# Comparative Analysis: West Coast vs. East Coast Routing to Global Destinations

In November of 2021 massive flooding from an atmospheric river caused road and rail line outages which blocked all access to the Port of Vancouver for almost three weeks. At the time, railways proposed that alternate routing of traffic through eastern ports would alleviate the strain on the supply chain. Most shippers and exporters saw alternative routing as economically unfeasible during the outage and subsequent recovery. The idea of diverting more traffic through eastern ports, however, has continued to be raised by one of the railways and members of government as an option to alleviate some of the stress on the West Coast supply chain, even in normal operating periods.

To evaluate the feasibility of this concept, Quorum Corporation has undertaken an analysis to compare the costs of routing a typical panamax vessel of wheat through west coast and east coast ports. In this analysis, we compare moving grain by rail to Vancouver against moving it by rail to Thunder Bay with furtherance to Montreal by lake freight for loading to ocean vessels. Costs are estimated in $CAD per tonne for a panamax vessel carrying 50,000 tonnes of wheat with rates, fees, and other costs described in Section 4. Methodology.

The transportation of Canadian bulk commodities to their final export destination requires a multimodal approach with trucks from farm to country elevators, rail from country elevators to port terminals, and marine vessels for the final transit from Canada to the overseas port. The per tonne cost of that endeavor varies based on the length of haul moved in each mode. Across the same distance, trucks are more costly than rail and rail is more costly than marine. This characteristic of bulk movement makes it so that grain transportation costs within Canada, done primarily via rail, are as important a consideration in the total logistics cost as ocean transportation, even despite the large difference in distance covered. For this reason, the origination point of Canadian grain is a critical component when determining which port routing has the most economical offering for a given export destination.

The results of this analysis confirm the position taken by most shippers that, for most origin – destination pairs, Vancouver is the most economically feasible routing. This is achieved by striking a better balance between distance from key growing regions to port terminals, proximity to overseas buyers of Canadian grain, and port fees.

## 1. Background

The movement of Western Canadian Grain has seen many changes over the past 100 years from regulatory, technological, and market perspectives alike. This analysis focuses on changes in the market conditions affecting the transportation and export of Canadian grains.

In the 1980s, European and African markets dominated the demand for Canadian grains, especially Eastern Europe which bought almost 25% of Canadian grain exports (Figure 1). The logical route for European destined grain was rail movement to Eastern Canadian ports, supported by the St. Lawrence Seaway. Grain would be loaded on to smaller laker-style vessels at Thunder Bay and taken to terminals capable of handling larger ocean vessels on the lower St. Lawence River. This led to Thunder Bay being the largest grain port in North America, for a time.

The breakup of the Soviet Union in the early 1990's rapidly shifted where Canadian grain was most in demand. As the economies of former Soviet countries improved, so did their agricultural practices, such that

they soon became self-sufficient in supplying their own grain products and not long after were competitors in global grain export markets.

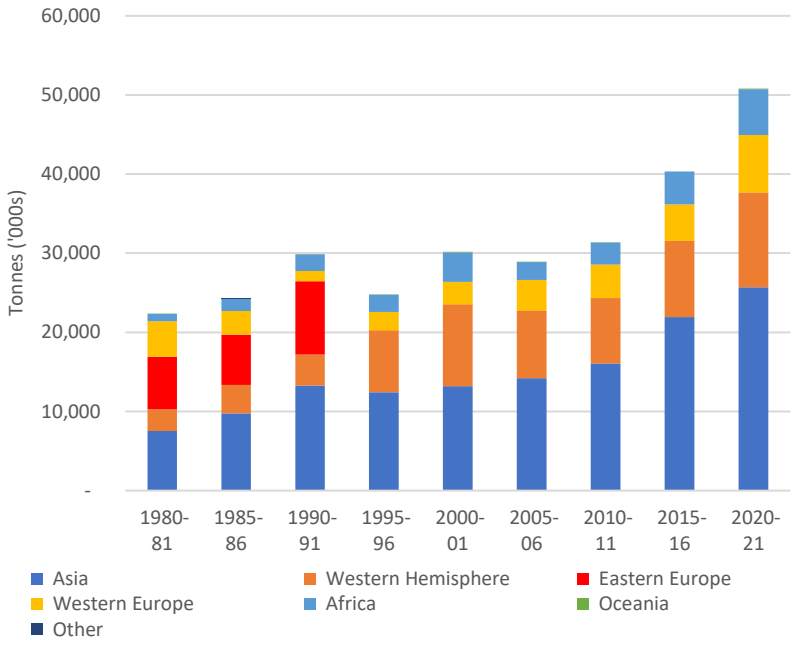



*Figure 1 - Global destination regions of Canadian export grain ('000s tonnes) 1980 – 2021 (source: Canadian Grain Commission)*

