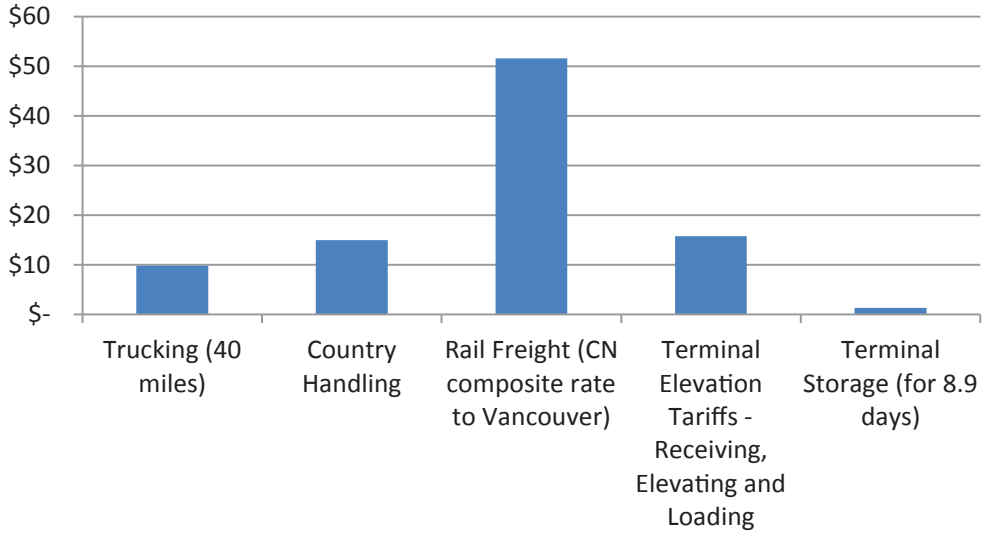
Chart 25. Storage of Canola



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Chart 26 presents representative supply chain cost data for canola carried by CN to the Port of Vancouver. In total, a representative export basis for canola at the Port of Vancouver is $92/tonne. Of this, rail freight is by far the most costly component at $52/tonne. It was assumed that canola is stored at the Port of Vancouver for 8.9 days (the average for 2012-13) and the trucking distance was 40 miles.

Chart 26. Canola Supply Chain Costs

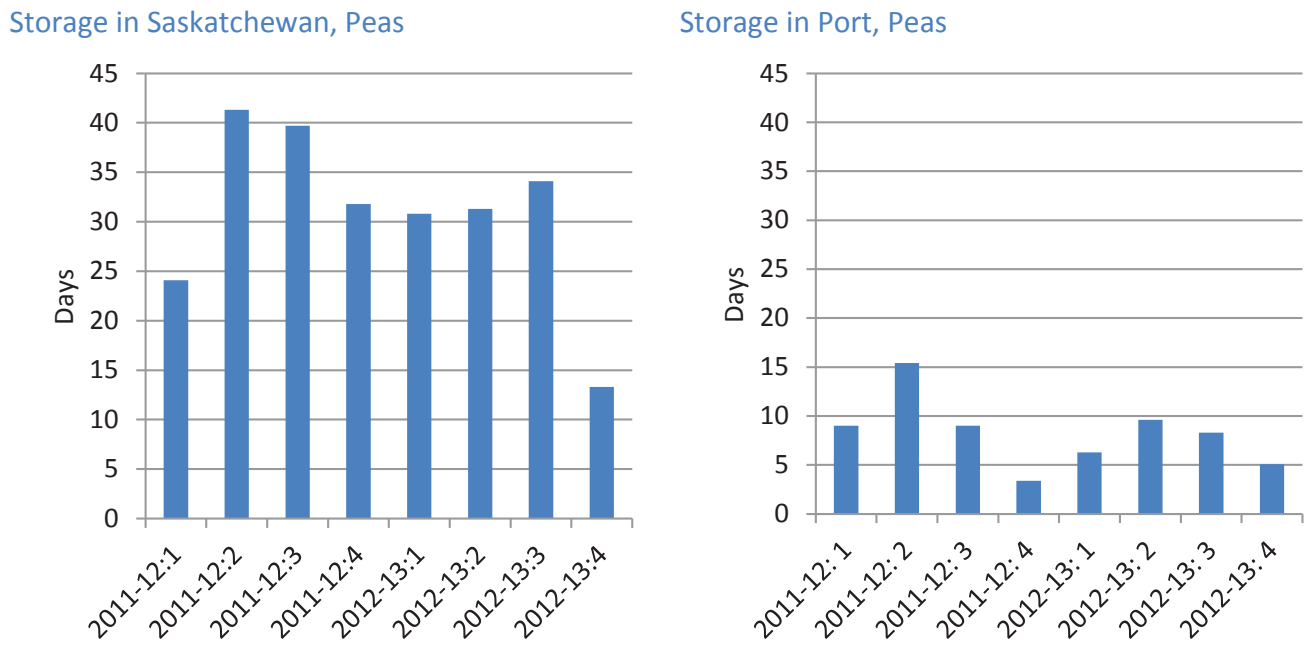


Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Pulses

Chart 27 provides storage durations for Saskatchewan peas in Saskatchewan and in port. Storage duration in Saskatchewan varied between 13 and 40 days, and storage duration in port was 15.4 days or less.

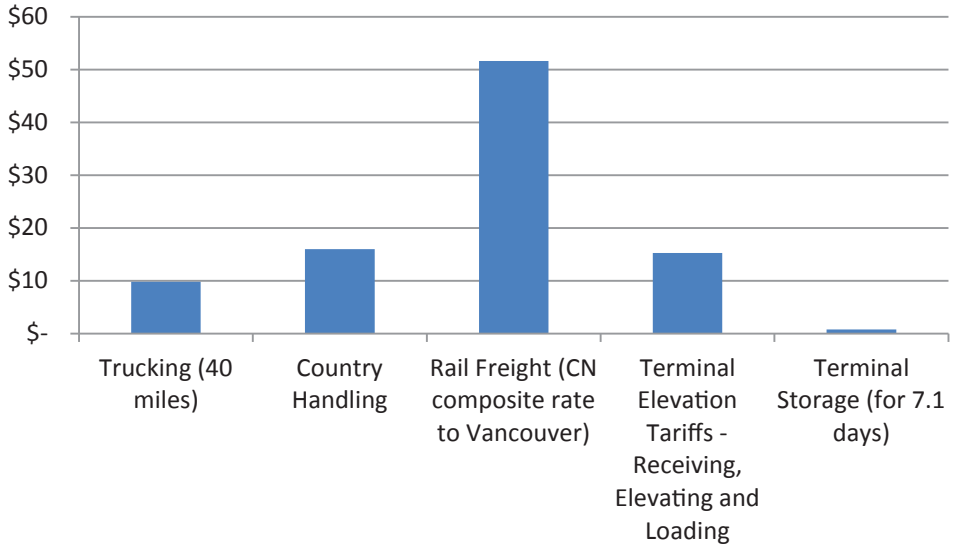
Chart 27. Storage of Peas



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Chart 28 presents representative supply chain cost data for pulses (peas) carried by CN to the Port of Vancouver. In total, a representative export basis for pulses at the Port of Vancouver is $93/tonne. Of this, rail freight is by far the most costly component at $52/tonne. It was assumed that pulses are stored at the Port of Vancouver for 7.1 days, the average for 2012-13.

Chart 28. Pulse (peas) Supply Chain Costs

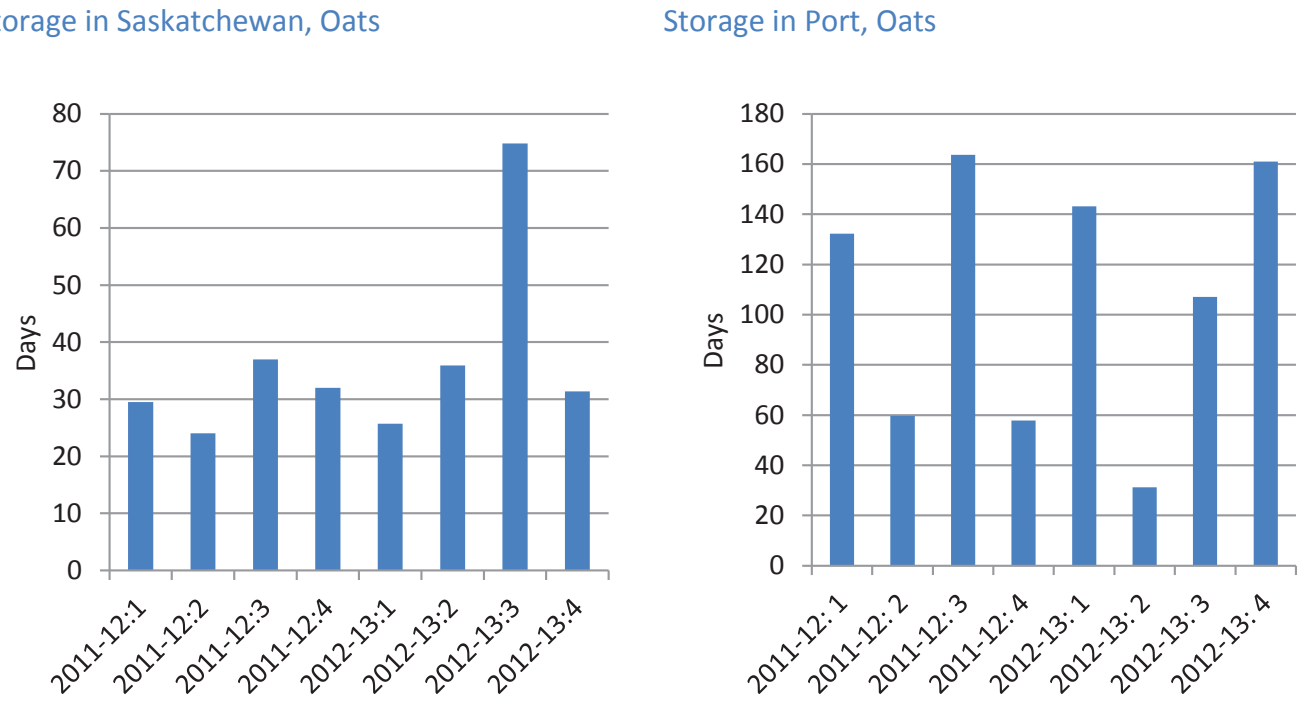


Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Other Cereals

Chart 29 presents storage times in Saskatchewan and at ports. It is notable that storage times are much higher for oats than for other commodities. This long storage time could reflect relatively small volumes that are exported at ports, relative to shipments to the United States, Saskatchewan's chief market for oats. It is notable that storage times are generally higher for oats than for other commodities.

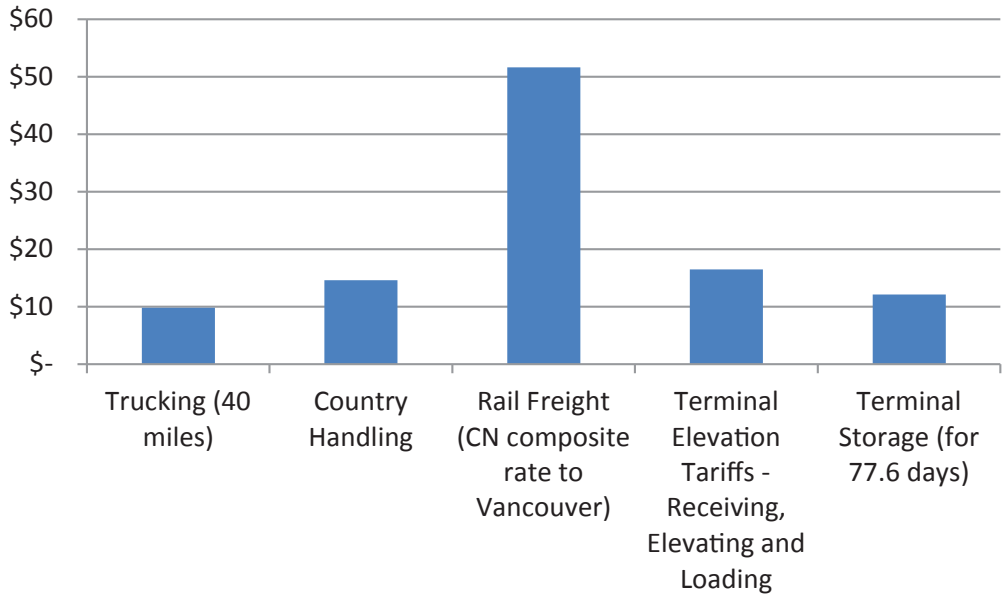
Chart 29. Storage of Oats



Source: CPCS analysis of Quorum Annual Report 2012-13 data.

Chart 30 presents representative supply chain cost data for oats carried by CN to the Port of Vancouver. In total, a representative export basis for oats at the Port of Vancouver is $105/tonne. Of this, rail freight is by far the most costly component at $52/tonne. It was assumed that oats are stored at the Port of Vancouver for 77.6 days, the average for 2012-13.

Chart 30. Oats Supply Chain Costs

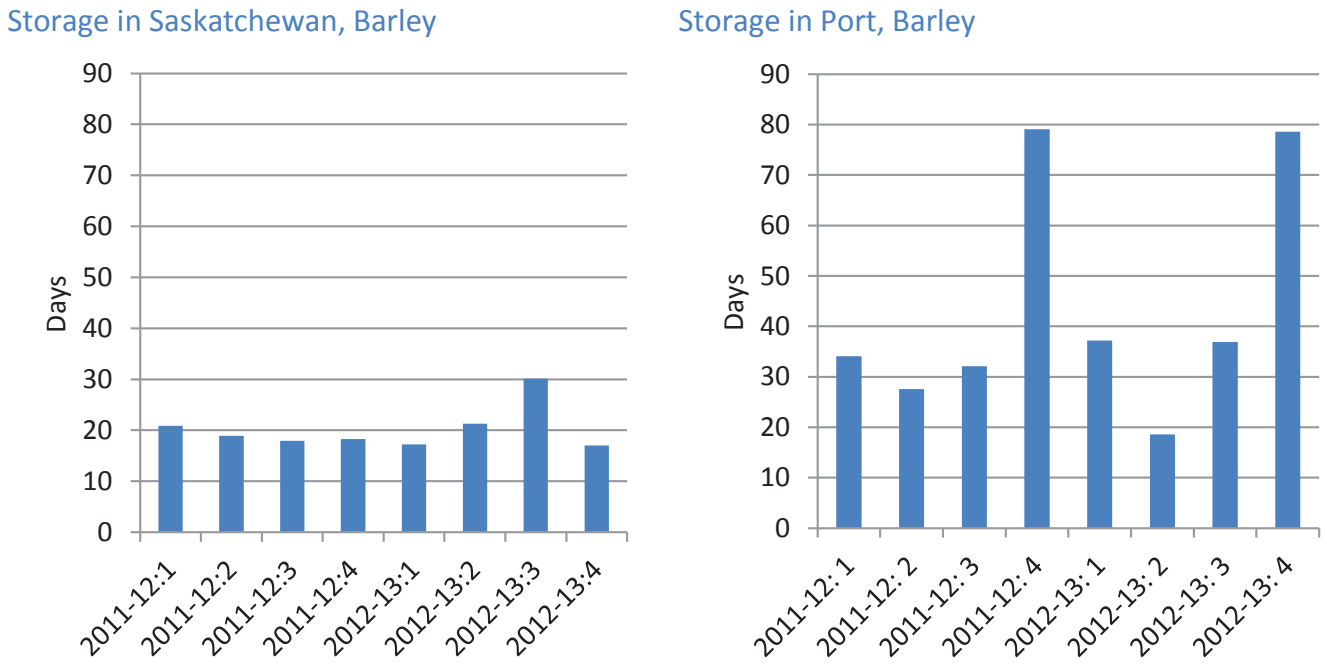


Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Barley

Chart 31 provides an overview of storage times of barley in Saskatchewan and in port.

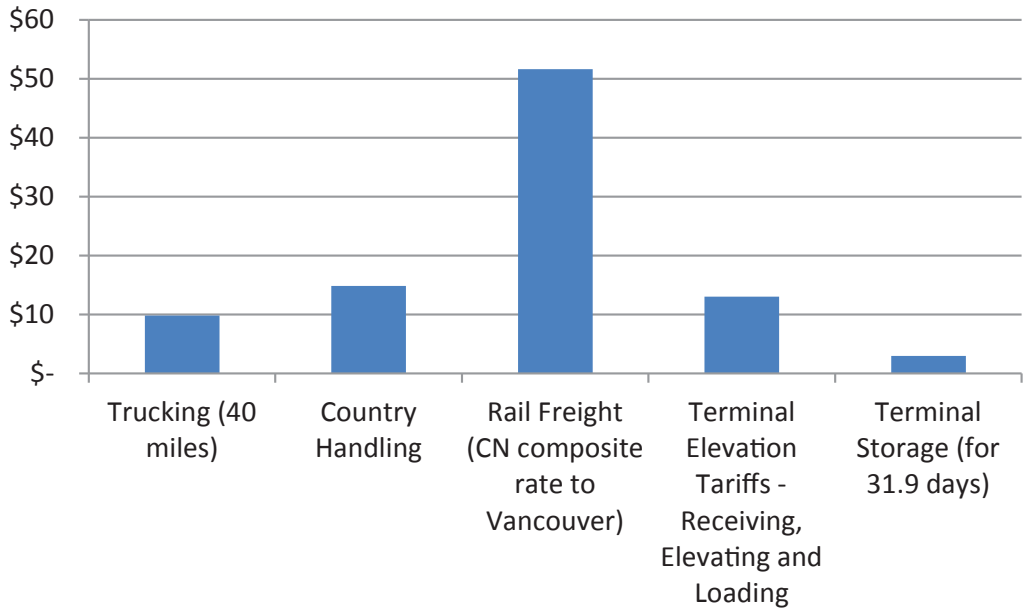
Chart 31. Barley Storage



Source: CPCS analysis of Government of Canada and Quorum *Annual Report 2012-2013 Crop Year* data.

Chart 32 presents representative supply chain cost data for barley (non-designated) carried by CN to the Port of Vancouver. In total, a representative export basis for barley at the Port of Vancouver is $92/tonne. Of this, rail freight is by far the most costly component at $52/tonne. It was assumed that barley is stored at the Port of Vancouver for 31.9 days, the average for 2012-13.

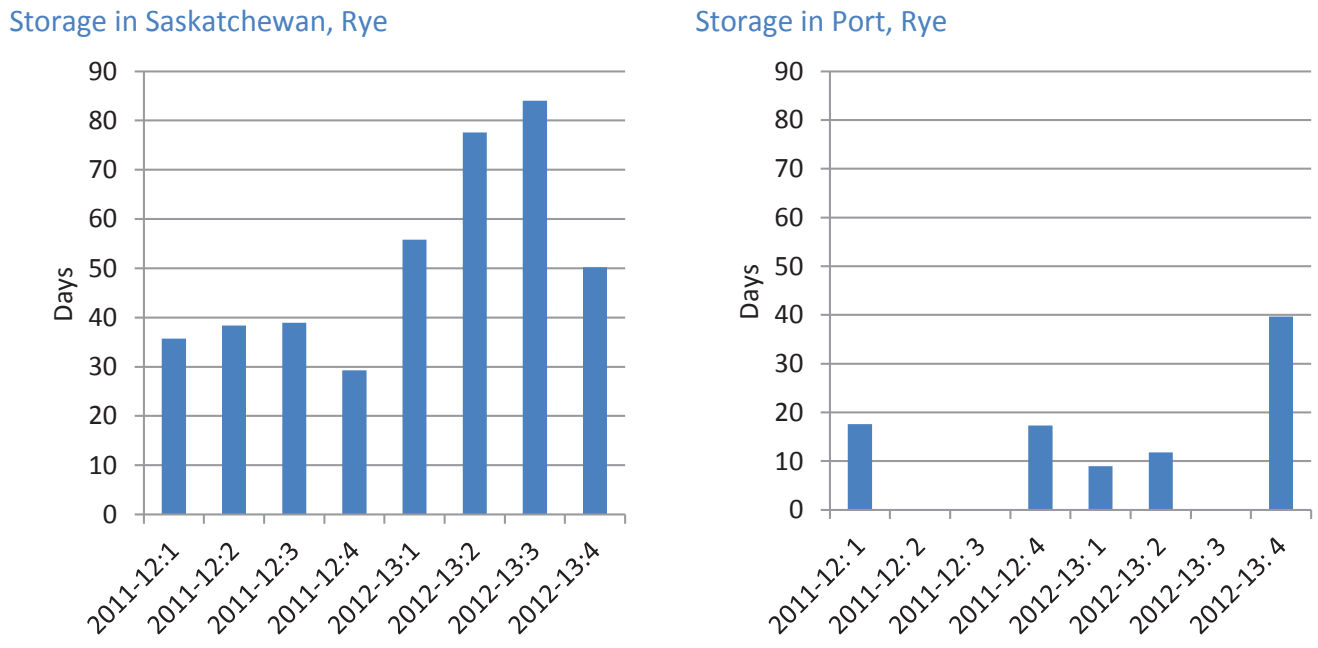
Chart 32. Barley Supply Chain Costs



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Chart 33 presents the storage times of rye in Saskatchewan and in port.

