Benefits of Strategic Freight Movement in Saskatchewan

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ABSTRACT

Provincial transportation ministries hold the responsibility for the safe and efficient movement of goods within their provincial boundaries. The Saskatchewan Ministry of Highways and Infrastructure adheres to those responsibilities through its development of strategic freight movement initiatives and its participation in inter-modal transportation.

Inter-modal facilities (IMFs) enhance the movement of goods through efficient methods of transferring shipping containers between trains and commercial trucks. In Saskatchewan, there is an economic advantage for rail to cooperate with the trucking industry instead of competing. IMFs facilitate this relationship and capture the benefits of both long-haul freight by rail and short-haul truck delivery.

The reduction of barriers to transfer and transport containers is key. The Ministry delivers a unique program, which allows shippers and carriers to transport containers in truck configurations that exceed regulated weights and dimensions. The presence of corridors with height restrictions can impede the movement of container freight; however, Saskatchewan's strategic approach encourages the designation of barrier-free high-clearance corridors. Designated routes reduce operating costs for commercial carriers, which leads to a reduction in fuel consumption and greenhouse gas emissions.

It is critical that IMFs provide exporters and importers with strategic links to markets in Canada and around the world. In Saskatchewan, locations of IMFs are best suited within urban limits but outside of the cities' core area. The locations chosen, along with the associated infrastructure requirements, ensure adequate access to the facility, reduce urban congestion, and improve traffic flow resulting in an increased level of safety for all roadway users.

Saskatchewan approach to freight movement recognizes all sides of the sustainability triangle. The operation of the IMFs combined with the efficient movement of goods on the provincial highway network complement the improving economic conditions in the province.

BACKGROUND

The Saskatchewan Ministry of Highways and Infrastructure continues to optimize transportation's contribution to the economic and social development of Saskatchewan. With its current commitment to efficient freight movement, the Ministry aims to meet the demands of the future.
The Saskatchewan Ministry of Highways and Infrastructure encourages economic growth and prosperity through the efficient movement of goods across the province. The ability to move products to markets safely and efficiently while minimizing environmental impacts is important to the support for economic development in the province. In Saskatchewan, transport by road and rail are complementary modes due to the nature of the combination of long-haul and short-haul shipping distances through both urban roadway networks and provincial highway networks. The transition from the provincial highway network into and out of urban centers requires additional consideration for efficient and safe trucking practices. This paper focuses on the relationship that exists between modal shifts and network shifts in Saskatchewan.

The Ministry is working to develop a provincial intermodal transportation system that is safe, economically efficient, and environmentally-sound, while providing a foundation for competition in the global economy. The reduction of barriers to transfer and transport commodities is key. Intermodal transportation provides economic benefit because containers create standardization of transport, urban access, security of contents and access to global trading. Sustainable transportation is accomplished by lowering costs and improving service by using each mode for the portion of the trip for which it is best suited. With the improvement of value and lower prices for transportation and expanding trade, demand for transportation is set to increase. The development of strategic intermodal transportation requires the optimal use of the different modes, strategic positioning of hubs and improving the connections between them. Through conscious efforts, the coordinated movement of goods through transportation systems like intermodal facilities (IMF) can improve competitive advantages for shippers while reducing environmental and social impacts. The Ministry enhances strategic and economic development by reviewing provincial transportation policies and implementing the necessary changes that encourage investment in the province.

In 2007, the transportation sector was the second largest emission-producing category and contributed approximately 2% (200 Mt) of greenhouse gases (GHG) to Canada's total emissions (1). The transportation sector includes emissions from road transportation, domestic aviation, domestic marine, railways, and other transportations such as off-road and pipelines. Saskatchewan generated 72.0 Mt CO2e in 2007. These GHG emissions are 65.8% increase from the 1990 GHG emission levels and rank Saskatchewan as having the highest GHG emissions per capita in Canada (2).

The population recently exceeded one million people, which combined with a resource-based economy involving oil, gas and mining industries, as well as a large agricultural sector, factors in to the high per capita GHG emission levels. Emissions generated by the business and personal transportation sector account for 9% and 5% respectively.