Following the loss of customers in Eastern Europe, Canadian grain needed different markets to sell into. Asia Pacific, Southeast Asian, and South American countries began to fill the demand. These regions were seeing a rapid growth in the middle-income demographic, a group that created a higher demand for better quality protein-based foods. As the markets shifted to Asia, it became more economical for grain shippers to route through the pacific coast ports of Vancouver and Prince Rupert. The mid-1990s saw the beginning of this shift (Figure 2) and it has continued since then with Vancouver capturing the largest portion of all increases in total export throughput.

To accommodate this growth in volume, grain terminals in Vancouver invested heavily in expanded storage and vastly improved railcar unloading and vessel loading operations, with three new terminals added to the five already in existence plus a bulk handler devoting a portion of its capacity to grains handling. Those investments increased the throughput capacity at the port by more than 40% over the past 15 years.

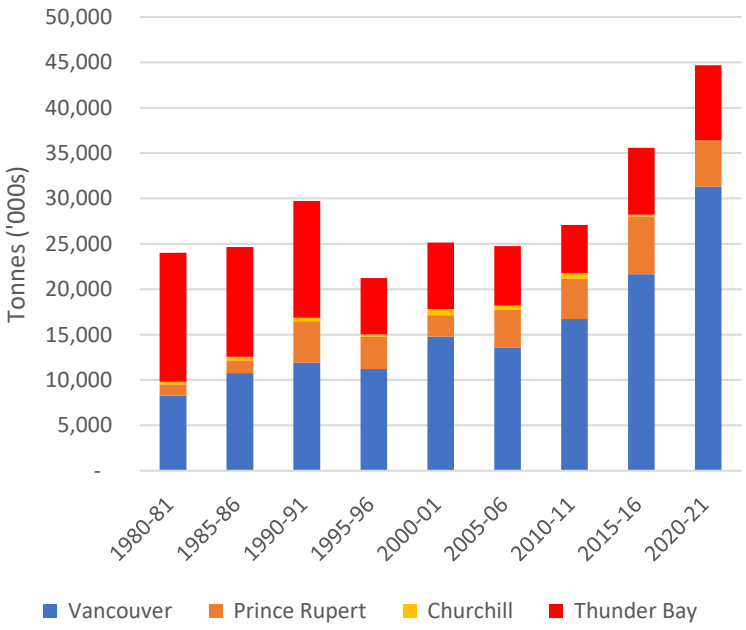



*Figure 2 - Western Canadian Port movement ('000 tonnes) 1980-2021 (source: GMP Data Warehouse)*

# 2. Findings

The analysis examined the costs associated with moving 50,000 tonnes of wheat from seven different origins to seven global destinations through western or eastern routing. The intent is to examine which sets of country origin, export port, and destination port are the most cost effective. Figure 3 shows the country origins and Canadian ports considered, along with the general prairie grain growing region.


*Figure 3- Grain origins and ports used in the analysis.*

The chosen destinations include major ports at countries which are regular buyers of Canadian grain. Osaka (Japan), Pohang (South Korea), and Shanghai (China) represent the key Asia-Pacific market, while Chennai (India) and Bandar e Emam (Iran) are included for the broader Asian market. Significant portions of Canadian grain are sold into North Africa and Western Europe, which is collectively represented by the Mediterranean region in the analysis. This region includes countries such as Morocco, Algeria, Spain, Italy, and Turkey, which all receive their grain from both the western and eastern routes. A midpoint within the Mediterranean region was selected for calculating the cost structure typical of shipping to the region. Finally, Cabello (Venezuela) is included for the South American / Western Hemisphere market as its position on east-coast South American makes the difference in cost structure between Montreal and Vancouver more pronounced.