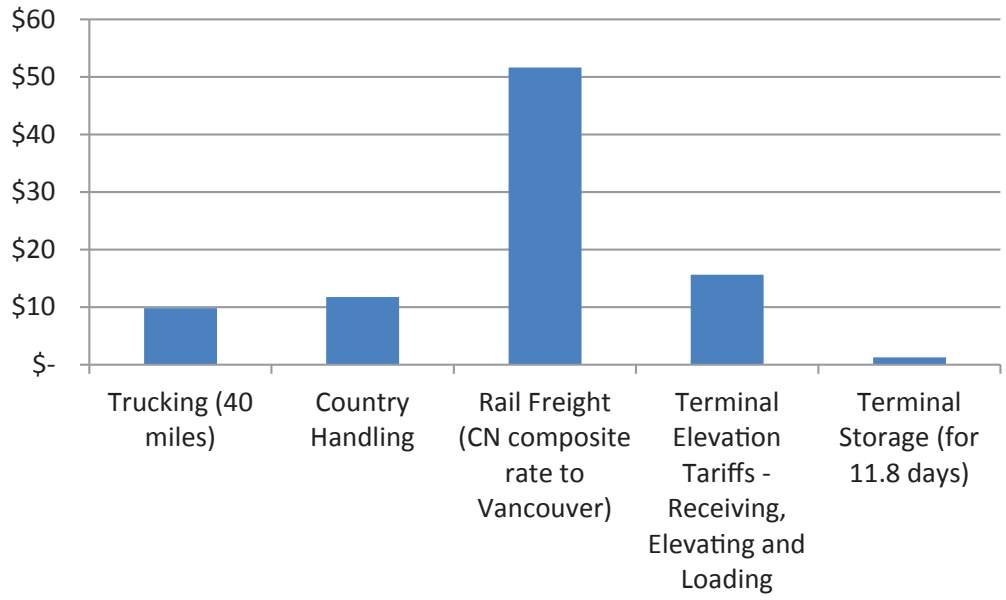
Chart 33. Storage of Rye



Source: CPCS analysis of Government of Canada and Quorum *Annual Report 2012-2013 Crop Year* data.

Chart 34 presents representative supply chain cost data for rye carried by CN to the Port of Vancouver. In total, a representative export basis for rye at the Port of Vancouver is $90/tonne. Of this, rail freight is by far the most costly component at $52/tonne. It was assumed that rye is stored at the Port of Vancouver for 11.8 days, the average for 2012-13.

Chart 34. Rye Supply Chain Costs



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

The estimates of transportation and logistics costs provided above show that for many of Saskatchewan's key exports, logistics costs and particularly rail transportation account for significant portions of prices that buyers eventually pay. Rail freight costs alone can account for up to 20 per cent of prices and when including other logistics costs this can increase to 30 per cent or more. Reducing those costs then have the potential to lower prices to buyers and expand the global reach of Saskatchewan's exports or return a higher portion of the export price to exporters.

Key Policies Relevant to Railway Transportation

As referenced earlier, there have been changes to recent federal policies that may impact rail freight transportation in Canada. Railway transportation policy in fact has a long and significant history in Canada. In general, over the decades the federal government has moved from direct ownership and/or regulation of railways to more indirect forms of regulations. Meanwhile, provincial and even local government policies can affect the efficiency and operation of Canadian railways. The following section provides a brief overview of some of the key railway and other policies that affect or can affect the export of goods by rail from Saskatchewan.

The Maximum Revenue Entitlement for Grain

The MRE is perhaps the most significant example of direct economic regulation of railways in Canada. Set for each crop year by the Canadian Transportation Agency (the Agency), the MRE is a limit on the average revenue per tonne (adjusted for the average length-of-haul) that Class I railways can earn on the shipment of regulated grains from Western Canada to the Port of Thunder Bay or to ports in British Columbia.[84] The limit is established by estimating the rate of inflation on railway inputs (such as labour, fuel and capital) to the limit that was established for the previous crop year.

The MRE is the result of the evolution of decades of economic regulation pertaining to the export of Western grain by rail. It was preceded by the "Crow Rate," which from 1925 to 1984 fixed the rail rate for export grain at 1899 levels. The Crow Rate ultimately proved to be a disincentive for railways

84 Canadian Transportation Agency, *Q&A.*

to invest in grain transportation infrastructure, leaving the federal and provincial governments to fill in the gap with the purchase of covered hopper cars. After 1984, the federal government replaced the Crow Rate with a direct subsidy to railways to cover some of the costs of grain transportation, while rail rates were still capped (but to a lesser degree). The subsidy ended with the passing of the *Canada Transportation Act* in 1996 (with the rate cap remaining). Finally, the rate cap itself was replaced by the MRE in 2000.[85]

During the period of the Crow Rate, there was little argument that it was a disincentive for railways to invest in grain transportation assets. Moreover, without a direct subsidy the railways were effectively forced to cross-subsidize the grain that they did carry from profits generated from the shipment of other commodities.

While the MRE today does not place a specific cap on total revenues that railways can earn from the export of grain per se, it does place a limit on the average revenue that railways can earn per tonne-kilometre. Without a direct subsidy it may be argued that under the MRE railways still have either a disincentive to invest in grain assets or must subsidize the movement of Western grain to some degree from profits earned from the movement of other commodities (or both). It may also discourage the use of higher-cost options to move grain, such as containerization. On the other hand, it may be argued that without the MRE, railways would simply raise the average rates charged for the movement of Western grain solely for the benefit of overall profits rather than better rates for other customers or improved service.

In either case, it is clear that the MRE is economic regulation that is unique to grain and as a result continues to be contentious, at least on occasion as being perceived to favour one group of customers at the expense of others. Furthermore, according to the Agency, it applies to grains and "any product" of those grains, but to the extent that it does not apply to final goods (such as breakfast cereal and alcoholic beverages) it may create a disincentive against more processing activity within Western Canada in favour of shipping more primary goods to millers abroad. Finally, the MRE creates an administrative cost. This cost may be higher for the railways (who have to balance the rates that they charge throughout the crop year in order to ensure that they land very close to but not over the maximum revenue entitlement for the year) than it is for the Agency.

85 Gill and Schulman, *From Earth to Berth.*

Competitive Access Regulations

Many shippers may find themselves "captive" to one railway due to their distance from the other railway. For these shippers, there are two specific regulations that are designed to encourage greater railway competition: interswitching provisions and competitive line rate (CLR) provisions.

When a shipper is within a radius of 30 kilometres from an interchange point (where the tracks of two railway carriers meet), the interswitching provision allows the Agency to apply a rate to the movement of the shipment to the interchange point by the originating carrier.[86] This is designed to allow the connecting carrier to compete for that traffic.

As part of the Fair Rail for Grain Farmers Act (granted Royal Assent in May 2014), the federal government extended the interswitching radius to 160 kilometres for shippers in Alberta, Saskatchewan and Manitoba. According to the Government, this would increase the number of primary grain elevators that have access to more than one railway from 48 to 261.[87]

CLRs apply to originating traffic that is more than 30 kilometres from an interchange point. However, in the case of CLRs, rates are determined on a case by case basis. This is in contrast to the interswitching rate, where rate scales that apply

86 Transport Canada, *Rail Freight Service Review, 7.*

87 Government of Canada, "Regulations Amending the Railway Interswitching Regulations."

to all eligible traffic are established in advance by the Agency. Shippers must also come to an agreement with the connecting carrier prior to applying to the Agency for a CLR. This, along with the rate uncertainty and a lack of infrastructure allowing for the interswitching of unit trains, has created obstacles for the use of CLRs in practice.

Level of Service Provisions and Final Offer Arbitration

The Canada Transportation Act (CTA) sets out a number of level of service (LOS) obligations on railways. Shippers who feel that they are not receiving adequate LOS can bring complaints to the Agency for investigation. If the Agency determines that the LOS provisions are not being met, it is able to obligate the railways to order that specific work be carried out, property be acquired or railway equipment be allotted by the railway in order to meet the LOS obligation.

Shippers who are not satisfied by rates or service levels offered to them by the railways also have the option of applying to the Agency for final offer arbitration (FOA). FOA has typically been used to resolve rate disputes, as service conditions are less easily-defined and complicate the process.[88] However, some shippers argue that these provisions are rarely used, due in part to the costly and time consuming processes, and as a result are largely ineffective.

Recent Temporary Remedies

As noted, the federal government recently extended the interswitching limit from 30 to 160 kilometres for traffic originating in the Prairie Provinces. This action was in response to the growing backlog of the grain crop after the 2013/14 crop season. At the same time, through an order in council (OiC) the federal government mandated that the railways carry minimum volumes of grain, approximately one million tonnes per week, through November 2014. More recently, the mandate was extended through March 2015, albeit at lower volumes (varying between 400 thousand and 930 thousand tonnes per week).

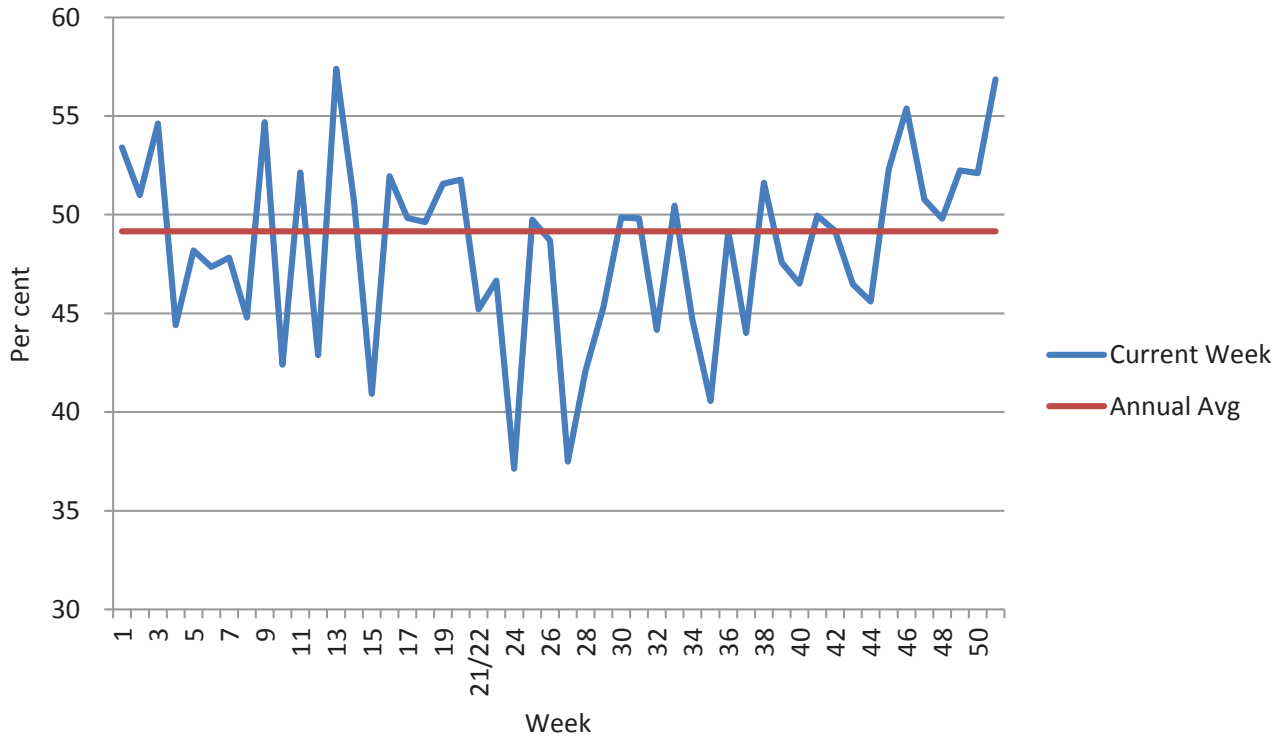
While farm groups have supported the extension, it has not generally been seen as a potential long-term remedy. For one, it increases the perception that grain traffic is accorded special attention at the expense of other traffic. Furthermore, a minimum tonnage mandate may encourage railways to favour traffic that must travel shorter, rather than longer distances. This may pose a particular problem for Saskatchewan growers who are "stuck in the middle" relative to growers in neighbouring provinces who are either closer to B.C. ports or Thunder Bay.[89]

An analysis of weekly delivery from primary elevators located in Saskatchewan seems to provide some, but not conclusive support to this hypothesis. For example, primary elevators in Saskatchewan accounted for 49 per cent of all deliveries from Western elevators for the 2013-14 crop year. However, from week 31 (the first full week after the minimum quantities were mandated) through week 44 the province's share of the total rarely exceeded 49 per cent (four times its share was barely over 50 per cent and one week it hit 52 per cent). Over that period Saskatchewan's share averaged 47 per cent. During the last seven weeks of the crop year Saskatchewan's share increased to 53 per cent. This may suggest that immediately after the minimum quantities were mandated shipments closer to port were favoured with quantities in Saskatchewan catching up later in the crop year. On the other hand, Saskatchewan's share of total shipments was already lower than the annual average in the weeks prior to the implementations of the mandate (see Chart 35), suggesting that the dip may have to do with the closing of the shipping season from Thunder Bay in mid-January (after week 23).

88 Transport Canada, *Rail Freight Service Review*, 8.

89 Stephenson, "Farm Groups."

Chart 35. Saskatchewan Share of Grain Shipments from Western Primary Elevators, 2013-14 Crop Year



Source: Conference Board Analysis of Data from the Canadian Grain Commission.

If only wheat is considered the trend is slightly more apparent. Saskatchewan's share of wheat for the entire crop year was 40 per cent. But during the period from week 31 to week 44 the province's share dipped to 37 per cent. Meanwhile, its share during the last seven weeks of the crop year increased to 44 per cent.

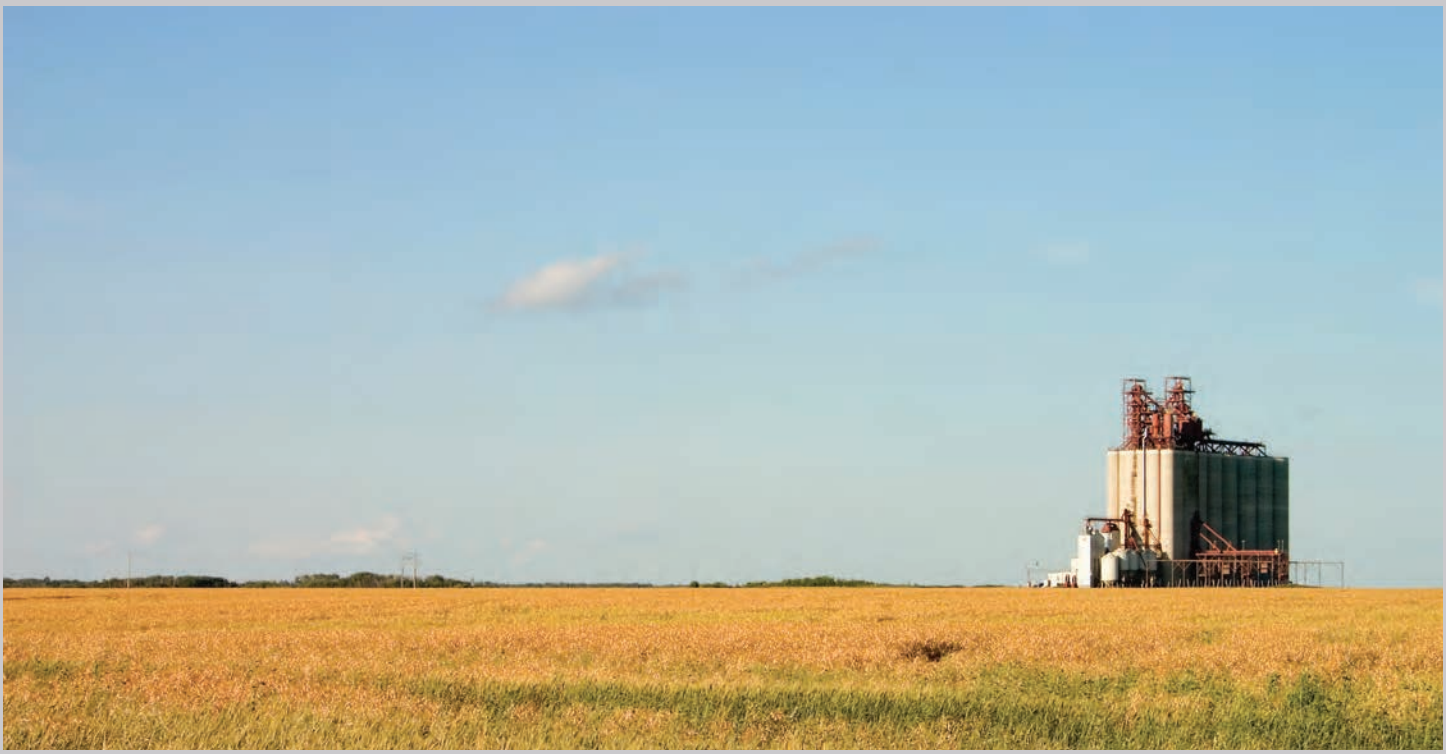
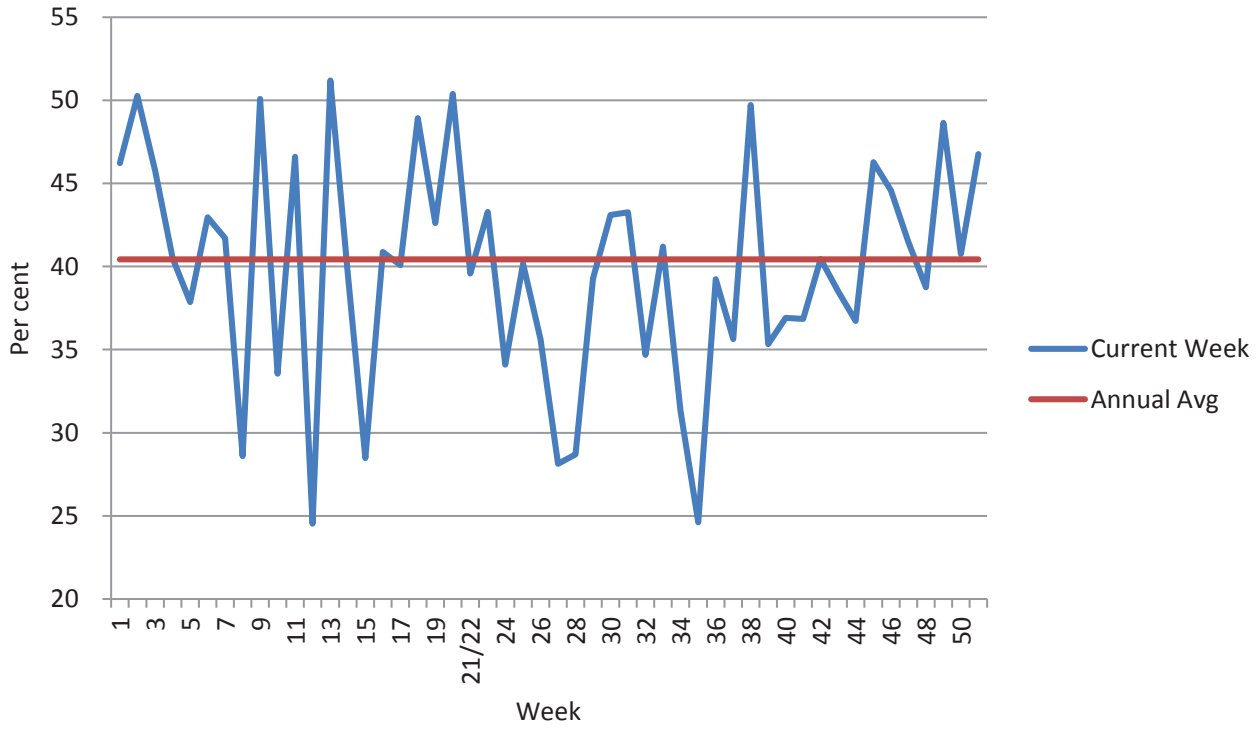


Chart 36. Saskatchewan Share of Wheat Shipments from Western Primary Elevators, 2013-14 Crop Year



Source: Conference Board Analysis of Data from the Canadian Grain Commission.

The OiC has also potentially impacted the ability to sell products in the US, as capacity has been diverted to West Coast ports. Selling to US markets is already difficult due to the long and variable railcar cycle times. For example, as noted in Chapter 3 some growers were forced to truck oats to mills in the US at a much higher cost as rail service simply became unavailable.