Table 1. Saskatchewan Annual GHG Emissions (3)

EMISSIONS, ECONOMY, and ENERGY	1990	2004	2005	2006	2007
Total GHG (Mt)	**43.418**	**71.509**	**72.073**	**71.160**	**71.977**
Change Since 1990	*NA*	*64.7%*	*66.0%*	*63.9%*	*65.8%*
Annual Change	*NA*	*NA*	*0.8%*	*-1.3%*	*1.1%*
GDP (millions)	**27,793**	**37,741**	**38,970**	**38,860**	**39,834**
Change Since 1990	*NA*	*35.8%*	*40.2%*	*39.8%*	*43.3%*
GHG Intensity (Mt/$B GDP)	**1.56**	**1.89**	**1.85**	**1.83**	**1.81**
GHG Efficiency ($B GDP/ Mt)	**0.64**	**0.53**	**0.54**	**0.55**	**0.55**
Population (000s)	**1,007**	**995**	**990**	**988**	**997**
Change Since 1990	*NA*	*-1.2%*	*-1.7%*	*-1.9%*	*-1.0%*
GHG Per Capita (tonnes/person)	**43.1**	**71.9**	**72.8**	**72.1**	**72.2**

Saskatchewan's economy is based on the production and export of natural resources; in fact, approximate 95% of all goods produced are grain, potash, uranium, or oil and gas (4). Saskatchewan grain exports totaled $664 M to destinations with Canada and $3,878 M to locations outside of Canada. The grain exports increased to 39.8% while potash exports rose by 38.4% from the previous year. The data suggests there is an increasing trend in road transportation that is related GHG emissions. The increase is likely due to increased use of heavy-haul diesel vehicles (HHDV) operating on the roadways. The increased use is a result of the demand for these types of vehicles generated by natural resource production and export activities. Significant national emission increases since 1990 are identified in HHDV as the emissions have increased by nearly 94% (19.4 Mt). In 2007, emissions from HDDVs contributed 40 Mt to Canada's total GHG emissions. Since 1990, the number HHDV operating on Canada's highways has more than doubled and now totals 897,000. This number accounts for 4.2% of all vehicle traffic on Canada's roadways (5). However, the total GHG emissions generated by HHDV accounts for 29.3% of the road transportation sector. The results indicate that the HHDV subsector of the total transportation sector requires significant encouragement in GHG reduction practices.

Table 2. Comparison of Transportation Subsector GHG Emissions in Canada (6)

GHG Source Category	1990	2004	2005	2006	2007
Heavy-Duty Diesel Vehicles	20.7	36.5	38.1	38.9	40.1
Railways	7	6	6	6	7

Intermodal freight transportation involves the movement of freight utilizing a container with more than one form of carrier during a single journey. Economic competitiveness depends on an effective intermodal transportation system, particularly in the global context. Improved access and service levels in the worlds inter-modal system provides new opportunities for Saskatchewan shippers particularly in the manufacturing sector and in high value commodities. Opportunities

for low margin commodities like pulse crops will develop with the availability of containers for back haul to shipping ports. These industries have had problems securing containers on the slot market and have had to pay higher costs to make them available. The network effect benefits shippers essentially expanding their regional and international market base for their product. Saskatchewan is focused on developing a transportation system that is accessible, strategic and sustainable.

To capture the synergy of markets, IMFs have traditionally been located near or within urban limits. Saskatchewan has IMFs in Regina, and Saskatoon where economies of scale are captured in aggregated markets. With a focus on economics, social needs and the environment, IMF locations along with the associated infrastructure, need to ensure adequate access to the facilities, reduce urban congestion, and improve traffic flow. Integration into the urban environment has resulted in the confliction use of land and impacted the quality of life and environment in urban centers. Good engineering practices must be used when developing strategic transportation corridors in and around urban centers to incorporate innovative solutions to provide an increased level of safety for all roadway users. Saskatchewan studied other IMF locations in centers that were not designed to accommodate the requirements of rail and commercial trucking within tradition road networks. The impacts of inadequate infrastructure and planning had major effects on environmental systems and public safety. The lack of height on rail overpasses did not allow for containers to be stacked and moved more efficiently. The location of rail yards in core areas reduced economic development and posed environmental and safety issues with refueling stations and rail crossings on major corridors.

The Ministry of Highways and Transportation is working towards several transportation initiatives and policies that will increase economic development and decrease the carbon footprint. The Ministry's transportation partnership program (TPP) enables industry to safely operate commercial motor vehicles with specified weighs and/or dimensions that exceed provincial regulation. The specified allowable limits that are not covered by regulation are defined in the TPP permits. The permit conditions must ensure that the motoring public is not adversely affected by the commercial traffic. Trucking program vehicles that are permitted by the Ministry through the Trucking Program are safer. In 2007, commercial vehicle kilometers totaled 1, 484.8 million and the commercial vehicle accident report indicated 1.87 accidents occurred per million kilometers traveled. In contrast, the commercial vehicle kilometers permitted under the Trucking Program totaled 77.3 million and resulted in 0.16 accidents per million kilometers traveled. The partnership program works with industry to increase efficiency and safety; however, positive externalities are achieved by the permitted truck-trailer configurations through the reduction of GHG. With fewer trucks hauling more freight efficiently, there is less congestion on urban connectors and in major centers. The implementation of energy efficient technologies and practices leads to a reduction of the GHG emissions produced by the transportation sector in the province.