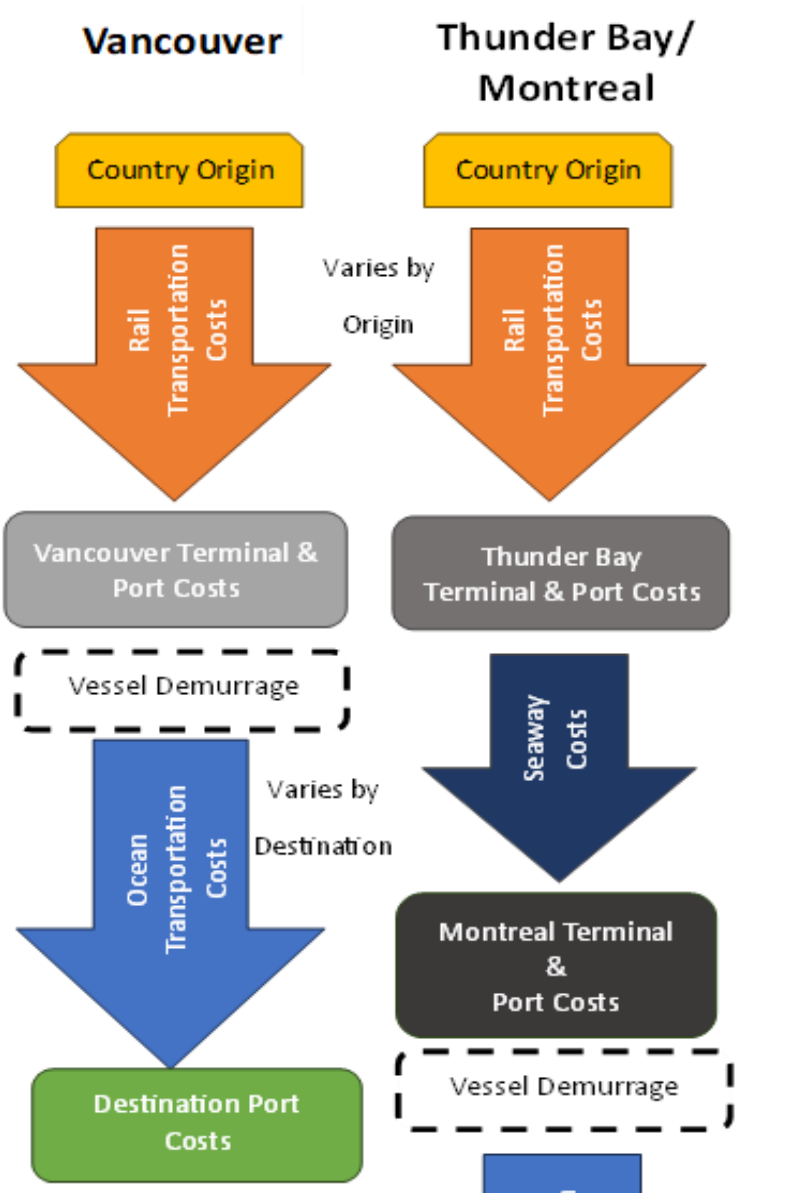
## *Total Cost Structure*

Total costs for origin-port-destination sets reveal that, in most cases, Vancouver routing is more economical than Thunder Bay/Montreal (Figure 5). For example, grain destined to Osaka Japan originating from Camrose and routed through Montreal will have a total logistical cost of $143.95/tonne compared to the cost through Vancouver of $73.77/tonne.

There are circumstances where the eastern route is more cost effective, typically when grain is sourced close to Thunder Bay. For example, grain from Winnipeg destined to Osaka favours the eastern route at a cost of $99.88/tonne versus the western route's $105.88/tonne. This differentiation for the same global destination underscores how transportation costs within Canada and overseas combine to impact the decision making of grain shippers.

Figure 6 shows the difference between costs to export grain via Thunder Bay/Montreal less those via Vancouver for each origin-destination pair. Exporting from Vancouver can be as much as $80/tonne cheaper when the grain is sourced in Alberta, owing to closer access to both port and destination. Even if longer marine transportation is required out of Vancouver, through the Panama Canal, to destinations in the Mediterranean it is still more than $25/tonne cheaper than using the eastern route when the grain can be sourced close to Vancouver.

As the origin moves farther and farther east, the difference lessens until Winnipeg, where Thunder Bay/Montreal becomes cheaper for




**BREAKDOWN ($/TONNE)**

| | West | East |
|---|---|---|
| Rail Transit | Varies | Varies |
| 1st Cdn Port | $15.03 | $10.66 |
| Seaway | - | $21.00 |
| 2nd Cdn Port | - | $13.21 |
| Demurrage | $2.11 | $0.84 |
| Ocean Transit | Varies | Varies |
| Int'l Port | $3.03 | $3.03 |
| **Total Estimate** | **$20.17** | **$48.74** |
| Diff Before Rail/Ocean | | $28.57 |

*Figure 4- Route Overview*

most destinations, by up to $45/tonne. Moose Jaw and Saskatoon, both in central Saskatchewan, approach a break-even point for Mediterranean destinations that allow for similar costs in either route when grain is sourced nearby. Grain grown within Manitoba is overwhelmingly exported through the eastern corridor as the additional costs to ship across Canada will typically outweigh differences in marine routing, even when crossing hemispheres.