Fuel Taxes

Railway diesel fuel taxes generate less public policy interest than do road and other transport fuel taxes, in part because rail transportation is more fuel efficient than most other surface modes of transportation. Nevertheless, fuel and by extension fuel taxes form significant parts of the railways' cost structure. The topic warrants at least brief mention here because Saskatchewan's application of its provincial fuel tax deviates to some extent from that of other provinces'.

For example, in 2012, railways paid nearly $40 million in fuel taxes to the Saskatchewan government which is more than any other province except for British Columbia.[90] This is the result of a particularly high provincial fuel tax per litre, which at 15 cents per litre is significantly higher than in Alberta (1.5 cents), Manitoba (6.3 cents) and most other provinces. While these are relatively small amounts when compared to overall railway operations, given the importance of railway transportation for the provincial economy the effects of this unique treatment warrants some consideration.

90 Railway Association of Canada, *2013 Rail Trends*, Appendix B.

Relevant Marine Transportation Policy

Marine policies impact the competitiveness of exports and by extension, can affect the demand for rail services as well as the railway service levels that inland shippers see. Perhaps the most relevant policy in the recent past was creation of Canada Port Authorities (CPA) in order to manage Canada's major ports on a self-sufficient basis (funding through fees charged for service). Although the federal government enforces borrowing limits, in general this has encouraged port investment on a more commercially-viable basis.

Since that time, a new container terminal has been built at the Port of Prince Rupert with funding shared by the Prince Rupert Port Authority, the B.C. and federal government, CN Rail and Maher Terminals (who runs the terminal). Since then it has grown to handle over five million tonnes of containerized goods per year. The port has also an increasing volume of bulk commodities since the early 2000s, particularly grains and coal. Its emergence as a significant export terminal has helped to provide shippers not only with greater export capacity, but also with more supply chain redundancy in the event of disruptions at other ports or other parts of the railway network.

On the other hand, despite ample capacity bulk traffic through the Port of Thunder Bay has steadily declined since the early 1980s, although it has stabilized since the mid-2000s. In 1983 the port handled nearly 18 million tonnes of grain traffic and 1.5 million tonnes of potash. Today the port typically handles approximately six million tonnes of grain and 0.3 million tonnes of potash annually,[91] although 2014 projects to be significantly higher. The decline in the traffic has occurred for a number of reasons, including the decline in Eastern, particularly Russian, markets relative to the growth in demand from Asia-Pacific markets, which are better served through the West coast ports; significant increases in Seaway costs; the general trend towards larger vessels, which only deep water ocean ports can handle; and the elimination of the Crow Rate and subsequent "Crow Benefit" (rail subsidies) referenced earlier.

Meanwhile, a number of obstacles prevent the Great Lakes and St. Lawrence Seaway (GLSLS) from being a viable alternative for bulk traffic in general, including the length of the shipping season, which is approximately nine months, and in some cases the lack of backhaul traffic. For example, one shipping line noted that its model for shipping to and from the Great Lakes was "steel in, grain out." When there is less steel to move, it makes the grain traffic less viable.[92]

Nevertheless, if there continues to be growing concerns regarding infrastructure capacity for meeting demand generated by commodity exports some consideration should be given for solutions for making Thunder Bay a more viable option for shippers. For example, the GLSLS opened six days later than anticipated in 2014 due to the build-up of ice on the Great Lakes after the harsh winter. An increase in ice-breaking capacity could have helped to open the system earlier and help to move the backlogged grain crop sooner as a result.

91 Thunder Bay Port Authority, *Historical Cargo Statistics.*

92 Roy, *Unlocking the Value*, 83.

Chapter Summary

Railway transportation is important for Saskatchewan's export prospects because roughly half of the province's exports depend on rail to reach their customers. Moreover, transportation and logistics costs constitute a large portion of the delivered value of those exports, and of those transportation costs rail freight cost are the most significant portion. For those reasons alone any export growth ambitions must consider the role that rail freight transportation will play in facilitating or hampering those efforts.

A number of government policies influence the cost, availability and efficiency of rail freight services. Furthermore, government investments and policies that affect other parts of the supply chain or other modes of transportation also impact the use and efficiency of rail freight services. While the impact of these policies might be obvious at first glance, the reality is that there are often secondary effects or unintended consequences that may result from the implementation of new policies. To the extent that is possible policymakers should determine ex ante what these effects might be, as well as making ex post evaluations of such effects.

Chapter 5
Rail Capacity: Looking Ahead

Supply chain efficiency depends partly on the physical capacity of the system and partly on the economics of the system, namely the incentives of commercial producers to put capacity in place.

Leaving aside the commercial incentives, the following discussion explores whether there are any physical constraints that would prevent capacity from being put in place to accommodate significantly higher export volumes from Saskatchewan.

One's view of supply chain constraints very much depends on the time under consideration. In the short run, constraints may exist, and can take more or less time to resolve. For example, any new construction, such as new sidings or new terminal infrastructure (e.g. storage sheds, silos, rail yards, etc.) would likely take at least one year to develop. The timeline for adding infrastructure may be even longer if regulatory and other reviews need to be undertaken, or if land needs to be acquired. By comparison, some elements of capacity may be expanded more quickly, such as the additions of locomotives and cars to a fleet, provided no manufacturing backlog exists, and new-employee hires; however, even these elements of capacity can be constraints in the short-term.

Fewer constraints exist to expanding capacity in the long run. It is important to understand that simple measures of capacity are of decreasing relevance the further into the future one looks. For example, a single track railway line might appear to be limited by the fact that it is single tracked. The reality is far more complex. Clearances can constrain railcar height: if they are low, they can be raised to accommodate taller railcars, doubling capacity in the case of container trains. Track quality can be a constraint on train speed and weight, but track can be upgraded to allow for the movement of more and heavier trains per day. Signal systems can limit traffic on a line, but they too can be upgraded. Only when all of these measures have been put in place is the capacity of a line reached. Even at this point, additional parallel tracks can be added to increase capacity.

Turning to the economic aspects of capacity, capacity investments are decisions that railways make on the basis of their estimate of the return to be generated. In more challenging terrain such as through mountains or over large watercourses, the costs of infrastructure upgrades can be very significant. Though a capacity expansion can almost certainly be designed in even the most challenging terrain, it is less likely that sufficient traffic revenue is available to justify the high-cost expansion. At this point, the prohibitively high cost of a single increment of capacity can become a constraint. If railway customers ultimately must pay higher transportation costs associated with costly capacity expansion, then the competitiveness of exports will suffer.

Another constraint that can be quite challenging is land. Railways own rights of way, which do not always provide sufficient land to add additional tracks or other infrastructure required to increase the capacity of a corridor. In some cases, railways may face political pressure to allow increased passenger/commuter traffic on their lines. In instances where constrained rights of way and/or capacity constraints imposed by use of line for passenger/commuter service threaten to take a line to capacity new corridors may be required. Only Montreal, Toronto, and Vancouver appear likely to face such constraints in the foreseeable future. However, those constraints impact the rail network as a whole. The solution in these cases is

to build new corridors to by-pass urban areas. Such investments are large, require land assembly, and would likely have to be led by governments.

Related to the issue of land, some expansions could encounter insurmountable social, legal, or regulatory concerns. For instance, there may be public opposition to a noisy facility near residents, or public concern over the potential environmental implications of a facility.

No significant hard constraints to increasing rail loading or rail line capacity in Saskatchewan or Alberta for any of the commodities considered are anticipated. Though some specific facilities might be limited by environmental factors or nearby populations, no specific constraints would preclude expansion. More specifically, if any constraints exist, they would likely be related to infrastructure development on the West Coast.

Port Terminal Considerations

The Port of Prince Rupert appears capable of handling significant additional growth. Canpotex currently has an 11.5 million tonne/year (Mt/year) export terminal planned, which would increase West Coast potash export capacity by 75 per cent. Ridley Terminals, a coal-export facility near Prince Rupert, also plans to double its capacity from 12 Mt/year to 25 Mt/year.[93] The Prince Rupert Port Authority and its partners also have plans to expand the Prince Rupert Container Terminal from 750,000 TEU (twenty-foot equivalent unit) to 2,250,000 TEU per year. Prince Rupert Grain Terminal has a capacity of 7.0 Mt/year,[94] though only saw 5.1 million tonnes of throughput during the 2012-2013 crop year.[95] There is likely other serviced land (such as the former pulp mill on Watson Island) and unserviced land around Prince Rupert that could handle additional terminals without encroaching on existing residents.

93 Invest in Northwest British Columbia, *Ridley Coal Terminal Expansion.*

94 Prince Rupert Port Authority, *Prince Rupert Grain.*

95 Government of Canada and Quorum Corp, *Annual Report 2012–2013 Crop Year* data tables.

Some proposed facilities, such as oil export terminals, would likely face strong resistance from First Nations and the general public. For example, the nearby town of Kitimat, British Columbia, voted to oppose the construction of the Enbridge Northern Gateway export terminal, which would have loaded ships bound for Asia with diluted bitumen.[96] However, following a recent revision of the Canadian Environmental Assessment Act (CEAA) in 2012, the Governor-in-Council (i.e. the prime minister and Cabinet) has ultimate authority to approve or deny a permit for a pipeline project following the completion of an Environmental Assessment under the Act.[97] As a result, local opposition may not be sufficient to prevent a project from going ahead. Further, this issue is likely not a hard constraint for other Saskatchewan exports, as potash and grain exports are relatively uncontentious.

At the Port of Metro Vancouver, there appears to be opportunities to upgrade the efficiency of the facilities, and land to expand facilities. For example, as will be discussed in the following sections, terminal operators have plans to make large increases in their capacity at their existing facilities. Ultimately, Vancouver cannot accommodate all traffic, especially when there is a particularly large crop production in a given year. Further, unlike with Prince Rupert, which has a relatively small population, expanding and building new facilities in Metro Vancouver would likely run into public opposition.

Terminals already open have been the subject of noise complaints. Of note, in 2012, Cargill, which owns a grain terminal in North Vancouver, agreed to upgrade their North Vancouver grain terminal in order to reduce noise experienced by nearby residents.[98] The first phase of the project is not very costly – it is estimated at $1.2 million.[99] As a result, the noise of any new facility near a large population may be a constraint for new facilities.

Key Rail Corridors

Adding capacity to rail corridors through British Columbia (BC) by adding parallel tracks and sidings (lighter tracks that can allow for trains to pass each other) could be cost prohibitive along some segments. To reiterate, by cost prohibitive, it is meant that traffic levels would not grow sufficiently and/or railways may not be able to charge enough to receive sufficient return on the high incremental cost of an expansion. CN and CP are confronted with rugged terrain with difficult geotechnical conditions through British Columbia. As railway geotechnical engineers have noted:

> *The rugged British Columbia terrain dictates that railways are typically located along the valley bottoms of major river systems with numerous adjacent rock cuts or steep natural rock slopes that are subject to considerable seasonal variability in temperature and precipitation. These features have made British Columbia the most active area on CN's system for rockfall hazard.*
>
> - Engineers and risk experts from BGC Engineering, Oboni Associates, and CN[100,101]

As a result, adding additional tracks and sidings in some areas of British Columbia rail corridors would likely be very costly.

96 CBC News, *Kitimat, B.C.*

97 Canadian Environmental Assessment Agency. *Overview.*

98 Cargill, *Cargill Limited.*

99 [100] Port Metro Vancouver, Project Review Application Form (October 16, 2013).

100 Pritchard and others, "CN Rockfall Hazard Risk Management System." This quote also mentioned rockfalls (often termed a "ground hazard") which can take track out of service for several hours or days. Engineers at CN and CP have every incentive to manage these issues. However, these accidents are costly and reduce track capacity: "[g]round hazard incidents represent up to 12 per cent of all engineering-related issues, and due to their high cost-per-accident they account for as much as 25 per cent of the cost of engineering-related losses and track outages."

101 Geotechnical Society of Edmonton, *News 2013.*

This statement would likely be particularly applicable along CN and CP routes to Vancouver, which must pass through spiral tunnels near Field, BC (CP), and the Thompson and Fraser River Valleys (both CN and CP). Heretofore, CN and CP have avoided the need to construct additional lines in the Thompson and Fraser River Valleys by operating a directional-running zone (DRZ) from Vancouver through to approximately 100 km west of Kamloops, BC. In the DRZ, westbound trains run on CN track, and eastbound trains run on CP track. However, any further expansion would be costly.

These issues appear somewhat less pronounced on the CN North Line Corridor to Prince Rupert; there appears to be room to accommodate future growth even if the CN BC North Line remains a single-tracked line with sidings. As is shown in Table 12, even assuming planned growth, the number of trains per day is still less than the total number of trains possible on a single track line with sidings (i.e. 30 to 48 trains per day). Though constructing some sidings may be costly given the mountainous terrain in northern British Columbia, there is some flexibility as to the specific siding placement, which would help ensure that costs are more reasonable. (The total number of trains per day should be interpreted with caution, as they are based on several variables such as train length and car capacity, and future estimates extrapolated based on current practices.)

Table 12. Estimated Potential Usage of the CN BC North Line from Prince George to Prince Rupert

	Estimated Current Service		Potential Future Service	
Commodity Group Yearly Export Tonnage (tonnes)		Approximate Number of Trains per Day (total, both directions)	Yearly Export Tonnage (tonnes)	Approximate Number of Trains per Day (total, both directions)
Grain	5,136,900	2.1	7,000,000	2.8
Coal	12,000,000	5.0	25,000,000	10.4
Intermodal	*	3.0	**	9.0
General Merchandise	***	2.0	***	2.0
Potash	None	0.0	11,500,000	3.6
VIA Passenger Train	****	1.0	****	1.0
Total		13.0		28.8

Source: CPCS analysis.

Though there are multiple CN, CP, and shortline routes across the prairies, there are effectively three main export rail routes from Saskatchewan through the Rocky Mountains to the Canadian West Coast: The CP and CN mainlines to Vancouver and the CN BC North Line to Prince Rupert. The latter diverges from the CN mainline west of Edmonton around Valemount, British Columbia and proceeds via Prince George to Prince Rupert.

Figure 3: Western Rail Corridors

Source: CPCS.

All three routes are mainly single track lines with sidings to allow trains heading in opposing directions to pass.[102] There are also some segments of double track. The DRZ from Vancouver to approximately 100 km west of Kamloops, British Columbia operates similar double track.[103] Both CN and CP use some form of centralized traffic control (CTC) with wayside signals,[104] which permits dispatchers in central offices to oversee train movements and control signals and switches remotely.

As a first approximation of the capacity of the line, a 2007 study estimated that the maximum capacity of a single-track line (with CTC) is between 30 and 48 trains per day (total, in both directions).[105] The range of estimates reflects the fact that as the number of different train types (e.g. slower bulk trains, faster intermodal and passenger trains) operating on a line increases, the capacity of the line decreases. The higher estimate of 48 trains per day is based on lines where there is a single type of train operating, whereas the lower estimate of 30 trains per day occurs on lines where there is multiple train types operating.[106] On Canadian rail lines, multiple types of trains operate, so single track lines in Canada likely have a maximum somewhere between the upper and lower estimates.

The actual capacity of the line may be higher or lower than these estimates. The theoretical (physical)

102 Cambridge Systematics, Inc., *National Rail Freight Infrastructure Capacity and Investment Study*.

103 As noted earlier, in the DRZ, westbound trains run on CN track, and eastbound trains run on CP track.

104 Wayside signals are signals placed alongside a rail line.

105 Cambridge Systematics, Inc., *National Rail Freight Infrastructure Capacity and Investment Study*.

106 The effect of differences in train types (often referred to as "heterogeneity") on capacity is similar to the effect of having to segregate different types of grain at an elevator on its capacity. Even if an elevator's storage capacity is not 100 per cent utilized, it may need to turn away a delivery if it does not have storage capacity for that particular type of grain. Similarly, for example, a railway company may need to put a train in a siding earlier if a higher-speed passenger train is approaching in the other direction. The train opposing the passenger train may have been able to travel further, but because there is no siding at the specific location, it will need to be parked at a siding closer to its current location. In this process, some of the track capacity may be lost.

maximum capacity of a single-track rail line is governed by the time it takes for trains to travel between the two sidings spaced furthest apart (in time). For example, if it takes a westbound train 45 minutes to accelerate out of a siding, travel to the next siding, decelerate, and park in the siding, and an eastbound train a similar amount of time to repeat the process in the opposite direction, then the physical maximum number of trains per day that could travel over that segment of track is 32.[107] The actual practical capacity of the line is much lower than this figure, and is governed by such factors as the mix of train types. The 30 and 48 trains per day limit provided above is based on the closest ("densest") possible siding spacing before it becomes economical to construct double track.

Similarly, though siding spacing governs the maximum capacity of a line, segments of double track can also increase capacity. A completely double-tracked corridor can increase the capacity of a line to 70 to 100 trains per day.[108]

For the CP and CN mainlines to Vancouver, the estimate of 30 and 48 trains per day appears reasonable first order approximation. One recent report indicates that CP operates 30 to 35 trains per day west of Calgary.[109] Though there have been no reports of CN's capacity, the fact that they are adding double-track segments on their Edmonton-Winnipeg corridor would suggest that they are also operating in the 30 and 48 trains per day range on their mainline. The capacity of the Edmonton-Prince Rupert corridor is likely less than 30 trains per day, as CN continues to add additional long (12,000 foot) sidings along this corridor, which indicates that they have not yet reached the closest possible siding spacing on a single-track line.

Ultimately, the capacity of a line to export commodities from Saskatchewan is governed not only by the number of trains per day, but also the capacity of each train. Trains are becoming longer and heavier as railway companies extend sidings and make increasing use of technologies such as distributed power. (Distributed power is where locomotives are placed throughout the train but controlled by one locomotive engineer, which permits the length of trains to increase without significantly increasing in-train forces.) For example, as suggested above, CN has increased the length of major sidings to approximately 12,000 feet.[110] CP now runs trains up to 14,000 feet in length using distributed power.[111] However, other factors, such as the length of terminal yards, may govern the ultimate length of a train.

In the case of potash exports, Canpotex runs up to 170-car potash unit train holding approximately 17,500 tonnes and approximately 8,500-feet long.[112] (Canpotex also uses 130 and 142-car trains.) Similarly, in the case of grain exports, a 150-grain unit train using government hoppers can haul 13,650 tonnes and is approximately 8,850-feet in length (a unit train using new hopper cars can increase the capacity to approximately 17,000 tonnes).[113]

It is also important to recognize that rail capacity is governed by more than just infrastructure constraints. Notably, locomotives are also a driver of rail capacity and travel throughout the network. As a result, congestion on one part of the rail network, such as Chicago, can have ripple effects throughout the network.

107 A simplified version of the maximum capacity of single track is given by the equation:

$$\text{Number of trains per day} = N = 2\left(\frac{1{,}440 \text{ min/day}}{\text{Eastbound Travel Time} + \text{Westbound Travel Time} + \text{Acceleration Time}}\right)$$

108 Cambridge Systematics, Inc., *National Rail Freight Infrastructure Capacity and Investment Study*.

109 Cairns, M. 2013. *Crude Oil by Rail*

110 CN Media News, *CN to Construct.*

111 Barrow, Keith. "The Long and the Short of Distributed Power."

112 Canpotex, Logistics; Canpotex, Railcar Maintenance Facility.

113 Using figures from CN, including from Khaira, "Coal Transportation Logistics" and CN, *Grain Products/Grain*.

"I can't tell you how many conversations I've had over the past six or seven months explaining how congestion in Chicago affects my ability to move a potash train in Saskatchewan. It's all connected . . ."

- *Keith Creel, Chief Operating Officer, CP*[114]

The recent merger talks between CP and CSX were partly motivated by the congestion faced by CP in transporting goods through Chicago. Such an arrangement would allow CP to route some traffic bound for the East Coast via upstate New York. By contrast, CN, which purchased a by-pass route known as the Elgin, Joliet and Eastern Railway (EJ&E), does not suffer from the same congestion when travelling through Chicago.[115]

Investments and Expansions

This section discusses both railway infrastructure capacity expansions, as well as expansions in the rail car fleet.

Railway Infrastructure and Locomotive Capacity

As shown in Table 13, both CN and CP have been investing in expanding the capacity of their network in Western Canada. Since 2011, CN has spent at least $330 million on increasing the capacity of its corridor from Edmonton to Winnipeg,[116] as well as its corridor from Edmonton to Prince Rupert. On the latter corridor, CN reported that it has spent nearly $150 million from 2004 to 2012 increasing capacity notably by extending and adding sidings capable of holding 12,000 foot-long trains.[117] Similarly, CP has reportedly spent at least $250 million upgrading its North Mainline from Winnipeg to near Edmonton.

With the exception of the CN investments on the Edmonton-Prince Rupert corridor, no additional capacity-related investments within British Columbia (since approximately 2010) were identified. However, CN and CP had already undertaken large capacity expansions starting in the early 2000s. For example, CP undertook a $160 million expansion in 2004-2005 between Moose Jaw, Saskatchewan and Vancouver.[118] By 2010, CN also started its program of extending sidings to 12,000 feet to increase train lengths and thus capacity.[119] Additionally, the CN and CP DRZ in British Columbia[120] means that there would be less need to expand sidings on a long segment of track within the province, as the capacity of double track segment is much higher than that of a single track with sidings. As a result, it is not surprising that there have not been large reported investments in infrastructure capacity through southern British Columbia since 2010.