The trucking program enables shippers and receivers to move towards efficiency, but does not force it to happen. The role of government is to modify regulations and programs to permit efficient and environmental transportation without compromising the efficiencies of the private sector. The total cost of trucking operations includes fixed vehicle costs, fixed business costs and variable operational costs. Fixed vehicle costs are set by the number of vehicles and account for

the depreciation and licensing costs of the tractor and trailer. The variable costs fluctuate by the number of trips and destinations of the trucks and can include driver costs, fuel, tires and maintenance. Given that the fixed costs do not change and are required in order to operate, carriers try to decrease their variable costs, such as the number of trips in order to make a profit. The Ministry encourages industry to become more efficient by reducing the number or trips required. These efforts result in decreased damage to provincial infrastructure along with decreasing negative environmental and social impacts associated with transportation.

A trucking partnership agreement (TPA) is an agreement between the Ministry and a shipper (origin) or receiver (destination) to allow the movement of goods by trucks that carry divisible loads, exceed regulated weights and/or dimensions and make multiple trips on designated routes. The transportation partnership programs are industry specific in which there are specific criteria and conditions for partnership agreements based on the industry involved. The six types of agreements apply to the following areas: bulk haul; timber; over-dimension; value-added agricultural products; oil and miscellaneous; and, energy efficient motor vehicles (EEMV). Vehicle weights and dimensions in Saskatchewan are limited by regulation to ensure the safety of the traveling public and to allow the efficient transportation of goods within and through the province. Transportation partnership programs allow shippers or receivers in Saskatchewan to increase productivity through reduced transportation costs by using vehicles, which safely exceed current regulated weights and/or dimensions. In exchange for this privilege, partners pay for any incremental damage to the provincial infrastructure and an administration fee to offset any administration costs to the program.

The savings generated enable trucking companies to increase competitiveness and develop innovative trucking solutions to today's transportation barriers. The objective of the transportation partnership program is to enhance truck safety, support economic development in Saskatchewan, promote the use of efficient and environmental road friendly vehicles, minimize the impact on road infrastructure, research and development and ensure the taxpayers do not subsidies costs associated with the impact of program trucks on the highway infrastructure. Incremental road damage is assessed to companies if the proposed vehicle consumes pavement life at a faster rate than the benchmark vehicle that complies with regulation. An engineering analysis is done to determine the incremental pavement costs on an individual and route specific basis. On hauls that involve secondary highways that have thin membrane oil surface (TMS) trucks must be equipped with central tire inflation (CTI) systems that allow tire pressure to be reduced when the vehicle is on the TMS structure. No incremental road damage costs are associated to CTI hauls because the technology reduces the road impact associated with primary weights to the impact of secondary weights.

The Ministry participates in research and development projects to look at trucking configurations that are new and innovative. Mechanistic evaluations are used to analyze the stability vehicle. This analysis uses the seven vehicle performance measures recommended by the vehicle weight and dimension study conducted by the Transportation Association of Canada (TAC). The specific measures used include load transfer ratio, static roll stability, rearward amplification, low speed off-tracking, high speed off-tracking, high speed dynamic off-tracking, and friction demand.

The Ministry's bulk haul program partners with container moving companies to better optimize urban access to intermodal facilities. These partnerships allow shippers to safely move multiple containers at once therefore reducing the number of trucks required to move containers between offloading facilities and urban manufacturers. This also lower costs on small quantity slot containers for backhauling or moving between IMFs which lowers the transportation costs for low value commodities like pulse crops.

CONCLUSION

Saskatchewan's IMFs enhance the movement of goods through efficient and seamless methods of transferring containers between trains and commercial trucks. In Saskatchewan, because of its geographical nature of highly populated urban hubs and less populated rural spokes there is an economic advantage for rail to cooperate with the trucking industry instead of competing. Centralized locations in Saskatoon and Regina utilize higher frequency of service between all origin-destination pairs in the network and a more efficient utilization of resources. At a hub, freight is consolidated into larger flows that are routed to other larger hubs by high frequency, high capacity transportation services like rail. Rail dominates in the long distance bulk commodity marketplace where trucks are less efficient and where transit times are less of a concern. Lower frequency services are operated between closer hubs and consumer-destination terminals, in smaller communities, would be best served by commercial trucks. Many of these locations are no longer serviced by main rail or short line service. Trucking dominates in the short distance, time-sensitive, small shipment marketplace. Because of its flexibility and efficiency, trucking is ideally suited for the just in time movement of high value added manufactured goods. It will be eventually the cooperation between trucking and rail that will determine the success for intermodal transportation in Saskatchewan.

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