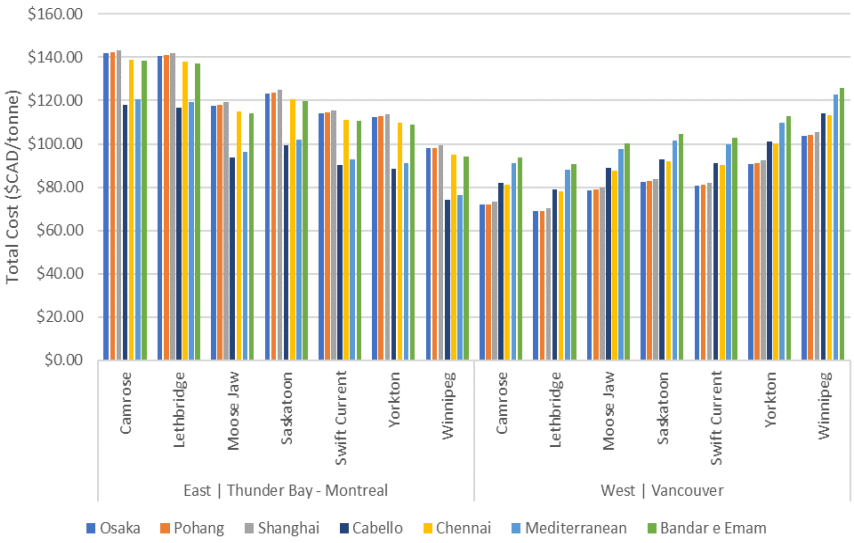



*Figure 5- Total logistical cost for each origin - destination pairing ($CAD per tonne)*

The prevailing market conditions in bulk shipping can shift this balance in any given week, especially for origin – destination pairs near $0/tonne difference. Bulk shipping rates change daily in response to supply and demand, much more frequently than rail rates do, and these shifts will affect the determination of the cheapest routing. When vessel rates increase, the balance shifts towards exporting on the same side of Canada as the destination, within the bounds set by rail freight, as it will not always be more economical overall if the rail length of haul must increase to save on the marine transit.

The number of bulk carriers operating in the Pacific region is greater than in the Atlantic, thereby increasing the relative supply and causing Pacific bulk rates to be lower than Atlantic. Since 2019, however, the rates have been steadily converging and Atlantic rates were only 2% higher than Pacific at the end of 2022. For this reason, Quorum calculated total costs as if the marine rates were equal. Historically, the Atlantic rates were 20% higher, and Figure 7 examines the total cost difference in such a scenario.

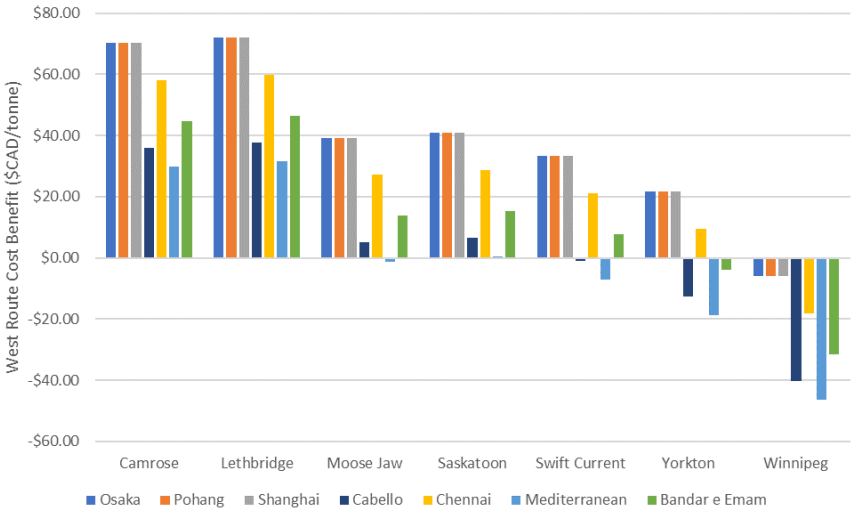



*Figure 6 - Cost difference between Thunder Bay/Montreal and Vancouver Routing ($CAD per tonne) (positive shows a Vancouver preference, negative shows a Thunder Bay/Montreal preference)*

When Atlantic rates are higher, the preference toward western routing increases accordingly. The total cost difference when only marine rates have changed does not immediately identify an obvious shift in the decision making of any origin-destination pair, as evidenced by how similar Figures 6 and 7 are. When shipping rates are higher in the Atlantic dry bulk market, it becomes even more unlikely that the eastern route would be used for access to Asia-Pacific destinations regardless of where grain is sourced in Canada.