114 Owram, "Rail Chaos Reigns in Chicago."

115 CN also recently constructed an interchange between its mainline and the EJ&E known as the Matteson Connection, which permits quicker movements in all directions. CN, *The Chicago Advantage*.

116 This corridor includes CN's mainline from Edmonton to Winnipeg as well as its roughly parallel Prairie North Line to the north.

117 CN Media News, *CN to Construct.*

118 Hatch Mott MacDonald, *Canadian Pacific Railway Western Corridor Expansion*.

119 The cited report points to long siding construction in 2008. As a result, CN's long siding expansion program was likely ongoing by 2008. A&B Rail Services Ltd., *CN Siding Capacity Expansion*.

120 In the directional-running zone, westbound trains run on CN track, and eastbound trains run on CP track.

Table 13. Report Railway Infrastructure Investments in Capacity in Western Canada

Railway	Project	Timeline	Value
CN	Construction of 5.6 km of double track 32 km east of Edmonton.	2011	$12 million
CN	Track reconfiguration at Walker Yard in Edmonton	2011	$3 million
CN	Construction of five extended sidings on the Edmonton-Prince Rupert (BC North Line) Corridor.	2012	$155 million
CN	Construction of extended sidings on the Edmonton-Winnipeg Corridor (including both the Main Line and Prairie North Line)	2013	$100 million
CN	Construction of additional double track segments on the Edmonton-Winnipeg Corridor	2014	$60 million
CP	Upgrades to CP's North Line between Winnipeg and Edmonton.	2011-2013	$250 million
CP	Additional spending on track upgrade work on the North Main Line, and signal upgrade work from Moose Jaw to Chicago.*	2013	No specific amount provided
CP	Upgrades between Calgary and Edmonton	2014	No specific amount provided

Note: This table includes only reported investments that suggest that the railways expanded their track capacity (e.g. additional sidings, double-track, etc.).

Source: CPCS summary of CN, CP, Railway Association of Canada media releases, and other media reports including the Western Producer, More Isn't Better; Lasuita, "Rail Lines Being Upgraded"; Amason, "Railways Spend Big on Upgrade."

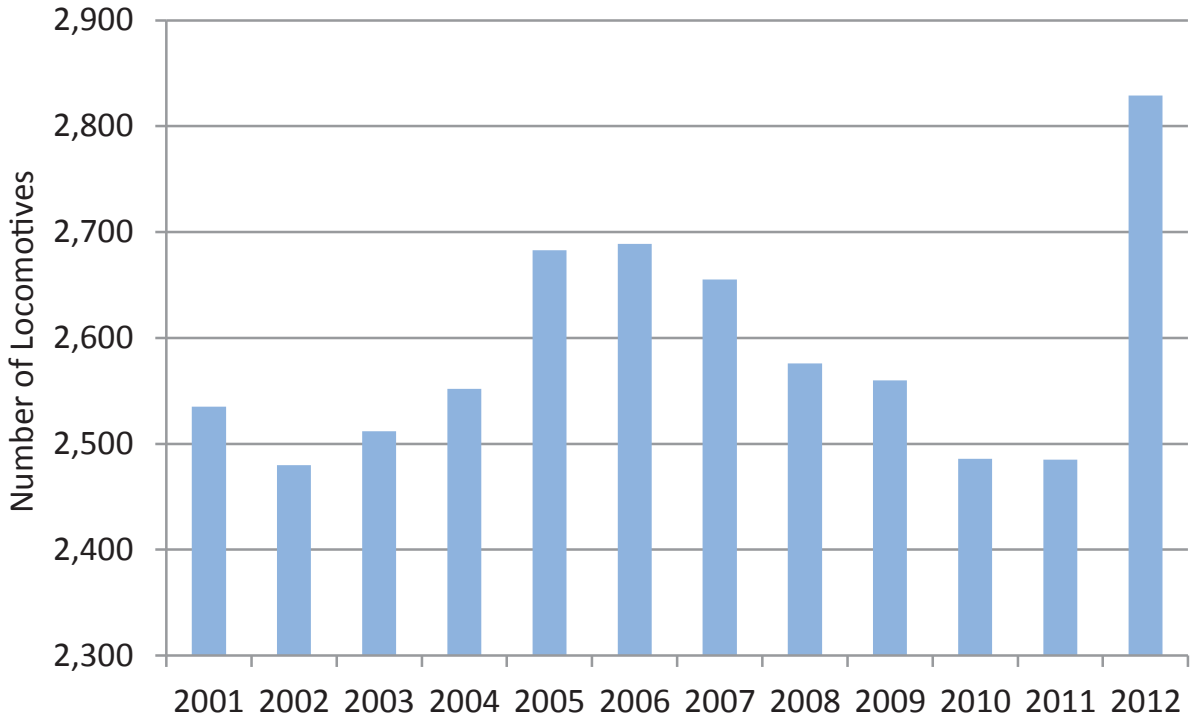
As shown in Chart 37, after a period of decline following the recession in 2008,[121] CN and CP increased the number of locomotives in their fleets in 2012. Since then, CN reports that it acquired 44 new and 37 second-hand high-horsepower locomotives in 2013 and plans to acquire an additional 45 by the end of 2014. It further reports that from 2004 to 2014, it has acquired 763 locomotives. However, these reports are not necessarily net additions to CN's locomotive fleet after accounting for locomotive retires. One report indicates that CP reduced its fleet by 400 locomotives since 2012,[122] but will have some leased locomotives return to CP service in late 2014; it does not have any new locomotives on order.[123]

121 In 2009, an article reported that CN and CP had parked and stored 350 and 281 locomotives, respectively. Foran, "With 5,000 Locomotives in Storage."

122 Heppner, "Staff & Power Shortage to Blame."

123 Atkins, "Railways Grapple."

Chart 37. Number of Locomotives in Service at CN and CP



Note: Includes locomotives in service on the carriers' Canadian network only.
Source: CPCS analysis of Statistics Canada data.

There have been some recent reports that only one of the two freight locomotive manufacturers in North America is currently producing new locomotives. Electro-Motive Diesel Inc. (EMD) has indicated that it will not be able to produce new locomotives until approximately 2017 that meet US EPA (Environmental Protection Agency) regulations coming into effect in 2015.[124] Though CN and CP both indicate that they have sufficient locomotives in their fleet (and on order, in the case of CN), the limited locomotive production capacity may become a constraint if traffic grows more than expected in the short-term or EMD takes longer to redesign its locomotives than expected.

CN reported in 2012 that it will be increasing the size of its locomotive repair shop in Prince George, British Columbia in a $12 million expansion. This facility would support capacity increases on the Edmonton to Prince Rupert corridor. CN notes that 9,000 trains transited through Prince George in 2011,[125] and the facility is already operation at 100 per cent utilization (three shifts per day, and seven days per week).[126]

CN has also recently constructed two training facilities: including a 100,000-square-foot facility in Winnipeg, for 250 to 300 employees a week, and a 75,000-square-foot centre, for 100 to 125 employees a week.[127]

124 These regulations are known as the EPA's Nonroad Diesel Engine emission standards (often referred to in "tiers"). These standards regulate the amount of pollutants that can be emitted from locomotive engines (including hydrocarbons, nitrogen oxides [NOx], particulate matter [PM], and carbon monoxide). These regulations have become progressively stricter in "Tiers"; Tier 4 is the latest standard to be fully implemented in 2015. United States Environmental Protection Agency, *Locomotives—Exhaust Emission Standards.*

125 This number would include trains that travel north and south from Prince George along former BC Rail track, along with trains travelling on the Edmonton–Prince Rupert Corridor.

126 CN Media News, *CN to Invest C$12 Million*.

127 CN Media News, *CN to Elevate Training Program.*

Potash Car Fleets

Canpotex currently exports potash from mines owned by the Potash Corporation of Saskatchewan, Agrium, and Mosaic Company to destinations other than the United States. Canpotex's website indicates that it currently has about 5,400 railcars in dedicated potash service at any given time and operates them in full unit trains of 130, 142 or 170 railcars.[128] As of 2011, Canpotex indicated that it spent approximately US$370 million upgrading its fleet since 1999.[129] Since then, it appears that Canpotex has added approximately 400 cars to its fleet.[130]

In December 2012, Canpotex opened a new $60 million rail car repair facility in Lanigan, Saskatchewan.[131] If this facility reduces the length of time required to repair a rail car, it could increase Canpotex's fleet size and thus its capacity to transport potash to the West Coast.

Canpotex coordinates most of its deliveries on a cost and freight (CFR) basis, and as such also heavily invests in its ocean fleet. Canpotex has indicated that it has spent over $1 billion in commitments to procure 18 new vessels by 2014.[132] Though not specifically related to rail transportation, the coordination that Canpotex has over its terminal and ocean-going operations likely has positive implications for its ability to maximize the effective capacity of its rail fleet.

Grain Car Fleets

In 2012, CN reported that it invested in 558 high-capacity covered hopper cars for grain exports.[133] It also has undertaken a "Fleet Integration Program", which allows private car owners to pool their fleet with the CN fleet. CN will guarantee that the private owner receives guaranteed car orders up to this amount over a period, and makes a payment to the owner for the use of the car. However, this program only applies to destinations that are not subject to the MRE, such as destinations in the US or domestic mills. Further, if the car owner does not use all of their maximum car allotment over a period, they will have to compensate CN approximately $100 per car.[134]

Notwithstanding this investment, the hopper car fleet in Canada is aging and in need of replacement. Aging cars are not just an issue of reliability; newer cars are both shorter and lighter and as a result contribute to an increase in the carrying capacity of approximately 25 per cent per train, making the replacement of the fleet the single most significant potential addition to capacity.

Oil Tank Car Fleets

In March 2014, the total tank car fleet in North America totaled 336,000 cars, approximately two-thirds of which are used for crude oil and other petroleum products. The tank car fleet grew by approximately five per cent between 2013 and 2014. Annual tank car production in 2012 and 2013 was approximately 59,000 cars and 50,000 cars respectively.[135] Most of the tank cars are purchased by shippers (including oil refiners), but the BNSF did purchase approximately 5,000 cars; however, this purchase is likely primary motivated by BNSF's desire to have greater control over the safety of rolling stock.[136]

Inland Terminal Expansion

Potash Terminals

Canpotex, which as noted earlier is jointly-owned by Mosaic Company, Potash Corporation of Saskatchewan, and Agrium Inc., is responsible for marketing and transporting potash from their potash mines to destinations other than the United States, via the ports of Vancouver, British Columbia, and Portland, Oregon.

128 Canpotex, *Logistics.*

129 Canpotex,*Canpotex: Growing Relationships.*

130 In 2011, Canpotex indicated that its fleet was approximately 5,000 cars. As of November 2014, its website indicated that it has 5,400 cars in its fleet.

131 Canpotex, *Logistics.*

132 Canpotex, *Planters' Diary 2013.*

133 CN Media News, *CN Acquiring More Than 2,200 Freight Cars.*

134 CN, *Western Canada.*

135 Rail Energy Transportation Advisory Committee, *Rail Fleet Update*.

136 Hays and Podkul, "Exclusive."

There are some new potash mines under development in Saskatchewan that will not use Canpotex to export potash. BHP Billiton is considering developing a $2.6-billion mine through the Jansen Potash Project.[137] The company has not yet decided on where to develop an export facility. As of June 2014, BHP allowed an exclusivity agreement with the Port of Vancouver, Washington, to end.[138]

K+S Potash Canada is currently developing its Legacy Mine. Potash from this mine will be delivered to Pacific Coast Terminals at the Port Metro Vancouver (Port Moody) for export.[139] This proposed export terminal is currently under review by the Port Metro Vancouver.

Grain Elevators

Existing Capacity

Most grain elevator capacity in Saskatchewan is at primary elevators[140] with rail yards capable of spotting at least 25 cars. There are a total of 190 grain elevators in Saskatchewan with a total storage capacity of 3.73 million tonnes.[141] This is roughly equal to between 13 and 18 per cent of total annual grain production in Saskatchewan, depending on the year of production chosen (with the lower end being based on the 2013-14 bumper crop).

Of these facilities, 133 elevators have track capacity for 25 or more rail car spots. As of November 2014, these 133 facilities have a total storage capacity of 3.19 million tonnes, or approximately 86 per cent of the total storage capacity in Saskatchewan. Additionally, of the total storage capacity of grain elevators, approximately 0.36 Million tonnes of storage capacity is at process elevators.[142]

Investments and Expansions

After a period of general decline, grain storage capacity at terminals in Saskatchewan has been increasing in recent years. As shown in Chart 38, grain storage capacity at Saskatchewan elevators has increased by approximately 16 per cent since 2006. Most of this capacity growth has come from terminals that can load 100 or more cars at once.

137 BHP Billiton, *US$2.6 Billion* Investment; Koven, "BHP Sends Mixed Signals."

138 Larson, "BHP Drops Exclusivity Agreement."

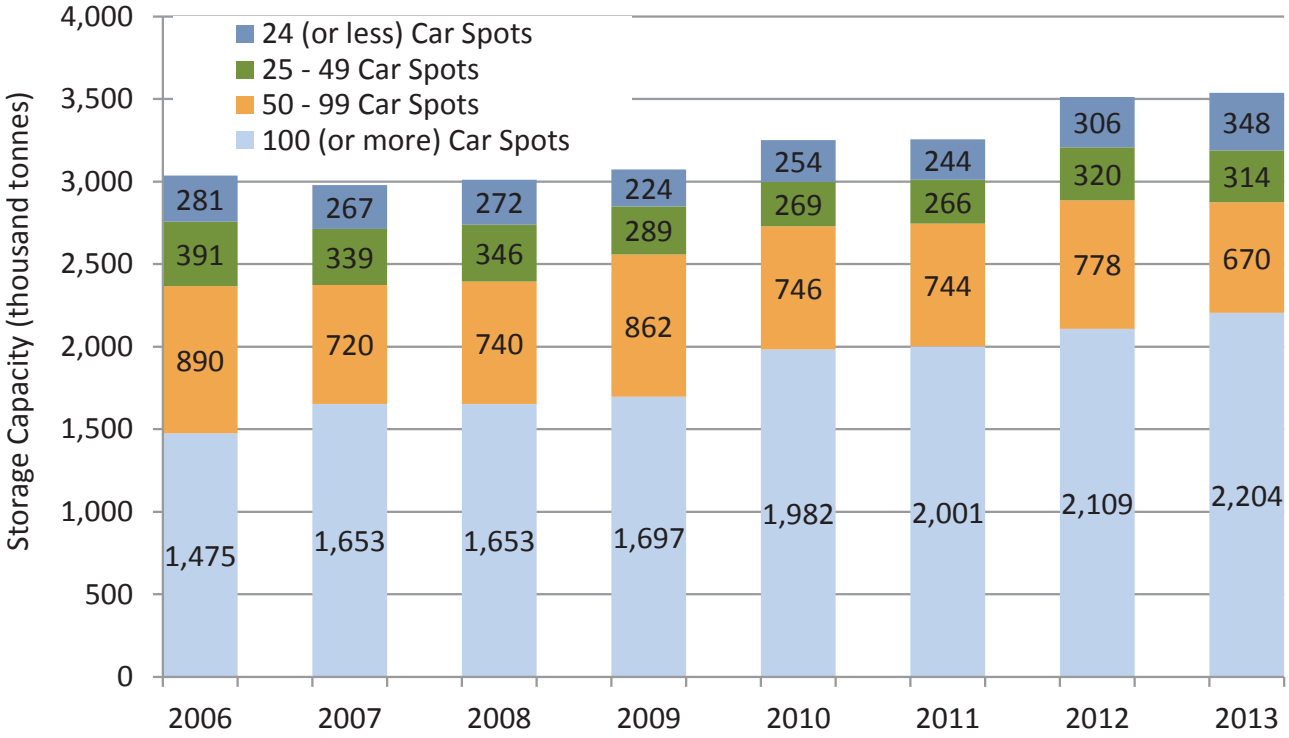
139 Pacific Coast Terminals and K+S Potash Canada, *Pacific Coast Terminals and K+S Potash Canada Sign Agreement*.

140 A primary elevator is defined by the Canadian Grain Commission as "an elevator [whose] the principal use of which is the receiving of grain directly from producers for either or both storage and forwarding." Canadian Grain Commission, *Classes of Licences and Definitions*.

141 Data from the Canadian Grain Commission, *Grain Elevators*.

142 The principal use of a process elevator is "is receiving and storing of grain for direct manufacture or processing into other products." Canadian Grain Commission, *Classes of Licences and Definitions*.

Chart 38. Storage Capacity of Grain Elevators in Saskatchewan, by Rail Car Block Length



Source: CPCS analysis of Government of Canada and Quorum Annual Report 2012-2013 Crop Year data.

Reports by grain handling companies since 2011 align with these data. As shown in Table 14, grain handling companies have been increasing not only storage capacity at their terminals, but also the number of rail car spots to accommodate 100-car unit trains.

Table 14. Reported Recent Grain Elevator Capacity Increases

Elevator	Project	Timeline	Value (if known)
Cargill Morris	Tripling storage capacity and increasing rail car storage from 54 to 100.	By 2015	
Canadian Wheat Board Colonsay	Construction of a 42,000 t (storage) elevator in Colonsay, Saskatchewan.	By 2015 harvest	
Viterra Kindersley	Construction of a new 34,000 t elevator with 108 railcar spots.	2014	
Viterra Saskatchewan	Storage capacity and rail car capacity increases at four elevators in Saskatchewan: White Star, Humboldt, Waldron and Ituna elevators.	2013	$20 million
Viterra Fairlight	Increasing storage and rail car capacity	2012	
Richardson Crooked River	Addition of 14,000 t of storage.	2013	
Richardson Estevan	Expansion of 14,000 t of storage and increase to 113-car spots.	2011	
Cargill Kindersley	Increasing rail car capacity to 100 cars	2012-2013	
Cargill Rosetown	Increasing rail car capacity to 100 cars	2013	

Source: CPCS Summary of media reports and company press releases.

Relative to total grain production in the province, there still exists less commercial storage in Saskatchewan and in Canada as a whole when compared with commercial storage in the US, where

commercial storage is equal to about half of annual grain production. However, much of the grain storage in the US is older and geared towards serving the domestic processing sector, which consumes a much larger share of total crop production than it does in Canada.

On Farm Storage

More difficult to determine is the extent of on farm storage. With the build-up of farm investments in the 2013-14 crop year as country elevators reached capacity, producers had to resort to storing inventories out in the open, risking deterioration in quality or even rotting. Increasing permanent on farm storage is one option for insuring against similar future events, but this obviously comes at a cost.

Crude Oil Terminals

Existing and Planned Capacity

As shown in Table 15, there is currently 502,000 barrels per day (bbl/d) of crude oil loading capacity in Saskatchewan.[143] By comparison, assuming a capacity of 600 barrels per rail car and 100 car unit trains, this capacity effectively translates into about eight unit trains per day.[144]

It is important to note that not all of this capacity is currently being utilized. The Canadian Association of Petroleum Producers (CAPP) notes that as of Q2 2014, only approximately 50 per cent of loading capacity in Western Canada is currently used. However, the CAPP cautions that the definition of capacity is not standardized and the publicly-reported capacities and utilization may not consider: "supply connections, system bottlenecks, operational inefficiencies, limited hours of operation, and ramp up time required to achieve full utilization."[145]

143 One terminal in Manitoba is also included as it is very close to Saskatchewan.

144 First, not all crude oil by rail moves in full unit trains; some oil moves in smaller blocks on manifest trains that consist of multiple commodities. Second, the capacity of an oil tank car can vary from about 525 to 650 barrels per car, depending on the density of the oil. Cairns, *Crude Oil by Rail*.

145 Canadian Association of Petroleum Producers. *Crude Oil Forecast, Markets & Transportation*.

Table 15. Major Crude Oil Loading Facilities in Saskatchewan

Company	Location	Capacity (bbl/d)	Status	Oil type
Crescent Point	Dollard	27,000	Operating; expansion Q2 2014	WCSB (heavy)
TORQ Transloading	Kerrobert	168,000	Q3 2014	WCSB (heavy)
Altex	Lashburn	90,000	Operating; Expansion Q1 2015	WCSB (heavy)
TORQ Transloading	Lloydminister	22,000	Operating	WCSB (heavy)
Ceres Global	Northgate	35,000	Q2 2014 (expandable to 70,000 bbl/d)	Bakken (light)
Crescent Point	Stoughton	45,000	Operating	Bakken (light)
Altex	Unity	19,000	Operating	WCSB (heavy)
TORQ Transloading	Unity	36,000	Operating	WCSB (heavy)
Tundra	Cromer, MB	60,000	Operating; Expansion Q2 2014	Bakken (light)

Sources: CPCS summary of various sources, including Canadian Association of Petroleum Producers, Crude Oil Forecast, Markets & Transportation; United States Department of State, Final Supplemental Environmental Impact Statement, Table C-10.