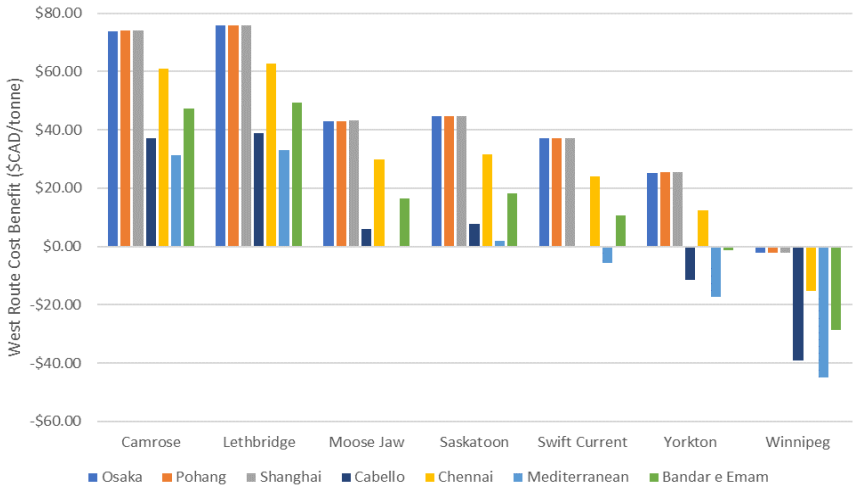



*Figure 7 - Cost difference between Thunder Bay/Montreal and Vancouver Routing ($CAD per tonne) When Atlantic bulk shipping rates are 20% higher than Pacific rates. (positive shows a Vancouver preference, negative shows a Thunder Bay/Montreal preference)*

## *Effect of Rail Movement and Rates*

The cost structure highlights that the primary reasons for choosing the eastern routing are distance from the grain source to Thunder Bay, and the distance from Montreal to the overseas destination. Grain companies may, at times, source grain further west due to supply availability or quality needs. One panamax vessel can hold approximately five trains worth of grain, so sourcing into western Saskatchewan, and rarely as far as Alberta, can be necessary to fill the customer requirements. In fact, almost half of the grain shipped to Thunder Bay originates in Saskatchewan (Figure 8). Only trace volumes move eastward from Alberta and British Columbia.

Conversely, the Vancouver corridor receives much more grain from Alberta, 40% of the 5-year average, and only 5% from Manitoba (Figure 8). Saskatchewan, as a central province and key growing region, originates more than half the volume shipped to either port.

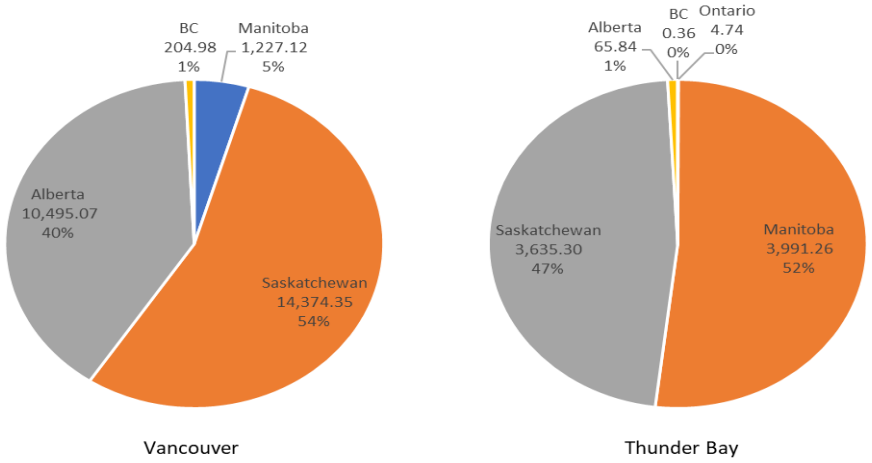



*Figure 8 - 5-year average tonnage shipped by rail to port destination, by origin province ('000s tonnes) 2018-2023*