Footnote a. of Table C-10 notes that WCSB (Western Canada Sedimentary Basin) refers primarily to heavy crude oil, and Bakken refers primarily to light crude oil.

Where there is disagreement between the CAPP and US Department of State source, the CAPP source is used.

Investments and Expansions

All of the facilities listed in the table above have recently opened or been expanded. The Canadian Association of Petroleum Producers notes that at the beginning of 2013, only 180,000 bbl/d of crude-oil-by-rail terminal capacity existed in all of Western Canada. As a result, at least 322,000 bbl/d of new capacity has been developed in Saskatchewan since the beginning of 2013.

A large unit train loading facility can cost upwards of $100 million to develop. For example, the TORQ Transloading facility in Kerrobert, Saskatchewan, which can load 168,000 barrels per day, or approximately two unit trains, is expected to cost $100 million.[146] Recent reports have also suggested that long-term contracts are being signed for the use of these large-scale facilities. For example, CAPP indicates that: "It is important to note that most of the large scale terminals are underpinned by long term take or pay contracts which should encourage utilization."[147]

146 Reuters, *TORQ to Build.*

147 Canadian Association of Petroleum Producers, *Crude Oil Forecast, Markets & Transportation*.

Export Terminal Capacities

Potash Terminals

Existing Capacity

As shown in Table 16, there are two facilities on the West Coast to export potash from Saskatchewan. These facilities are used by Canpotex, which is responsible for exporting potash from Mosaic, Potash Corporation of Saskatchewan, and Agrium. As of 2011, Canpotex indicates that approximately 70 per cent of its potash exports use Neptune Bulk Terminals in Vancouver, BC.[148]

Table 16. Existing Potash Export Facilities

Terminal	Location	Commodities	Capacity* (Mt/year)
Portland, Oregon Terminals	Portland, Oregon	Potash	4.0
Neptune Bulk Terminals	Vancouver (North Shore Burrard Inlet)	Potash	11.5

Source: CPCS analysis of various sources, including Canpotex, Logistics; Canpotex, Canpotex: Growing Relationships; Canpotex, Capotex Company Profile.

*Canpotex provides current terminal throughput "up to" these quantities, which is interpreted to refer to approximate terminal capacity.

Investments and Expansions

As shown in Table 17, there is approximately $80.5 million in potash terminal capacity construction work currently ongoing, and an additional $945 million in investment currently planned.

Table 17. Potash Terminal Investments and Expansions with Capacity Implications

Terminal	Project	Timeline	Value
Neptune Bulk Terminals Upgrades	Upgrades to existing potash handling capabilities.	2012-2014 (under construction or recently finished)	$80.5 million
Canpotex Prince Rupert Terminal	Construction of a new terminal with up to 11.5 Mt/year in throughput capacity.	Permit secured, no decision to proceed	$775 million
Pacific Coast Terminals (Vancouver)	Construction of a new potash handling terminal with up to 2.15 Mt/year in throughput capacity.	Planned, under review	$170 million

Source: CPCS analysis of various sources, including Port Metro Vancouver, Project Review Application Form (April 18, 2012); Canpotex, Potential Potash Export Terminal; Pacific Coast Terminals Co. Ltd. Handling Potash; Canadian Environmental Assessment Agency, Comprehensive Study Report.

148 Canpotex, *Canpotex: Growing Relationships*.

Grain Terminals

Existing Terminals

As shown in Table 18, there are currently eight grain export terminals on the West Coast of Canada. Seven of the terminals are in Metro Vancouver and one of them is in Prince Rupert.

Table 18. Existing Grain Terminal Capacity on the Canadian West Coast

Terminal	Location	Commodities	Storage Capacity (t)	Through-put Capacity (Mt/year)
Alliance Grain Terminal	Vancouver	Primarily wheat, barley, canola and pulses)	102,070	2.3
Cargill	Vancouver	Wheat, durum, canola, barley and grain by-products	237,240	
Cascadia (Viterra)	Vancouver	Wheat, durum, canola, barley, rye, oats and by-products.	282,830	
Pacific Elevators (Viterra)	Vancouver	Canola, flax, peas, and various bulk manufactured agri-forage and by-products	136,100	2.0 – 3.0*
Richardson International	Vancouver	Wheat, canola, barley, rye, flax, grain and feed products	108,000	3.0
Parrish & Heimbecker, Limited	Surrey	Canola meal, distillers dried grains, malt, soybeans, lentils, peas, grains and oilseeds	15,000	0.6
Kinder Morgan Vancouver Wharves	Vancouver	Specialty agri-products	25,000	
Prince Rupert Grain	Prince Rupert	Primarily wheat and barley	202,000	7.0

Sources: CPCS summary of various data sources, including Port Metro Vancouver, Bulk Terminals; Prince Rupert Port Authority, Prince Rupert Grain; Richardson, Vancouver Terminal Grain Storage Project; Canadian Grain Commission, Grain Elevators; Parrish & Heimbecker, Limited, Fraser Surrey Terminal; Colley West Shipping Ltd., Colley West Shipping Ltd.; Viterra, Cascadia Terminal; Viterra, Viterra's Cascadia Terminal; Port Metro Vancouver, Alliance Grain Terminal Project Approval.

*In reports, Viterra has indicated that it is doubling or tripling its existing capacity to 6.0 Mt/year.

Investments and Expansions

As shown in Table 19, there is currently at least $242 million in grain terminal capacity investments[149] under review or construction on the West Coast of Canada. All of them are located at the Port of Metro Vancouver.

Table 19. Grain Terminal Investments and Expansions with Capacity Implications

Terminal	Project	Timeline	Value
Cargill Terminal	Projects at Vancouver Terminal, including some related to capacity expansion.*		$50 million
Richardson Grain Terminal	Addition of net 70,000 Million tonnes of new storage to increase terminal capacity to 5.0 Mt/year.	2012-ongoing (under construction)	$120 million
Pacific Elevators (Viterra)	Construction of a new ship-loading facility, installation of new grain handling equipment, and dredging to increase terminal capacity to 6.0 Mt/year.	2014-ongoing (under review)	$100 million or more
Alliance Grain Terminal	Construction of four new grain loading towers and associated conveyors to increase capacity to 2.6-2.8 Mt/year.	2013-ongoing (under construction)	$22 million

Sources: CPCS summary of various sources, the Port Metro Vancouver, Canadian Grain Commission, as well as other including Richardson, Richardson, Vancouver Terminal Grain Storage Project; Richardson, Richardson International Grain Storage Capacity Project; Port Metro Vancouver, Viterra Pacific Elevators; Port Metro Vancouver, Project Review Application Form (April 9, 2014); Cross, "Port Upgrade"; Port Metro Vancouver, Alliance Grain Terminal—Gallery Replacement Project; Nickel, "Boosting West Coast Exports."

*A media report notes this expansion, but it is not listed on the Port Metro Vancouver's website. Dawson, "Canada's Grain System."

149 According to documents on the Port of Metro Vancouver website, Cargill is also undertaking a $1.2 million noise-reduction project. Port Metro Vancouver, *Project Review Application Form* (October 16, 2013).

Terminal operators have contended that current and planned capacity is ahead of the railways' ability to service these terminals. Meanwhile, railways point out that despite the challenges resulting from the severe winter they were still able to move a record amount of grain. The WGEA notes that Western and Eastern terminal export capacity is approximately 46.6 million tonnes/year. According to data from the Canadian Grain Commission total Western and Eastern terminal receipts amounted to 43.5 million tonnes for the 2013-14 crop year, or about 93 per cent of total terminal capacity. This suggests that at least when looking at the entire crop year the railways were able to deliver at close to the total capacity of which terminals were capable. However, as noted elsewhere annual totals cannot speak to the performance on a week-to-week basis.

Crude Oil Terminals

The vast majority of crude oil produced in Canada either remains in Canada or is transported to the US.[150] In Vancouver, Kinder Morgan operates Westridge Marine Terminal,[151] which is used to export crude oil from the Kinder Morgan TransMountain Pipeline originating near Edmonton. There has not been any reported construction of crude oil by rail unloading facilities in Vancouver.

Configuration of Competitor Supply Chains

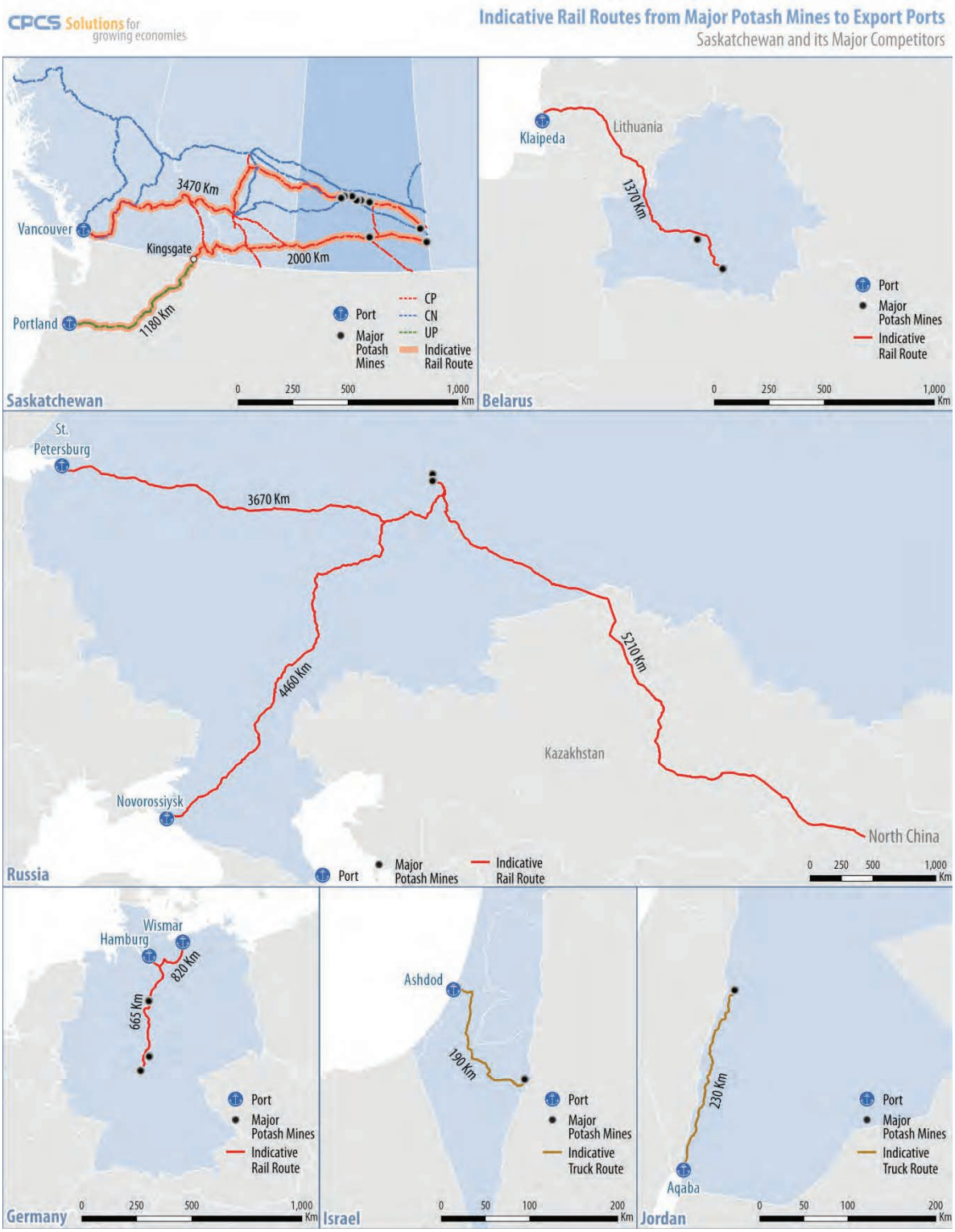
The configuration, capacity and performance of the Canadian system is important in a market context of competitor countries. This section analyzes, by commodity, the configuration of competitor shipping options to give an idea of what Saskatchewan is up against as it seeks to increase its exports.

Figure 4 shows indicative routes from potash mines in these countries to nearby ports. The indicative route is from port to the farthest mine in each country. However, for comparison, other known mines are also shown in the figure.

150 According to data estimated by the National Energy Board, only approximately 4 per cent of exported crude is destined for somewhere other than the US. National Energy Board, Estimated Canadian Crude Oil Exports.

151 Kinder Morgan–Canada, Trans Mountain Pipeline System.

Figure 4. Indicative Routes from Potash Mines to Port



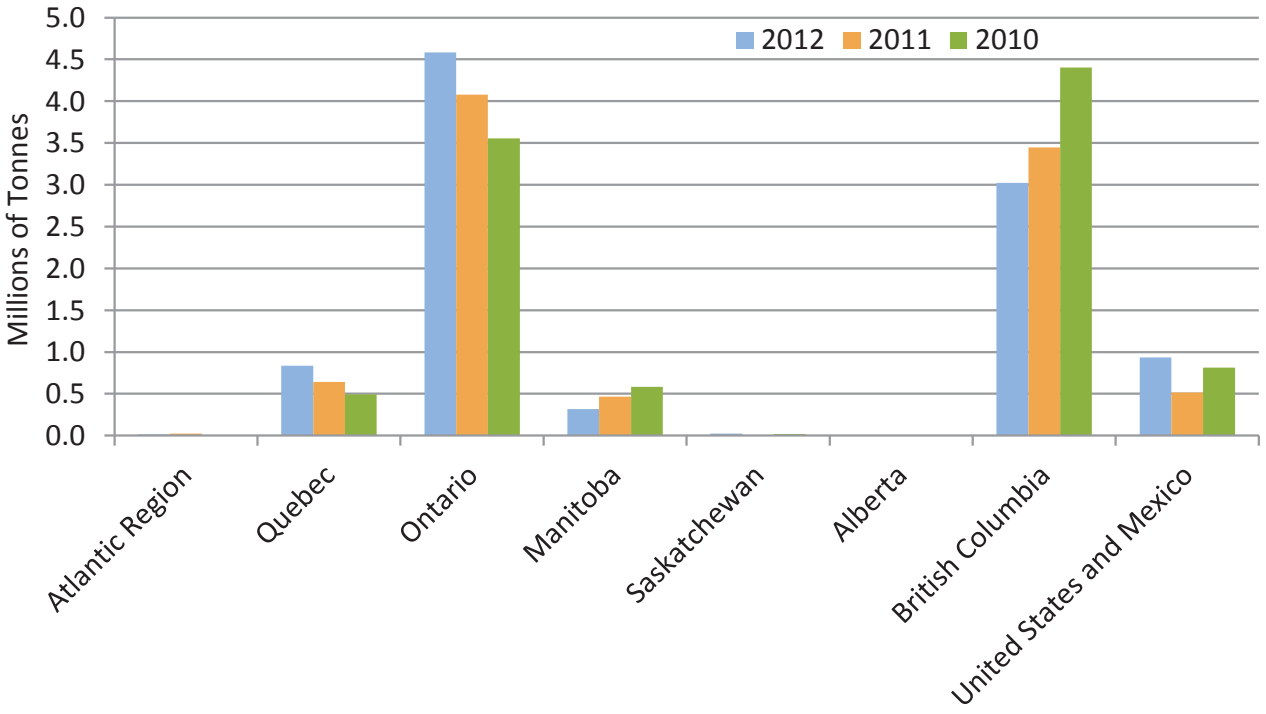
Source: CPCS analysis of data on company websites and other publicly available sources.

The lengths of haul from potash mines in Saskatchewan to ports on the West Coast are longer than most of its major competitors, except Russia. Russia, Belarus, and Germany are three of Saskatchewan's largest competitors by tonnage. The length of haul from potash mines in Russia, near the Ural Mountains, to port at St. Petersburg, is six per cent longer than the all-Canadian export route from Saskatchewan to Vancouver, BC. By contrast, the length of haul from a potash mine in Belarus to a port on the Baltic Sea in Lithuania is 61 per cent shorter than length of haul from Saskatchewan to Vancouver. The German routes are between 76 per cent and 80 per cent shorter than those in Canada. Though the distance by ship from origin to destination port also has impacts for the total logistics cost, this analysis indicates that Canadian railways have to be very efficient for Saskatchewan potash to be transported to markets in a cost effective manner.

Wheat

Unlike with potash, which is almost entirely produced in Saskatchewan and almost exclusively shipped through West Coast ports, Saskatchewan accounted for 34 per cent of Canada's total wheat production and 87 per cent of durum production. As well, in 2012 about 50 per cent more wheat was shipped to Ontario than British Columbia; however, reports from the 2013-2014 crop year indicate that more durum, which is primarily from Saskatchewan, was shipped through Vancouver.[152] Therefore, while western export routes for Saskatchewan wheat are important, they are not the only routes of export.

Chart 39. Rail Transport Destinations of Saskatchewan Wheat



Source: CPCS analysis of Statistics Canada data.

152 Cross, "Clogged."

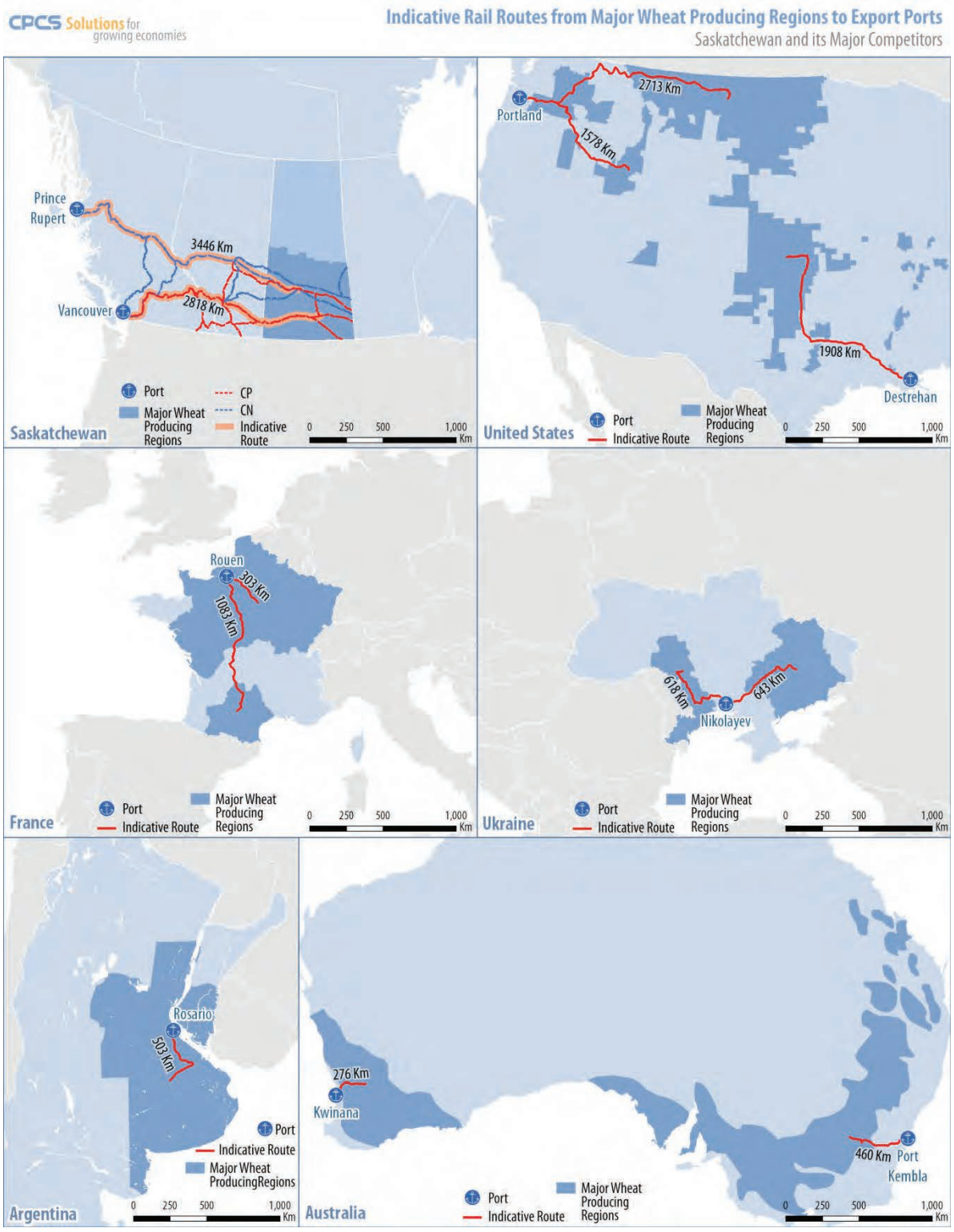
Figure 5 shows indicative routes from major wheat producing areas to ports in:

- United States
- Australia
- Ukraine
- France
- Argentina

Saskatchewan primarily competes with the United States and Australia for wheat destined to countries in Asia (notably Indonesia, Japan, and China), whereas it competes with France, Argentina, and Ukraine for wheat (including notably durum) destined for Mediterranean countries.

The length of haul from wheat producing regions from the United States to West Coast ports is similar to the distance from Saskatchewan. The route shown in the US to Portland, Oregon, is about four per cent shorter than the route in Canada to Vancouver, though given the large wheat producing area in the upper Midwest, are very similar in length. By contrast, wheat produced in Australia, particularly Western Australia, is nearly at port. The route in Western Australia is 90 per cent shorter than the route in Canada to Vancouver. Once again, though other factors influence the competitiveness of Saskatchewan wheat, such as its quality, and other factors are considered in the logistics cost, such as distance by ship from origin to destination port, this analysis suggests that Canadian railways have to be very efficient for Saskatchewan wheat to compete in global markets.

Figure 5. Indicative Routes from Major Wheat-Producing Areas to Port



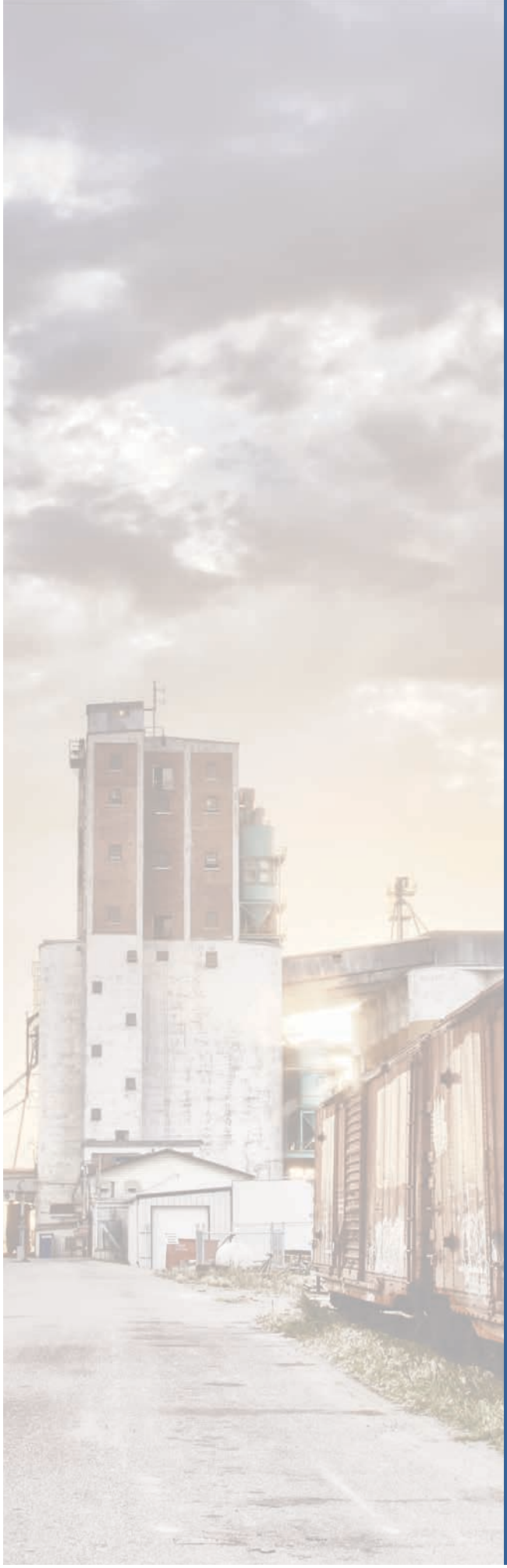
Source: CPCS analysis of data on company websites and other publicly available sources.

Chapter Summary

Railway and related rail-based supply chain investments are often large and take years to complete. Furthermore, these investments are not made at the first sign of capacity constraints. Commercial interests must have some degree of certainty that volumes will be large and consistent enough to ensure that new capacity is utilized enough in order to provide for an adequate return on capital.

It is clear that there have been significant ongoing and planned investments in key rail corridors, rolling stock and inland and port storage facilities though perhaps one notable exception is investment in the aging covered hopper car fleet. More difficult to determine is the extent of on farm storage, the need for which was especially evident during the 2013-14 crop year. Farm storage helps producers monitor market fluctuations and take advantage of market opportunities when they arise. It also helps to maintain the integrity of crop outputs in times where there are difficulties getting product to market.

For at least some international players who compete against Canadian and especially Saskatchewan-based exporters, fewer of these capacity investments – and some, not at all – are required a function of the natural geographic advantage that many of these competitors have.



Chapter 6

The Economic Impact of Constrained Railway Capacity and Reliability

There are several methods of measuring freight transportation service reliability. With respect to rail transportation service, the key factors are usually car spotting performance or order fulfillment. In a nutshell, car spotting performance refers to the timing of the delivery of empty railcars for loading and/or the pickup of loaded railcars for delivery to the port or customer. Shippers would naturally like cars to be delivered for the day in which they were ordered. A railway might fulfill 100 per cent of the orders by a given shipper over the course of a week, month or the year. However, if the cars are sometimes delivered the day after or several days after they were anticipated, this can have a range of effects on the shipper.

In addition to car spotting performance, transit time and transit time reliability are other elements of railway (or other freight transportation) service. Faster and less variable transit times to the port or customer are naturally preferable to slower, less reliable transit times. However, it is generally understood that transit time, while important, is not as significant of a factor as car spotting or order fulfillment, though there are exceptions depending on the commodity and nature of the supply chain. This is a result of the fact that shippers can generally plan for slower, yet still reliable, transit times and that transit time in general increases or decreases in small increments over time. The main additional costs of longer transit times are higher in-transit carrying costs and capital costs due to lower utilization of rolling stock assets (more locomotives and cars being required for the same amount of tonnage). Unreliable car spotting or order fulfillment performance is naturally more difficult to plan for and there are a greater number of potential incremental costs as a result, including labour overtime costs, vessel demurrage and lost or delayed sales.

The Impact of Freight Transportation Reliability

Unreliable performance can affect shippers in a number of ways, with a range of potential impacts. These include, among others:

- The permanent loss of a sale
- The deferral of a sale
- An increase in operating cost and resulting decrease in profitability
    - Higher demurrage fees
    - Higher labour costs (idle labour, overtime)
    - Performance penalties
    - Expedited transportation costs

In the medium to long term, the expectation of unreliable transportation and logistics service may

encourage the shipper to alter business practices and move to a permanently higher cost structure in order to avoid the potential for even higher operating costs or loss in revenue for the reasons explained above. For example, shippers may try to negotiate longer delivery times with buyers, at a reduction in the selling price, or simply shift to more price-sensitive buyers, who do not demand as a high a level of service or as high a quality of good. Or, they may make capital investments in order to hold higher levels of inventory in the ongoing anticipation of some unreliability in transportation and logistics service.

The impact on specific shippers varies depending on the nature of the good and the markets that they serve. Among Saskatchewan's key exporters, the impacts are roughly similar for all grain and oilseed shippers. Pulse shippers are impacted similarly, though a key difference in the pulse crop logistics supply chain is a greater trend towards containerization. Meanwhile, potash shippers tend to have greater control of their logistics supply chain, through things like the direct ownership of railcars. Furthermore, unlike grains and pulses, the production of potash is more centralized as there are fewer mine sites relative to the thousands of farms on which crops are grown. As a result, there is less handling and fewer transport points; potash is shipped directly from the production site to the export terminal, whereas grains are typically trucked to country elevators first, before being loaded into railcars destined for port terminals.

The differences in these supply chains mean that unreliable transportation and logistics service have different impacts on these industries. Before the economic impacts of rail-based logistics supply chain constraints are estimated, a summary of the impacts of unreliable service on the export of the three commodities mentioned above is provided, primarily based on stakeholder interviews.

Grains and Oilseeds

As noted earlier, the bulk of Saskatchewan's grain products are exported to international markets through port terminals, where they are loaded on bulk vessels for transport to the port of destination. Unlike container ships which typically operate on a fixed schedule, bulk vessels are often charted by shippers who coordinate the arrival of the vessel at the port with the delivery of the product to the port terminal. If the vessel arrives at the port before the terminal is loaded, it must wait at the port. For grain shippers, this results in one of the costs of unreliable rail transportation service: vessel demurrage (the penalty for holding a vessel for longer than anticipated).

Interviewees told us that vessel demurrage typically ranges from $10 to $20 thousand per day. One shipper indicated that they pay $8 to $10 million in demurrage each year. Other shippers have indicated that vessel demurrage is typically smaller than this, but the combination of last harvest year's

(2012-13) large crop and logistics problems resulted in significantly higher vessel demurrage than usual. One shipper noted that they typically pay $1 to $2 million per year in vessel demurrage, but paid $12 million last year.

Vessel demurrage, while significant, can be dwarfed by the cost of contract penalties. Grain shippers typically make sales to customers within a promised delivery window. If that window is missed they are generally subjected to contract penalties. These penalties can amount to 1.5 per cent of the contract price. To put this into context, consider a typical panama vessel which can hold approximately 70 thousand tonnes of grain. At a price of $300 per tonne, this equates to $21 million in grain per vessel. If delays cause the entire shipment to miss the contracted delivery window and incur penalties of 1.5 per cent, this would amount to a total cost to the shipper of $315,000.

In the worst case, the shipper may be forced to buy out the contract if it is unable to meet the shipping window. While the penalties are larger here than the daily cost of vessel demurrage, this typically occurs on a less frequent basis. For example, while the shipper noted above paid $12 million in demurrage last year, they paid about $2 million to buy out contracts.

Other costs to grain shippers resulting from unreliable service are more difficult to quantify because they are not charged explicitly, but are no less important. For instance, in anticipation of the delivery of empty railcars for loading at a country terminal, the shipper must mobilize its labour in order to promptly load the railcars before they are delivered to the port. If the anticipated railcars do not arrive, labour is left idle but is still paid. Some of these additional labour costs could be mitigated not only through more reliable spotting performance, but also through better, faster communication about the estimated time of arrival of railcars. For example, if the shipper knows in advance that railcars will be spotted later than originally anticipated, it may be able to reschedule at least some of its labour to be ready at the new date.

Persistent delays in spotting empty cars at country elevators could lead to a situation where elevators reach capacity. In this case, shippers cannot take new orders from customers and/or must turn back deliveries from growers to the elevators. This in turn has multiple secondary effects. The result can be higher inventory costs due to lower turnover at the elevator, so lower annual throughput for a given amount of terminal space, or a larger volume of sales to the spot market where prices are lower.

In general, at least in the short run, all of the grain that is grown is eventually sold. However, the process of how the shipper eventually arrives at that sale can be significantly more or less costly due to unreliable transportation service, or the total value of the product that is sold can be less than it would have been.

As noted, pulse crops are subject to many of the same issues that grains and oilseeds are with the distinguishing difference being that pulse crops are more likely to be shipped by container. In general, shipping by container is more costly but is also a premium type of service due to the fact that the product is handled less frequently. For example, if the shipper loads the product into an international container inland, the product does not have to be handled at all until it reaches the eventual customer. This helps to maintain the product integrity as well as improve transit time performance. It also has the advantage of being shipped via scheduled vessel service.

As a result, pulse crops supply chains may have a bit more redundancy or flexibility with which they can get product to market, as there are multiple transportation options at their disposal. However, shipping by container still naturally relies upon the railway to deliver empty containers to the shipper for loading.

A previous study found that rail service issues cost Canadian pea and lentil shippers approximately $14 million in 2008.[153] To put this into context, total Canadian exports of peas and lentils in 2008 were $1.6 billion. This indicates that the cost to shippers was approximately 0.9 per cent of the export price. If it was assumed that this same percentage applied to all agricultural exports from Saskatchewan, the annual cost would have been approximately $105 million in 2013. However, as indicated the pulse crop supply chains differ from grain supply chains and as a result, the specific impacts may be more or less for other crops.

Potash

As mentioned, the potash supply chain differs from the field crop supply chains in part because there are relatively few mine sites. Furthermore, Canpotex has made greater investments directly into the logistics supply chain capacity where they can. They own 5,400 railcars which they maintain directly, leading to fewer potential delays due to the condition of the railcars themselves. Furthermore, they charter vessels on long term contracts, which allows them to avoid vessel demurrage fees, at a higher upfront cost. They have also made major investments in port facilities. In total, they have invested over $600 million in new capacity over the past ten years.

The combination of railcar ownership, long-term vessel contracts and direct port terminal investments have allowed Canpotex to better coordinate the arrival of vessels with their shipments. Still, all potash shipments naturally rely upon railways to pick up and deliver their railcars. As a result, constraints on the locomotive or crew side has the potential to disrupt the potash logistics supply chain.

Furthermore, while Canpotex can avoid vessel demurrage or the cost associated with railway owned railcars through their direct ownership model, higher cycle times or more variable transit times reduce their utilization of those assets. For instance, interviewees reported that last year transit times to Port Metro Vancouver increased by two days, due in part to weather-related delays, up to a total of five days. Persistently longer transit times means that on average, each railcar can deliver less product to the port over the year. All things being equal, the doubling of railcar cycle time to and from the port means that twice as many railcars are needed for the same volume of exports.

Due to the length of haul, the cycle time to US markets is as much or even more important. For example, the typical cycle time between Esterhazy, SK and Jeffersonville, IN is 12 days, but this increased to 17 days last winter (2013-14). In the previous example it was noted that longer cycle times imply a greater number of railcars for a given volume of exports. However, when the longer cycle times are unanticipated shippers cannot immediately add new railcar capacity to offset the impact, and even if they were able to, the locomotives may not be available to cycle the additional cars.

In this case the cost can manifest itself in a number of additional ways. The mine may run out of storage capacity at the mine site, creating congestion. This leads to a slowing or even

153 SJT Solutions, Lost Earnings From Induced Costs.

stopping of production all together, the overall impact being lower annual productivity of the mine.

Interviewees indicated that when bottlenecks occurred last year mine production slowed due to reduced warehouse space. This resulted in significant deferral of sales. These shipments may be picked up in later quarters, if demand would have been softer in those quarters. In that case, the main cost is the time value of money and/or lower prices. Still, if demand is strong in subsequent quarters and mines must be run at full capacity to meet the current demand, those deferred sales may be lost forever.

Summary of Transportation Service Reliability and Shipper Costs

If the general shipper sentiment that the railways will eventually move all of the volume holds, then on an annual basis it can be said that the demand for railway services equals the supply. However, the timing of that supply within the year (or within a given month or week) is where there is more likely to be a mismatch, resulting in higher costs/lower revenues, which in turn lead to lower profitability.

The implications for Saskatchewan's growth plan export targets then may be more likely to be on the price side of the equation, rather than the volume side of the equation. However, one cannot discount the potential for volumes to be affected in the longer run. For example, if transportation service is persistently poor and eats into shippers' profitability enough, there will be incentive for some shippers to reduce their volumes or even exit the business in the long run. But, the railways should have a direct incentive to prevent this from happening – if volumes are reduced then they lose business as well.

In addition, in extreme situations agricultural output can be impacted negatively if crops are stored in uncovered areas on farms due to backlogs at country elevators, in which case rotting may occur. However, it is assumed that this is not likely to be a persistent annual situation as growers would make adjustments according to their previous years' experience over time.

The Economic Impact of Railway Service on Saskatchewan's Economy

Earlier it was estimated the extent to which Saskatchewan's exports rely on rail transportation and in turn, what the province's Plan for Growth implies for future demand for railway service. The economic impact of railway service and railway service constraints on Saskatchewan's economy is now estimated.

In order to do this, a base scenario in which the province grows the exports of its key products that would at least be necessary to meet its goal of approximately $59 billion in nominal exports in 2020 was first created. The base scenario was anchored in the implied railway volumes that were estimated in Chapter 3. As noted, the growth in these commodities only take the province part way to meeting the goal of doubling the value of its exports by 2020, implying that growth in other industries such as manufacturing and services will likely be required. The implied railway volume increases then can be considered then as the minimum volumes required in order to meet the growth target.

Those commodity volumes were then matched up with their respective industries according to the System of National Accounts. For example, grains and oilseeds are produced by the crop and animal production industry whereas potash is naturally produced by the potash mining industry.

Aligning commodities with industries is necessary in order to estimate the economic impact, or economic footprint of the relevant industries in the provincial economy. The commodities in question represent the gross output of the relevant industries. In order to estimate the direct GDP impact the Gross Domestic Product (GDP) to gross output ratio of each industry was applied to the value of the gross output that was estimated (see text box "Gross Domestic Product and Gross Output" for details on the distinction between GDP and gross output).

Gross Domestic Product and Gross Output

Gross Domestic Product (GDP) is a measure of value added. Gross output, on the other hand, measures the market value of the goods/services produced. The primary distinction between these different measures of output is that gross output is not adjusted to reflect the value of the intermediate inputs consumed by the industry.

As such, an industry's gross output is more or less equal to its revenues. Conversely, GDP is adjusted to remove the costs of intermediate inputs so that the net value added to the economy can be estimated, without double-counting the value of the inputs that would already be attributed to the GDP generated by other industries.

One way to compute the GDP of an industry is to add up the profits, wages and depreciated capital. Or alternatively, one can take the industry's gross output and subtract the cost of its intermediate inputs. For example, in the case of agricultural industries, key intermediate inputs may be seeds, fertilizer, and energy.

In addition to the direct GDP, these industries have a larger footprint on the provincial economy through purchases of domestic goods and services. For example, as alluded to in the text box, crop production requires the purchase of seeds fertilizers and other products, some of which may be procured from within the province. The extent to which these products are procured domestically was estimated though Statistics Canada's Input-Output tables. More specifically, in order to estimate the total GDP impacts of the scenario described above, the gross output, labour income and GDP multipliers derived from Statistics Canada Input-Output tables were applied for the relevant industries in Saskatchewan. Table 20 below summarizes these results.

Table 20. Estimated Provincial Economic Impact of Rail Export Commodities from Saskatchewan, 2020 (millions $nominal)

Rail Commodity	NAICS Industry	Projected rail commodity export value	Projected GDP impact of rail exports
Crude oil	Non-conventional oil extraction	5,285	2,098
Potash	Potash mining	9,238	8,472
Wheat	Crop production	4,069	2,821
Canola seed	Crop production	1,820	1,262
Canola oil	Grain and oilseed milling	1,977	1,157
Lentils	Crop production	1,134	786
Peas	Crop production	1,036	718
Canola meal	Animal food manufacturing	459	219
Other cereals	Crop production	685	475
Refined petroleum products	Petroleum refineries	121	48
Total		25,825	18,055

Source: The Conference Board of Canada.
Note: GDP Impact includes the sum of direct, indirect and induced impacts on the provincial economy.

As previously noted, the implications for the rail system are an additional 20 million tonnes of goods originating from the province by 2020 (relative to 2012). This represents almost a 50 per cent increase in originating tonnage.[154] In order to estimate the potential economic impact resulting from a limitation of railway or rail-based supply chain infrastructure, two alternate scenarios were created where the rail-based supply chain was only able to handle up to 80 or 90 per cent of the total projected export volumes for 2020. This would represent a shortfall of approximately five and ten million tonnes, respectively. The constraints were assumed to be distributed equally across all commodities. Tables 20 and 21 show the 90 per cent and 80 per cent scenarios, respectively.

Table 21. Estimated Provincial Economic Impact of Constrained Rail Export Commodities, 90 per cent of 2020 Demand Met (millions $nominal)

Rail Commodity	Projected rail commodity export value	Projected GDP impact of rail exports	Export value, difference from base	GDP impact, difference from base
Crude oil	4,756	1,888	-528	-210
Potash	8,314	7,624	-924	-847
Wheat	3,662	2,539	-407	-282
Canola seed	1,638	1,136	-182	-126
Canola oil	1,780	1,041	-198	-116
Lentils	1,021	708	-113	-79
Peas	932	646	-104	-72
Canola meal	413	197	-46	-22
Other cereals	616	427	-68	-47
Refined petroleum products	109	43	-12	-5
Total	23,242	16,250	-2,582	-1,806

Source: The Conference Board of Canada.

154 This is off the base of 42 million tonnes which also includes all interprovincial and intraprovincial originating tonnes.

Table 22. Estimated Provincial Economic Impact of Constrained Rail Export Commodities, 80 per cent of 2020 Demand Met (millions $nominal)

Rail Commodity	Projected rail commodity export value	Projected GDP impact of rail exports	Export value, difference from base	GDP impact, difference from base
Crude oil	4,228	1,678	-1057	-420
Potash	7,390	6,777	-1848	-1694
Wheat	3,255	2,257	-814	-564
Canola seed	1,456	1,009	-364	-252
Canola oil	1,582	926	-395	-231
Lentils	907	629	-227	-157
Peas	829	574	-207	-144
Canola meal	367	175	-92	-44
Other cereals	548	380	-137	-95
Refined petroleum products	97	39	-24	-10
Total	20,660	14,444	-5,165	-3,611

Source: The Conference Board of Canada.