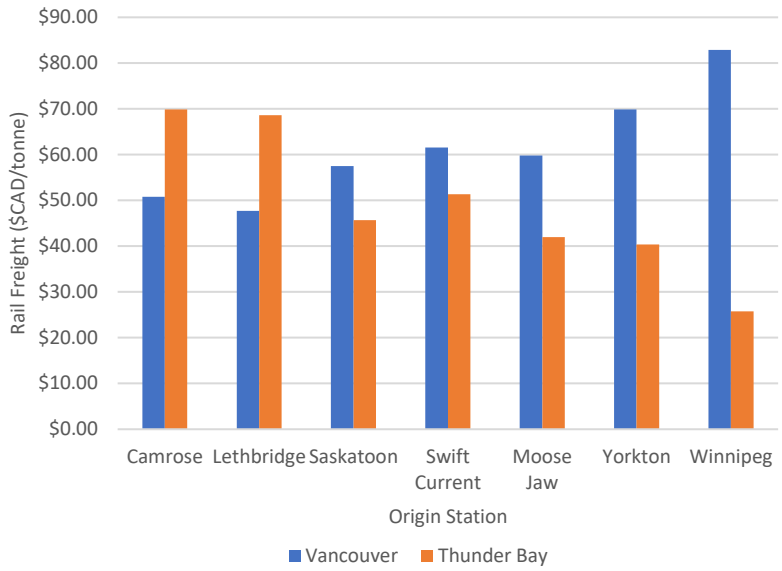



*Figure 9 - Summary of Rail Freight ($CAD/tonne) (source: CN, CPKC)*

As would be expected, the rail freight rate increases the longer the length of haul to port, as seen in Figure 9. Rail freight costs comprise between 60 and 75% of the total freight cost of the grain movement from origin to final destination. Hence, the effect the origin's distance from port has the single greatest impact on the overall cost of movement, and stands as the prime determining factor for grain company logistics managers choosing the routing

## *Actual Export Volume by Port*

The Canadian Grain Commission publishes export statistics by destination country and export region within Canada. Figure 10 examines the last 3 years of exports for the destinations considered in this report to highlight which corridors grain shippers have primarily been using.

The actual movement of grain for export follows the expectation based on the total logistics cost described in previous sections. Most origin-destination pairs had favourable pricing along the western routing and that is confirmed by the actual movements. Only Venezuelan, Mediterranean, and Iranian destinations have more than half their exports originate at an eastern Canadian port. However, conditions within 2023 have shifted the trend within these regions. Both Venezuela and the Mediterranean have received a higher proportion of exports off the west coast, which require use of the Panama Canal. Iranian destinations, which utilize the Suez Canal for optimal routing from the east coast, have not received any western port originated grain in 2023.

It should be noted that at the time of publishing, in November 2023, low water levels in the Panama Canal have resulted in slower canal movements. This has extended the waiting period and increased fees for vessels transiting the Panama Canal and may have short term impacts on the routing choices made by grain shippers.

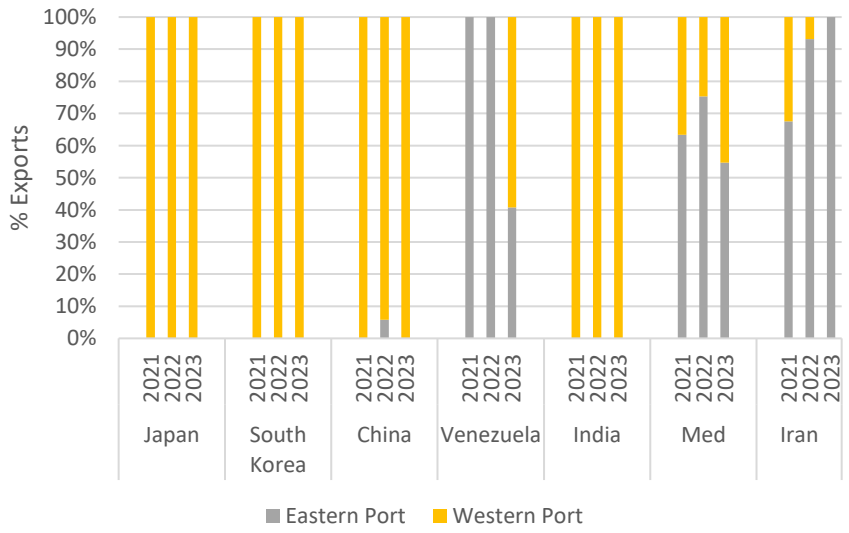



*Figure 10 – Percentage of Exports by Port Region for Destination Countries 2021 – 2023 YTD (source: Canadian Grain Commission)*

## 3. Summary

As noted above, the transportation and logistics groups responsible for determining the optimal routing for export grain will first look at costs. While overall cost is a major factor, the number of times product is handled and the length of time in transit also play a part. That said, the rail distance to the port of export is the largest determining factor in calculating the total logistics cost of movement. This is visualized in Figure 11, showing rail and marine transportation costs on a per tonne basis for the origins and destinations analyzed.

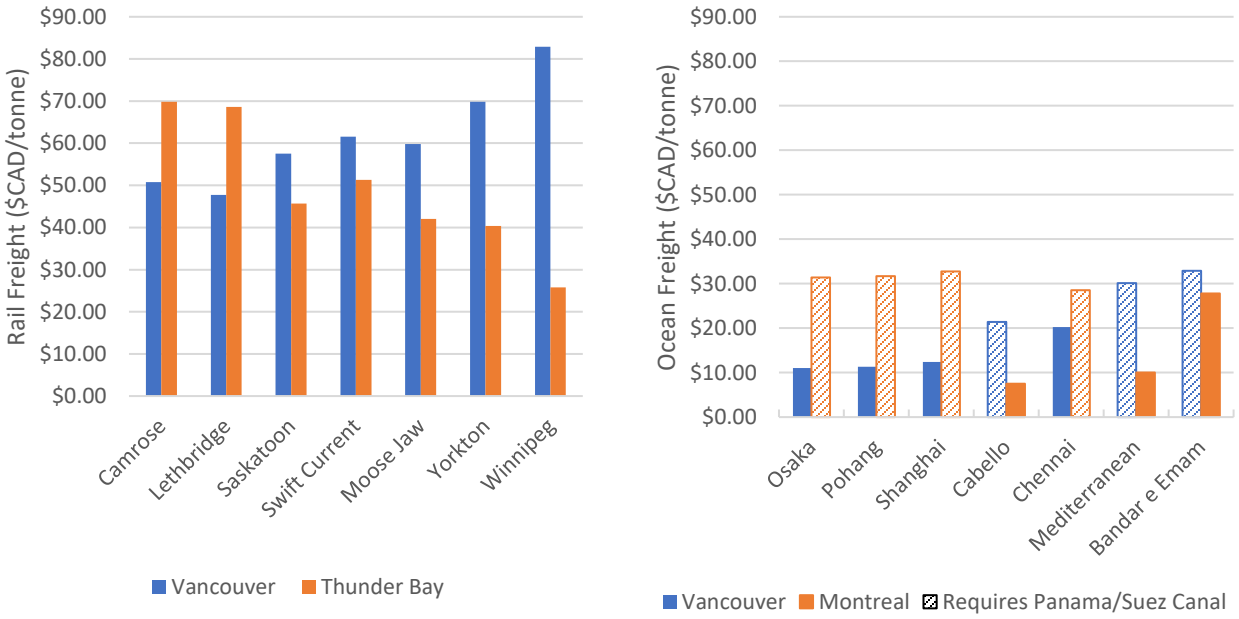



*Figure 11 – Comparison of Rail and Marine Freight at each Port of export (source: CN, CPKC, Capital Link Shipping, sea-distances.org)*

The average rail length of haul was 945.6 miles in 2021-22 (GMP Table 4C-3 A), this is approximately the distance between Swift Current and Vancouver (958 miles) or Thunder Bay (935 miles). The tariffs with CPKC for those routes are $61.55/tonne and $51.34/tonne respectively. A journey from the west coast to a Mediterranean destination is one of the more expensive ocean routes commonly used by grain shippers and is estimated to cost $30.12/tonne. Such a journey covers more than 10,000 nautical miles and requires use of the Panama Canal yet is more than 40% cheaper per tonne than rail freight from a midpoint station between Vancouver and Thunder Bay.

In terms of handling, an eastern routing from Thunder Bay requires that grain be handled three times prior to loading to an ocean vessel. For most grain products this would have minimal effect but for some such as pulse products, it is a major determining factor as multiple handles degrades the product. Eastern routings are further impacted by the cost associated with the seaway movement. While the seaway cost is lower than the alternative of positioning product at eastern ports by rail, it adds an additional cost not experienced by the western route that goes directly by rail to Vancouver.

Ocean freight, by its nature, is the most cost-effective shipping method over long distances and is therefore the least impactful transportation component per tonne. However, this is not necessarily always true. Marine freight is distinct in that pricing is highly variable with supply and demand of vessel capacity within each shipping region. For example, over the past 10 years we have witnessed Pacific panamax vessel rates as low as $4,900 CAD/day and as high as $41,000 CAD/day – wholly dependent on the available capacity and the associated demand of markets. At $41,000 CAD/day, approximately double the rates used in this analysis, marine freight would factor into routing decisions much more prominently.