The 80 per cent scenario is considered to be particularly extreme, as it implies that only half of the projected growth in demand for originating tonnage is met by 2020. The 90 per cent scenario could also be considered as unlikely; rather than strictly eliminating tonnage it is more likely that unreliable service issues would eat into the profitability of shippers by increasing their cost base or by reducing the price that they receive for their products. This lower profitability scenario would still negatively impact the GDP, the degree to which would be difficult to calulate but would likely be lower than the forecasted scenarios

Chapter Summary

Poor rail service – particularly in terms of unpredictable car spotting performance – can affect shipper profitability in a number of ways. Some of these may reduce overall output (the quantity of goods produced). Others may reduce profitibility through lower prices or higher costs (with the quantity being left untouched). This is an important distinction, as the scenarios above are based on a reduction of overall output whereas a reduction in profitability through lower prices would likely have a lower overall economic impact. In addition, it is noted that railways are themselves adament that challenges in rail service may be a function of supply chain operations as a whole, and not just aspects of the supply chain that they themselves can control directly.

Nevertheless, both "constraint" scenarios illustrate the economic importance of rail-based supply chain to Saskatchewan's economy. In the case where 90 per cent of the total demand is met, the total negative GDP impact including direct, indirect and induced impacts, would be $1.8 billion. In the 80 per cent scenario, the total negative GDP impact increases to $3.6 billion. As a result, any plan for export growth must consider the option for improving the efficiency of rail-based supply chains. This includes not only direct investments in rail infrastructure and rolling stock, but also port, terminal and other investments, as well and operational efficiencies across the entire logistics supply chain. Clearly, there is ongoing investments in all of these aspects that are helping to address capacity. But as was seen in the 2013-14 crop year, when rail service demand increases rapidly from one year to the next service may not be able to respond as quickly. Planning for slightly longer term growth prospects in naturally more manageable.

Chapter 7
Conclusions and Recommendations

There is no doubt that Saskatchewan's economy depends on exports and those exports depend on railways. The value of the province's exports are equal to about 40 per cent of its GDP, which is higher than in any other province. Meanwhile, about half of the province's exports are carried by rail for at least part of their journey to customers. While diversification of the province's economy could reduce this share to some extent, there is no doubt that heavy dependence on the railway infrastructure will remain into the foreseeable future.

The province's exporters and its economy as a whole then have a direct interest in the efficiency of railways and rail-based supply chains that serve Saskatchewan. However, it is important to note that the efficiency of those supply chains is affected by a multitude of factors that extend well outside of the province and across Canada and even North America. Both CN and CP are North American railways. Their ability to move products from Saskatchewan not only has to do with the investments that they make directly but also with the investments and operations of their customers and other supply chain partners.

In terms of recommendations for improving the efficiency of Saskatchewan's rail-based supply chains and ensuring that they will not be a constraint to export growth in the future, the following considers some factors that are or could be within the provincial or federal government's control as well as the role that businesses can play in improving the export competitiveness of the province as a whole

Investigate the Full Impacts of the Maximum Revenue Entitlement (MRE)

The MRE is a sensitive and divisive topic. As noted, some contend that the MRE provides a disincentive to invest in and improve the efficiency of grain transportation. Others point to the service levels that other (non-grain) shippers receive as evidence that performance would not improve in the absence of the MRE. It is noted that from our review of recent supply chain investments that there has been an ongoing investment in railcars dedicated to potash and petroleum products. There has, however, been relatively little investment in hopper cars, evidenced by the aging of the current fleet. This is not necessarily conclusive evidence that the MRE is responsible or related. Nonetheless, 15 years have passed since the MRE was implemented a full and public review is warranted.

Reduce the Cost of Shipping by Rail To and From the Province

The province has very little direct control over railway and other logistics costs. Where it does, however, have some control, it would serve the province well to reduce any costs or obstacles to shipping by rail given the implications for its export-based economy.

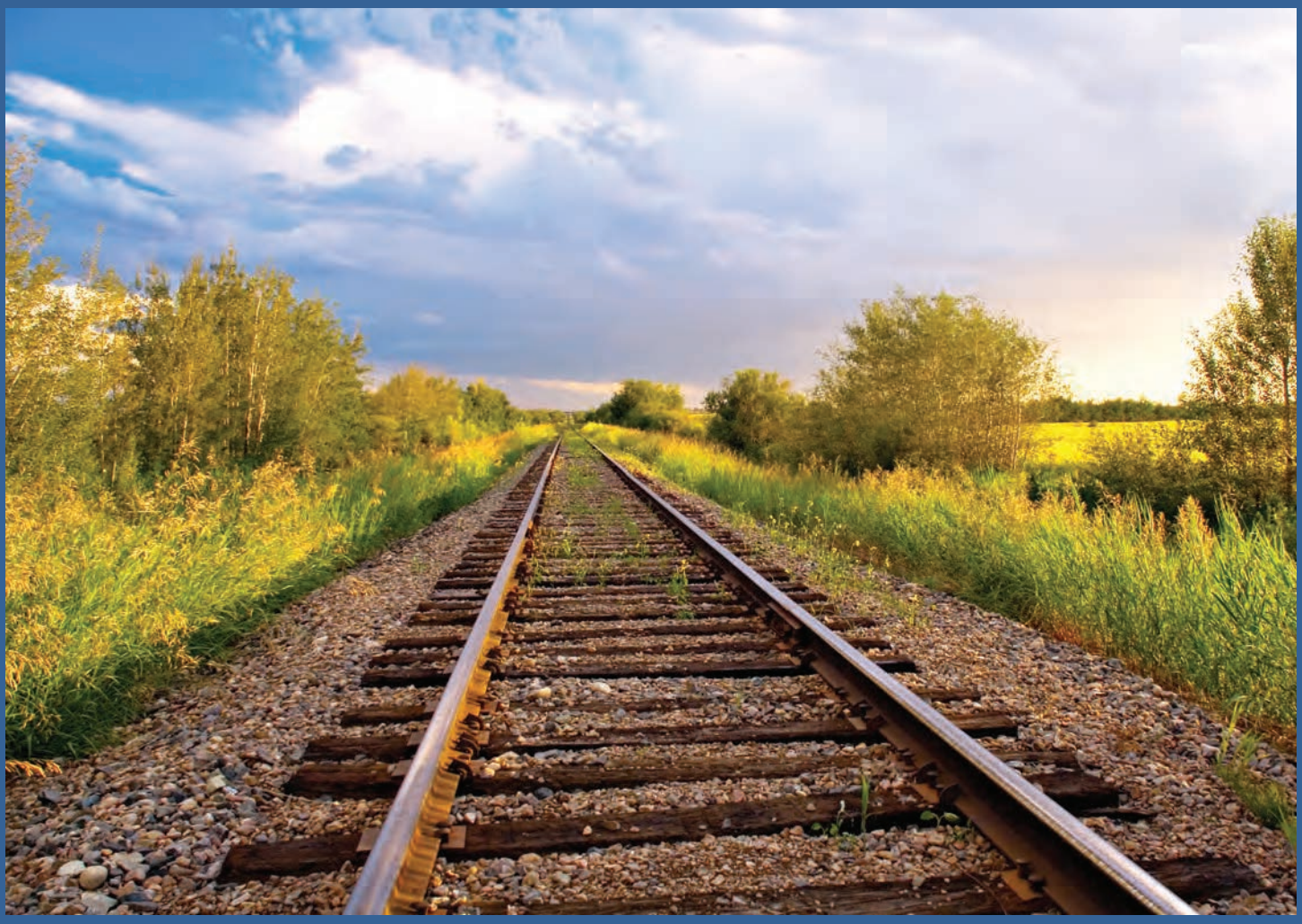
As referenced, railways paid nearly $40 million in fuel taxes to the Saskatchewan government, which

is more than any other province except for British Columbia, as a result of a particularly high provincial fuel tax per litre (15 cents per litre). Given the dependence on railways to get products to market, it makes sense to at least bring fuel taxes in line with other provinces.

Encourage Greater and Timelier Communication Across the Logistics Supply Chain

While not directly within the control of the government, more can be done in order to encourage better and a more timely flow of information across the logistics supply chain. This includes better and faster real-time information from the railways to shippers when they become aware that delays will occur. With communications technology advancing as fast as it has, there is no reason why shippers should not be given ample notice and even real-time information concerning delays.

Greater communication also includes better information regarding short and medium term volume forecasts so railways can prepare as far in advance as possible to handle those volumes. If shippers are concerned with the commercial sensitivity of this information at the micro level, governments may have a role to play in terms of collecting and protecting sensitive information in the process of aggregating it to a level that is required for the railways and other supply chain partners to prepare.



But businesses – railways and shippers – must understand that it is ultimately up to them to make this happen. Railways and shippers have long had an acrimonious relationship but they are also partners whose fortunes are tied together and regardless of their disputes they cannot forget this.

It is noted that some shippers contend that they already do or try to provide any information that they have on a timely basis, but railways have little or no incentive to cooperate or use the information in order to allocate capacity due to their market power. Railways, on the other hand, contend that they do have an incentive in that the competitiveness of their customers is also in their own best interest. As referenced earlier if degraded transportation and logistics performance results in permanent losses of volumes, and not just profits, railways lose those volumes as well. In that case railway shareholders should be just as interested in the issue as are policymakers. Without someone taking ownership of the issue the debate regarding who is providing what information in a timely fashion is likely to continue. Governments may be able to play a role in terms of taking ownership of the issue or appointing someone to do so.

Increase Coordination with Governments and Infrastructure Providers Outside of the Province

The government can also play a role with other governments and prioritizing direct investments in infrastructure in a coordinated fashion. There is already evidence that this is happening to a greater degree through the New West Partnership (a partnership between British Columbia, Alberta and Saskatchewan). Governments are naturally tempted to make investments solely within their political boundaries. Given the national, and in fact, continental nature of our logistics supply chains, governments must resist this temptation.

Saskatchewan and its economy has as direct an interest in investments and efficiencies at Port Metro Vancouver, Prince Rupert and Thunder Bay as it does in investments in freight infrastructure within the province and perhaps even more given that the bottlenecks that do exist are largely outside of the province. For example, as it relates to efficiencies, growers, shippers and railways all do not have the luxury of operating on a 9-to-5 schedule given that they are serving customers across the country and in fact, around the world. As such it makes sense to look at the rules regarding hours of operations at ports where they are limited and consider the constraints that places on the rest of the supply chain as a result.

Proximity issues are also increasingly constraining the ability of ports and railways from operating in the context of serving global supply chains. While many or most of these proximity issues extend well-beyond Saskatchewan's boundaries, they are as or more important to the province than they are to the provinces in which they are physically situated. As noted, some terminal operators have attempted to get local buy-in by making investments to reduce local noise pollution in Vancouver.

The Government of Saskatchewan has as much interest in being involved in such efforts either directly or indirectly. Action can be as simple as helping to extol the benefits of grain and potash to Vancouverites, many of whom may know little about those products or as complex as sharing a small portion of the profitability of those exports directly with those most negatively affected by the localized transportation impacts. At the same time, local governments in particular should be aware of the impact of policies that allow for increasing urban encroachment on the competitiveness of the Canadian economy as a whole and make proportionate decisions on land use as a result.

Increase Supply Chain Options and Redundancy

Last year's bumper crop could have moved faster if the Port of Thunder Bay and the seaway was able to open earlier in the season. In fact, the Port now handles five or six million tonnes of grain per year which is down from its peak of 17 million tonnes per year in the early 1980s. Especially for Saskatchewan – a province that is more landlocked than any other – any increased redundancy in terms of routing options to export markets is valuable. Whether this means helping to fund ice-breaking capacity or more indirect methods of enabling redundancy it is a factor that should be considered if export growth continues to be a provincial priority.

Consider the Full Effects of Legislative Solutions while Focussing Efforts on Long-Term Rather than Short-Term Solutions

While the data does not conclusively suggest that shorter-haul shipments were favoured after the Order-in-Council – which specified the minimum amount of grain to be moved – was adopted, this is a possible consequence. Furthermore, policies that favour or encourage the movement of goods through ports for other international exports may be hurting the prospects for greater penetration of certain products in the US market. The possibility of such unintended consequences undermining supply chain efficiency should be considered and monitored.

Related to this, policymakers should consider the extent to which policies simply reallocate profits as opposed to the extent to which the overall pie is grown (or shrunk). Both are important, but for the public good the latter is a more important consideration.

Determine the Current Capacity and the 'Right Size' of on Farm Storage

The extent of on farm grain storage is currently unknown. However, the need for storage was painfully evident during the 2013-14 crop year. Investing in more storage is expensive. However, producers in Canada in particular depend on growing and maintaining a high quality product in order to be able to sell at a premium relative to international competitors. Furthermore, the emerging number of product varieties sold by Canadian growers similarly places greater strain on the commercial system (due to need for increased separation). As a result, more on farm storage may be able to play a greater role in effectively acting as an insurance policy to some extent in the event of supply chain logistics problems. Policymakers could investigate the barriers, financial or otherwise, to investing in more on farm storage in order to determine the value in some solutions.

Determine the Impact of Pipeline Expansion Opportunities

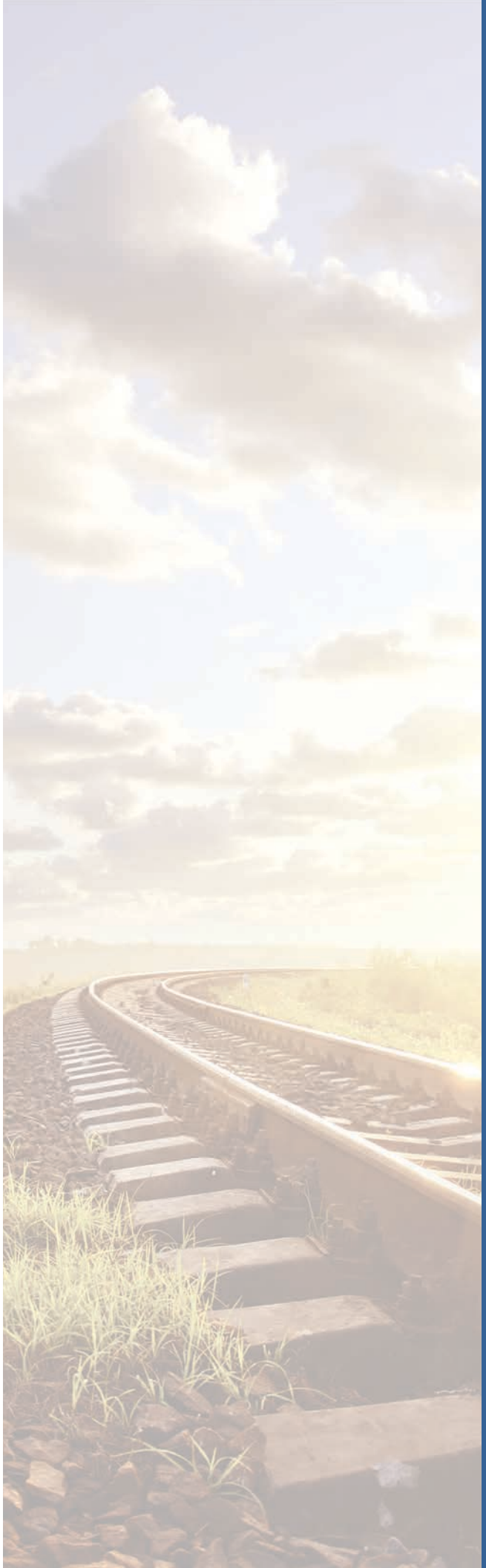
As noted in the section Export Reliance on Rail, the single largest uncertainty regarding rail demand is how much oil will be shipped by rail. For this report, the Conference Board's forecast resulted in a conservative rail tonnage estimate of 7.5 million tonnes. However, it is noted that the actual amount could be significantly more or less due to the uncertainty of production increases and pipeline expansion. Although generated prior to the oil price collapse, an estimate derived from a CAPP forecast suggests that the amount of oil transported by rail in Saskatchewan could increase seven-fold by 2016 to over 12 million tonnes.

The growing role in oil transportation played by rail is largely a result of current pipeline access becoming

increasingly constrained. Governments need to make a concentrated effort to work through the political intricacies that have bottlenecked pipeline expansions and determine the impact if any on rail service for other commodities.

Examine Alternative Hopper Car Purchasing Arrangements

Specific to grain shipping, the hopper car fleet in Canada is aging and in need of replacement. Newer cars are both shorter and lighter and as a result contribute to an increase in the carrying capacity of approximately 25 per cent per train. The nature through which these cars, a significant capital expenditure, could be purchased is an important consideration. Other industries have successfully renewed rail car fleets to the benefit of both shippers and railways. Continued railway ownership, shipper ownership, or perhaps other third-party ownership could bring in timely capital investment. The expansion of CN's "Fleet Integration Program" is an example of where a short-term impact could be made. The federal and provincial governments should identify and remove the barriers to new hopper car purchasing, as it relates to potential ownership by railways, shippers, or third-parties.



Bibliography

Note: All online links were verified and operational as of February 25, 2015.

A&B Rail Services Ltd. *CN Siding Capacity Expansion—Northern BC.* http://abrail.com/project/cn-siding-capacity-expansions/.

Agriculture and Agri-food Canada. Wheat Sector Profile. Part 1: Overview. November 2010. http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/crops/crops-market-information-canadian-industry/market-outlook-report/wheat-sector-profile-part-one-overview-november-2010/?id=1378843495280.

Agrium. *New Video: An Introduction to the 4R Nutrient Stewardship System.* www.agrium.com/en/what-we-do/our-stories.

Amason, Robert. "Railways Spend Big on Upgrade." *The Western Producer,* May 30, 2014. www.producer.com/2014/05/railways-spend-big-on-upgrade/.

Atkins, Eric. "Railways Grapple With Locomotive Shortage and Soaring Carloads." *The Globe and Mail,* November 6, 2014. http://m.theglobeandmail.com/report-on-business/railways-grapple-with-locomotive-shortage-and-soaring-carloads/article21374737/?service=mobile.

Barrow, Keith. "The Long and the Short of Distributed Power." July 31, 2011. www.railwayage.com/index.php/operations/the-long-and-the-short-of-distributed-power.html.

BHP Billiton. *US$2.6 Billion Investment in Jansen Potash Propect.* News release, August 20, 2013. www.bhpbilliton.com/home/investors/news/Documents/2013/130820_InvestmentInJansenPotashProject.pdf.

Cairns, M. *Crude Oil by Rail: Parts I and II. Potential for the Movement of Alberta Oil Sands Crude Oil and Related Products by Canadian Railways.* June 11, 2013. www.ctrf.ca/conferences/2013Halifax/Cairns2013CTRFPresentation.pdf.

Cambridge Systematics, Inc. *National Rail Freight Infrastructure Capacity and Investment Study.* September 2007. www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf.

Canadian Association of Petroleum Producers. *Canadian and U.S. Crude Oil Pipelines and Refineries.* www.capp.ca/getdoc.aspx?DocID=247758.

—. *Crude Oil Forecast: Markets & Transportation.* June 2014. www.capp.ca/getdoc.aspx?DocId=247759.

—. *Transporting Crude Oil by Rail in Canada.* March 6, 2014. www.capp.ca/getdoc.aspx?DocId=242427.

Canadian Environmental Assessment Agency. *Comprehensive Study Report: Canpotex Potash Export Terminal and Ridley Island Road, Rail, and Utility Corridor.* September 2012. www.ceaa-acee.gc.ca/050/documents/p47632/81285E.pdf.

—. Overview: C*anadian Environmental Assessment Act, 2012.* July 6, 2012. www.ceaa-acee.gc.ca/default.asp?lang=en&n=16254939-1.

Canadian Grain Commission. *Classes of Licences and Definitions.* August 1, 2013. www.grainscanada.gc.ca/licensee-licence/cld-cld-eng.htm.

—. *Grain Elevators in Canada Statistics by Crop Year, 2009–2010 to 2014–2015.* August 1, 2014. www.grainscanada.gc.ca/wa-aw/geic-sgc/search-recherche-eng.asp.

Canadian Oilseed Processors Association. *Industry Profile.* http://www.copaonline.net/.

Canadian Shipper.com. *Feds Announce New Regs to Grain Handling and Transportation System.* August 4, 2014. www.canadianshipper.com/sustainability/feds-announce-new-regs-to-grain-handling-and-transportation-system/1003187236/?ref=enews_CTL&utm_source=CTL&utm_medium=email&utm_campaign=CTL-EN08052014.

Canadian Transportation Agency. *Q&A: Maximum Revenue Entitlement for the Transportation of Western Grain.* www.otc-cta.gc.ca/eng/qa-maximum-revenue-entitlement-transportation-western-grain.

Canola Council of Canada. C*anola Meal: Feed Industry Guide.* 2009. www.canolacouncil.org/media/516716/canola_meal_feed_guide_english.pdf.

—. *Industry Overview.* www.canolacouncil.org/markets-stats/industry-overview/.