In summary, the factors noted above support and explain the decisions made by grain companies for routing grain movements in the manner they do today. Without a significant change in price structures, the west coast ports will be the preferred routing for most Western Canadian grain exports. Despite the large volumes and their attendant high dollar values, grain remains a very competitive global market yielding only moderate profit margins. It is imperative that for the grain economy to remain competitive and continue to grow, the logistical routing remains efficient and cost effective.

# 4. Methodology

Three components were considered in the analysis of total costs: getting the grain to export position, loading the vessel at port, and getting the grain to destination. All costs are normalized to $CAD per tonne based on a typical export of 50,000 tonnes of wheat.

## *Rail Freight*

CN and CPKC post tariffs for moving a single railcar of grain from a country origin to a port destination, for each commodity. This analysis uses the tariffs posted for wheat effective on October 1, 2023, and assumes an average of 98 tonnes per railcar. Each carrier also offers an incentive of $8.00/tonne for unit train origins, which is discounted from the per tonne costs in the analysis. Figure 11, seen above, summarizes each of the seven origin stations examined. There is a clear association between the distance from origin to destination and the per tonne cost. Origins in western Canada have lower rates to move to Vancouver than to Thunder Bay. At Saskatoon, and further east, rail tariffs begin to favour movement to the Port of Thunder Bay.

## *Port Costs*

Information on fees and tariffs for utilizing port facilities is primarily drawn from the fee guides for each port. The ports of Vancouver, Thunder Bay, and Montreal each post detailed documents which Quorum was able to draw upon for estimating typical costs using the rates that were effective at the onset of 2023. Port fee documents include harbour dues, anchorage, berthage, and in the case of the Port of Vancouver, Gateway Infrastructure Fees 1 & 2.

Other costs were collected as follows:

- Seaway Costs – Grain companies which operate out of Thunder Bay provided estimates to Quorum with their total per tonne cost of loading grain at Thunder Bay into lake vessels then through the St. Lawrence River to a secondary port. The estimates ranged from $20-25/tonne, and since this analysis assumes the nearest lower river port, Montreal, as the port of export, Quorum has selected $21.00.
- Pilotage – Pilots are required at both Vancouver and Montreal ports. The fees are estimated based on BC Pilotage authority times and rates.
- Port Terminal Fees (Fobbing) – Each terminal elevator must post a maximum tariff with the Canadian Grain Commission for handling grain through the elevator. The average of all posted tariffs for all terminals in Vancouver and Thunder Bay were used. At Montreal, only the tariff for Viterra is used.
- Loitering – All vessels require food and provisions for the crew, which are often charged to the charter. The analysis uses an estimate provided by grain shippers at each port.
- Destination Port Fees – All destination ports are assumed to have the same per tonne cost as Vancouver, less Fobbing.

## *Marine Freight*

Seven destinations were picked to represent markets that purchase Canadian grain. The sailing distance from the Ports of Vancouver and Montreal is used to build the base cost, with additional fees for canal usage where routes require it.

- Base Fees - Vessel fees are based on Pacific and Atlantic averages for the past month (October 2023) and expressed as the daily rate for a panamax size vessel. The daily rate is multiplied by the number of days at sea for a sailing speed of 12 knots (Table 1).
- Demurrage – Demurrage is based on the typical number of days that vessels were in port over and above the average free time referenced in a normal charter party agreement. For Vancouver it was calculated based on statistics for the past three years, for an estimated 5 days of demurrage. Montreal was estimated at 2 days based on conversations with grain shippers that there is less than half the demurrage than at Vancouver.
- Fuel Surcharge (FSC) – FSC is charged based on a percentage of the total base vessel fees and was estimated at 40%.
- Canal Fees – An online calculator for Panama and Suez Canal fees was used to determine the per-tonne cost to transit the canal for a panamax vessel carrying grain. When a route requires a canal crossing, 3 days are added to the sailing time to account for additional time waiting.

| Destination | Distance from Vancouver | Distance from Montreal | Days to Dest – Vancouver | Days to Dest-Montreal |
|---|---|---|---|---|
| Osaka, Japan | 4,349 | 11,312 | 15.1 | 39.3 |
| Pohang, Korea | 4,500 | 11,450 | 15.6 | 39.8 |
| Shanghai, China | 5,001 | 11,980 | 17.4 | 41.6 |
| Chennai, India | 8,863 | 9,032 | 30.8 | 31.4 |
| Mediterranean (Middle point) | 10,068 | 4,481 | 35.0 | 15.6 |
| Bandar e Emam, Iran | 11,440 | 8,705 | 39.7 | 30.2 |

*Table 1 - Marine Sailing distances and time to destination at 12 knots (nautical miles)*