Canpotex. *Canpotex Company Profile.* August 6, 2012. www.fertilizer.org.au/files/pdf/conf2013/Managing%20a%20Complex%20International%20Logistics%20Chain%20-%20Kot.pdf.

—. *Canpotex: Growing Relationships.* June 2011. www.mosaicco.com/images/Company_Profile_June__2011.pdf.

—. *Logistics.* http://www.canpotex.com/what-we-do/logistics.

—. *Planters' Diary 2013.* Singapore: Canpotex International Pte. Limited, 2013.

—. *Potential Potash Export Terminal at Prince Rupert.* October 16, 2014. www.canpotex.com/news/2014/10/16/potential-potash-export-terminal-at-prince-rupert/.

—. *Rail Car Maintenance Facility Grand Opening.* June 21, 2013. www.canpotex.com/download/51c35cec-7778-401a-af13-356ed846575a.

Cargill. *Cargill Limited Commits to Noise Level Reduction Project in City of North Vancouver.* April 25, 2012. www.cargill.ca/en/news/NA3058966.jsp.

CBC News. K*itimat, B.C. Votes "No" to Northern Gateway in Plebiscite.* April 12, 2014. www.cbc.ca/news/canada/british-columbia/kitimat-b-c-votes-no-to-northern-gateway-in-plebiscite-1.2607877.

CKOM. *Agrium Potash Mine Out of Production Due to Breakdown.* http://ckom.com/story/agrium-potash-mine-out-production-due-breakdown/401924.

CN. *Grain Products/Grain.* February 2004. https://www.cn.ca/-/media/Files/Our%20Business/Equipment/graingov-en.pdf.

—. *The Chicago Advantage.* www.cn.ca/mattesonconnection.

—. *Western Canada—Fleet Inegration Program.* www.cn.ca/-/media/Files/Your%20Industry/Documents-Grain/Western-Canada-Fleet-Integration-Program-Feb2014-en.pdf.

CN Media News. *CN Acquiring More Than 2,200 New Freight Cars and 1,300 Containers in 2012 to Support Traffic Growth and Improve Customer Service.* www.cn.ca/en/media/2012/09/media_news_cn_acquiring_freight_cars_20120904.

—. *CN to Construct Five Long Sidings in 2012 on B.C. North Line as Part of C$155-Million Expenditure to Handle Rising Traffic in Edmonton–Prince Rupert Corridor.* July 5, 2012. www.cn.ca/en/news/2012/07/media_news_bc_north_investment_20120705.

—. *CN to Elevate Training Program, Build Two Training Facilities in Canada and U.S.* September 28, 2012. www.cn.ca/en/news/2012/09/media_news_cn_build_training_facilities_20120928.

—. *CN to Invest C$12 Million in Expansion of Prince George, B.C., Locomotive Shop as Freight Traffic Increases Along Edmonton–Prince Rupert Corridor.* www.cn.ca/en/news/2012/09/media_news_cn_invest_expansion_prince_george_2012090.

Colley West Shipping Ltd. *Colley West Shipping Ltd.* www.colleywest.bc.ca/ColleyWest-Brochure.pdf.

Cross, Brian. "Clogged: Bigger Crops Will Increase Pressure to Solve Rail Problem." *The Western Producer*, March 14, 2014. www.producer.com/2014/03/clogged-bigger-crops-will-increase-pressure-to-solve-rail-problems/.

—. "Port Upgrade to Cost $100 Million." *The Western Producer,* April 17, 2014. www.producer.com/2014/04/port-upgrade-to-cost-100-million/.

Dawson, Allan. "Canada's Grain System Increasing Its Capacity." *Manitoba Co-operator,* May 2, 2014. www.manitobacooperator.ca/news-opinion/news/canadas-grain-system-increasing-its-capacity/.

Foran, Pat. "With 5,000 Locomotives in Storage, Class Is Won't Be Placing Power Orders Any Time Soon." *Progressive Railroading,* June 2009. www.progressiverailroading.com/canadian_pacific/article/With-5000-locomotives-in-storage-Class-Is-wonrsquot-be-placing-power-orders-any-time-soon--20598.

Gensource Potash Corp. T*ypical Saskatchewan Solution Potash Mine Economics*. www.gensourcepotash.ca/?page_id=53.

Geotechnical Society of Edmonton. N*ews 2013*. Updated March 12, 2013. www.geotechnical.ca/News/

news130319.php.

Gibsons. *Moose Jaw Refinery.* www.gibsons.com/Business-Need/Business-Segment/Processing-and-Distribution/Moose-Jaw-Refinery.aspx.

Gill, Vijay, and Joseph Schulman. *From Earth to Berth: Improving the Efficiency of Canada's Grain Supply Chain.* Ottawa: The Conference Board of Canada, February 2011.

Government of Canada. "Regulations Amending the Railway Interswitching Regulations." *Canada Gazette* 148, no. 17 (July 31, 2014). www.gazette.gc.ca/rp-pr/p2/2014/2014-08-13/html/sor-dors193-eng.php.

Government of Canada and Quorum Corporation. Annual Report: 2012–2013 Crop Year. *Monitoring the Canadian Grain Handling and Transportation System.* 2013. http://quorumcorp.net/Downloads/AnnualReports/AnnualReport201213.pdf.

—. C*ontainer Use in Western Canada: Inland Terminals, Container Utilization, Service and Regulatory Issues and the Optimization of Use in Western Canada.* November 2007. www.quorumcorp.net/Downloads/SupplementalReports/ContainerUseWesternCanada.pdf.

—. Traffic, *Market and Logistical Changes in the Western GHTS: 1980 to 2010.* www.quorumcorp.net/Downloads/SupplementalReports/TraffMktLogChanges1980-2010.pdf.

Government of Saskatchewan. *Saskatchewan Plan for Growth: Vision 2020 and Beyond.* n.d. http://gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=4208,3975,594,1,Documents&MediaID=da3f2b1a-dade-4e4e-8308-5d1534bc4729&Filename=Saskatchewan+Plan+for+Growth+-+Full+Version.pdf.

Grant, Michael. *Green Machine: Financing Growth in the New Saskatchewan*. June 10, 2013. www.conferenceboard.ca/temp/196d944b-4fbe-454d-a58c-8715dd85e914/14-001_greenmachine_si_rpt.pdf.

Grant, Michael, Michael Burt, and Lin Ai. *Saskatchewan in the Spotlight: Acquisition of Potash Corporation of Saskatchewan Inc.—Risks and Opportunities. 2010*. www.gov.sk.ca/adx/aspx/adxGetMedia.aspx?mediaId=1245&PN=Shared.

Hatch. *Mosaic Belle Plaine Expansion Project.* www.hatch.ca/mining_metals/industrial_minerals/projects/mosaic_belle_plaine.htm.

—. *Mosaic Colonsay Expansion Project.* www.hatch.ca/mining_metals/industrial_minerals/projects/mosaic_colonsay.htm.

Hatch Mott MacDonald. *Canadian Pacific Railway Western Corridor Expansion.* www.hatchmott.com/projects/canadian-pacific-railway-western-corridor-expansion.

Hays, Kristen, and Cezary Podkul. "Exclusive: BNSF to move into tank car ownership with safer oil fleet." *Reuters.* February 20, 2014. www.reuters.com/article/2014/02/20/us-bnsf-crude-rail-idUSBREA1J1BE20140220.

Heppner, Kelvin. "Staff & Power Shortage to Blame, Not Weather, Says CP Rail Engineer." *Teamsters Canada Rail Conference*. March 17, 2014. www.teamstersrail.ca/March_17_14_1.htm.

—. "US Millers Desperate for Oats." *Discover Moose Jaw*, February 28, 2014. www.discovermoosejaw.com/index.php?option=com_content&task=view&id=34605&Itemid=901.

—.Husky Energy. *Lloydminister Upgrader*. www.huskyenergy.com/operations/downstream/facilities/heavyoilupgrader.asp.

IndexMundi. *Japan Wheat Domestic Consumption by Year.* www.indexmundi.com/agriculture/?country=jp&commodity=wheat&graph=domestic-consumption.

—. *Japan Wheat Production by Year.* www.indexmundi.com/agriculture/?country=jp&commodity=wheat&graph=production.

Invest in Northwest British Columbia, Canada. *Ridley Coal Terminal Expansion*. January 3, 2013. http://investnorthwestbc.ca/major-projects-and-investment-opportunities/map-view/prince-rupert/ridley-terminals-expansion.

Jang, Brent. "CN Muscles in on CP's Potash Deal." *The Globe and Mail,* January 23, 2012. www.theglobeandmail.com/globe-investor/cn-muscles-in-on-cps-potash-deal/article1359781/.

Khaira, Gurpreet. "Coal Transportation Logistics." *6th Annual Community Coal Forum*. Held at Tumbler Ridge, BC, October 9, 2013. http://www.tumblerridge.ca/Portals/0/Temp/CN-Oct09.pdf

Kinder Morgan–Canada. *Trans Mountain Pipeline System*. www.kindermorgan.com/pages/business/canada/transmountain.aspx.

Koven, Peter. "BHP Sends Mixed Signals on Potash Plans." *National Post*, October 29, 2014. http://business.financialpost.com/2014/10/29/bhp-sends-mixed-signals-on-potash-plans/?__lsa=a232-82a2.

Krugel, Lauren. *Rail Mergers Could Fix Sector's "Unacceptable" Status Quo: CP Exec*. October 22, 2014. www.canadianmanufacturing.com/supply-chain/rail-mergers-fix-sectors-unacceptable-status-quo-cp-exec-141854/.

Larson, Scott. "BHP Drops Exclusivity Agreement With Port in Washington." *The Star Phoenix*, June 26, 2014.

Lasuita,Tim. "Rail Lines Being Upgraded." *Mountainview Gazette*, June 3, 2014. www.mountainviewgazette.ca/article/20140603/MVG0801/306039992/-1/mvg08/rail-lines-being-upgraded.

National Energy Board. *Canada's Energy Future 2013: Energy Supply and Demand Projections to 2035.* 2013. www.neb-one.gc.ca/nrg/ntgrtd/ftr/2013/ppndcs/ppndcs-eng.html.

—. *Estimated Canadian Crude Oil Exports by Type and Destination.* www.neb-one.gc.ca/nrg/sttstc/crdlndptrlmprdct/stt/stmtdcndncrdlxprttpdstn-eng.html.

Natural Resources Canada. *Canada's Potash Industry.* www.nrcan.gc.ca/media-room/backgrounders/2012/3275.

Nickel, Rod. "Boosting West Coast Exports Seen Key for Moving Bigger Canada Crops." *Reuters*, April 16, 2014. www.reuters.com/article/2014/04/16/crops-canada-exports-idUSL2N0N817320140416.

Organization of Petroleum Exporting Countries. *World Oil Outlook 2013*. www.opec.org/opec_web/static_files_project/media/downloads/publications/WOO_2013.pdf.

Owram, Kristine. "Rail Chaos Reigns in Chicago." *National Post*, 2014. http://business.financialpost.com/welcome-to-chokepoint-usa/.

Pacific Coast Terminals and K+S Potash Canada. *Pacific Coast Terminals and K+S Potash Canada Sign Agreement on New Potash Handling and Storage Facility.* Joint press release. Port Moody, BC, Aoril 15, 2014. http://www.k-plus-s.com/en/news/presseinformationen/2014/presse-140415.html.

Pacific Coast Terminals Co. Ltd. *Handling Potash*. www.pct.ca/code/navigate.asp?Id=69.

Parrish & Heimbecker, Limited. *Fraser Surrey Terminal*. www.parrishandheimbecker.com/5_908.php.

Port Metro Vancouver. *Alliance Grain Terminal—Gallery Replacement Project.* March 17, 2014. www.portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led-Projects/alliance-grain-terminal-gallery-replacement.

—. *Alliance Grain Terminal Project Approval.* March 17, 2014. www.portmetrovancouver.com/docs/default-source/PROJECTS-AGT/approved-project-permit-(2013-125).pdf?sfvrsn=0.

—. *Bulk Terminals.* www.portmetrovancouver.com/en/portusers/landoperations/terminalsandfacilities/bulk.aspx.

—. *Project Review Application Form.* April 18, 2012. www.portmetrovancouver.com/docs/default-source/projects-project-review/2012-04-20_application_from_neptune_terminals_-_project_craig_phos_rock_handling_infrastructure_improvements_(pp_2012-041).pdf?sfvrsn=2.

—. *Project Review Application Form*. October 16, 2013. www.portmetrovancouver.com/docs/default-source/projects-project-review/1_2012-10-17_application_fr_cargill_ltd_-_phase_1_noise_mitigation_project_pp_2012-130_1.pdf?sfvrsn=2.

—. *Project Review Application Form.* April 9, 2014. www.portmetrovancouver.com/docs/default-source/PROJECTS-Viterra/2014-04-09-application-from-viterra-inc---ship-loading-system-upgrade-at-pacific-terminal-(pp-2014-081)---web-version.pdf?sfvrsn=0.

—. *Richardson International Grain Storage Capacity Project.* www.portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led-Projects/RichardsonInternational.aspx.

—. *Viterra Pacific Elevators—Shipping Upgrade Project*. www.portmetrovancouver.com/en/projects/

OngoingProjects/Tenant-Led-Projects/viterra-pacific-elevators.

PotashCorp. Website. www.potashcorp.com/.

Prince Rupert Port Authority. *Prince Rupert Grain*. www.rupertport.com/facilities/princerupertgrain.

Pritchard, Mark, Michael Porter, Dr. Wayne Savigny, Dr. Iain Bruce, Dr. Franco Oboni, Tim Keegan, and Brian Abbott. "CN Rockfall Hazard Risk Management System: Experience, Enhancements, and Future Direction." *2005 International Conference on Landslide Risk Management.* Held at Vancouver, May 31 to June 3, 2005. www.riskope.com/wp-content/uploads/2013/06/CN-Rockfall-Hazard-Risk-Management-System-Experience-Enhancements-and-Future-Direction.pdf.

Quorum Corporation. *Reports*. http://quorumcorp.net/reports.html.

Rail Energy Transportation Advisory Committee. *Rail Fleet Update.* March 6, 2014. www.stb.dot.gov/stb/docs/RETAC/2014/Mar/RETAC per cent20Railcar per cent20Update per cent20Mar per cent206 per cent202014.PDF.

Railway Association of Canada. *2013 Rail Trends.* www.railcan.ca/railtrends.

Richardson. *Vancouver Terminal Grain Storage Project.* www.portmetrovancouver.com/docs/default-source/community-north-shore-waterfront-liaison-committee/richardson-international-presentation---september-2012.pdf?sfvrsn=0.

Reuters. *TORQ to build 168,000 bpd Western Canada crude-by-rail terminal.* August 14, 2013. http://www.reuters.com/article/2013/08/14/canada-crude-rail-idUSL2N0GF0Z520130814.

Roy, Marc-André. *Unlocking the Value of the Great Lakes–St. Lawrence River Maritime Transportation System.* Draft. Chicago: Council of Great Lakes Governors, Great Lakes-St. Lawrence River Maritime Task Force, December 2013.

Salman Partners. *Potash Transportation Cost Comparison.* February 10, 2011. http://salmanpartners.com/lib/files/Research/2011/February/transportationcomparison.pdf.

Saskatchewan Canola Development Commission. *Canola Quick Facts*. www.saskcanola.com/industry/canolaquickfacts.php.

Saskatchewan Chamber of Commerce. *Sustainable Growth Strategy.* www.saskchamber.com/default.aspx?page=6.

Saskatchewan Mining Association. *Potash*. www.saskmining.ca/commodity-info/Commodities/6/potash.htm

Saskatchewan Ministry of Agriculture. *2013 Specialty Crop Report: Statistics.* www.agriculture.gov.sk.ca/Default.aspx?DN=57e075f3-2dfe-420b-9c65-a027fb1ee61c.

—. *Agriculture Statistics Fact Sheet.* July 2014. www.agriculture.gov.sk.ca/Default.aspx?DN=6dae21c7-fdfe-4e7d-bd31-ddcb176618f4.

Saskatchewan Ministry of Energy and Resources, *20 Year Statistical Summary.* 2014.

Saskatchewan Pulse Growers. *Pulse Industry*. www.saskpulse.com/grow-buy-sell/pulse-industry/.

SJT Solutions. *Lost Earnings From Induced Costs.* Southey, SK: SJT Solutions, 2010.

Statistics Canada. *Canadian International Merchandise Trade Database*. www5.statcan.gc.ca/olc-cel/olc.action?objId=65F0013X&objType=2&lang=en&limit=0.

—. *CANSIM table 126-0001. Supply and Disposition of Crude Oil and Equivalent.* www5.statcan.gc.ca/cansim/a26?lang=eng&id=1260001.

—. *CANSIM table 133-0003. Summary of Pipeline Movements.* www5.statcan.gc.ca/cansim/a05?lang=eng&id=1330003.

—. *CANSIM table 228-0060. Merchandise Imports and Domestic Exports Customs-Based, by North American Product Classification System (NAPCS), Canada, Provinces and Territories.* www5.statcan.gc.ca/cansim/a26?lang=eng&id=2280060.

—. *CANSIM table 404-0002. Railway Carloadings Statistics, by Commodity*. www5.statcan.gc.ca/cansim/a26?lang=eng&id=4040002.

—. *CANSIM table 404-0021. Rail Transportation, Origin and Destination of Commodities.* www5.statcan.gc.ca/cansim/a26?lang=eng&id=4040021.

—. *Civil Aviation, Quarterly Operating and Financial Statistics, Canadian Air Carriers, Level I and II.* 2014. Catalogue no. 51-004-X. www.statcan.gc.ca/pub/51-004-x/51-004-x2014001-eng.pdf.

—. *Trucking Commodity Origin and Destination Survey.* March 25, 2014. www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=2741.

Stephenson, Amanda. "Farm Groups Praise Extension of Grain Hauling Rules." *Calgary Herald,* November 30, 2014. http://calgaryherald.com/business/local-business/farm-groups-praise-extension-of-grain-hauling-rules. HeraldH

The Canadian Encyclopedia. *Potash*. www.thecanadianencyclopedia.ca/en/article/potash/.

The Economist. "Prairie Pile-Up." *The Economist*, March 5, 2014. http://www.economist.com/blogs/americasview/2014/03/canadas-grain-crisis.

The Western Producer. *More Isn't Better Says CN on Lack of Rail Cars.* December 5, 2013. www.producer.com/2013/12/more-isnt-better-says-cn-on-lack-of-rail-cars/.

Thunder Bay Port Authority. Historical Cargo Statistics. www.portofthunderbay.com/article/historical-cargo-statistics-281.asp

Tita, Bob. "Railcar Shortage in U.S. Pushes Up Lease Rates." *The Wall Street Journal*, n.d. (subscription required). www.wsj.com/articles/railcar-shortage-in-u-s-pushes-up-lease-rates-1401393331.

Transport Canada. *Rail Freight Service Review: Final Report.* January 2011. www.tc.gc.ca/media/documents/policy/TP_15042_Final_Report_EN_WEB.pdf.

United Nations. *UN Comtrade Database.* http://comtrade.un.org/.

United States Department of Agriculture. *Oilseeds: World Markets and Trade.* February 10, 2015. www.fas.usda.gov/data/oilseeds-world-markets-and-trade.

—. *Wheat Outook.* October 15, 2014. www.ers.usda.gov/media/1685374/whs-14j.pdf.

United States Department of State. *Final Supplemental Environmental Impact Statement for the Keystone XL Project.* January 2014. http://keystonepipeline-xl.state.gov/documents/organization/221135.pdf.

—. *Final Supplemental Environmental Impact Statement: Keystone XL Project.* n.d. http://keystonepipeline-xl.state.gov/documents/organization/221147.pdf.

United States Environmental Protection Agency. *Locomotives—Exhaust Emission Standards.* 2012. www.epa.gov/otaq/standards/nonroad/locomotives.htm.

U.S. Energy Information Administation. *U.S. Net Imports by Country: Crude Oil.* www.eia.gov/dnav/pet/pet_move_neti_a_epc0_IMN_mbblpd_a.htm.

—. *United States.* May 30, 2013. www.eia.gov/countries/country-data.cfm?fips=US#pet.

Vantuono, William C. "BNSF Taking Bids on 5,000 Oil Tank Cars." *Railway Age*, February 20, 2014. www.railwayage.com/index.php/mechanical/freight-cars/bnsf-taking-bids-on-5000-oil-tank-cars.html?channel=59.

Viterra. *Cascadia Terminal*. http://omicnet.com/omiccan/terminals/cascadia.pdf.

—. *Viterra's Cascadia Terminal Sets Vancouver 24-Hour Unload Record. News release, Regina: Viterra*, October 29, 2008. www.marketwired.com/press-release/Viterras-Cascadia-Terminal-Sets-Vancouver-24-Hour-Unload-Record-914807.htm.

World Bank. *Overview of Commodity Markets.* September 2014. http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/

The Conference Board of Canada

SASKATCHEWAN CHAMBER *of* COMMERCE

2015