Municipal Actions to Improve the Efficiency of Goods Movement

Overview

Efficient goods movement is crucial to supporting Canada's export driven economy and providing for domestic needs and wellbeing. However, goods movement can come at a cost to urban neighbourhoods, where the majority of Canadians live and where the dense built environment amplifies the negative impacts associated with commercial truck shipping.

Two case studies presented here highlight approaches municipalities undertook to manage urban goods movement in Vancouver, British Columbia and Sherbrooke, Quebec. These demonstrate opportunities to manage inner-city truck travel and deliveries, reduce distances travelled by freight trucks, optimize routing and loads, and integrate consolidation into strategies.

Beyond trucking, modal shifts to rail, marine and even human powered transport need to be considered as part of long-term solutions to goods movement in cities.

Resources

Study Addresses Trucking Inefficiencies. City of Sherbrooke, Quebec. Green Municipal Fund Case Study. www.sustainablecommunities.ca/Search/PDF/GMEF2790_CS_e.pdf

City of Vancouver – Host City Transportation Plan. http://olympichostcity.vancouver.ca/pdf/Host City Transportation Plan Brochure - October 2009.pdf

Contacts

Alain Rajotte, Sustainable Development Service, Ministry of Transport of Quebec 418-644-5607, # 4163
Alain.Rajotte@mtq.gouv.qc.ca

Eric Mital, Transportation Engineer, City of Vancouver 604-871-6528
eric.mital@vancouver.ca

Context

The movement of goods is an important part of the transportation landscape in Canada. With an export driven economy and domestic demand for consumer and industrial goods over an expansive geography, the need for efficient and sustainable transport strategies is crucial both for the health of urban environments and for supporting local, provincial and national economies.

The need for efficient goods transport is especially sensitive in cities - where 80% of Canadians live. Municipalities have a key role to play in managing how these impacts are felt in urban areas. This includes coordination between the different jurisdictions and agencies involved in inter-city shipping, as well as management of local area transportation systems through such measures as land-use planning, route allocation, noise and emission controls, etc..

The past twenty years have seen a shift away from the dominance of rail and marine transport towards greater reliance on trucking, primarily brought about by increased cross-border trade with the United States (US) and demand-side influences (e.g., the trend towards just-in-time shipping). Still, 40% of Canadian freight transport is moved by rail, 30% by marine transport, and the remaining 29% by commercial trucks[1]. Trucking is especially relevant to the context of urban goods movement, as it is the most common form of transport in cities for freight on

[1] Greenhouse gas emissions and the surface transport of freight in Canada. Paul Steenhof, Clarence Woudsma, Erik Sparling. 2006.

the final leg of their journeys to commercial recipients.

While urban transport is a necessary part of contemporary Canadian life, it brings a range of negative impacts to cities. The transportation sector in Canada accounts for approximately 25% of total greenhouse gas (GHG) emissions. "Heavy-duty" transport trucks are responsible for approximately 27% of that total, while rail and domestic marine each account for between 3% and 5% of transportation emissions[2]. Shipping road and rail infrastructure cuts through urban neighbourhoods with side effects that include noise, congestion, accident risk, and air pollution in addition to general liveability impacts. Marine transportation infrastructure impacts urban water bodies and waterfront landscapes.

There are a range of strategies that can be used to encourage positive goods movement practices and mitigate negative impacts – from land use regulations, scheduling and logistics to information technologies and modal shifts. Implemented effectively, these can reduce environmental impacts, improve local quality of life and contribute to improving economic competitiveness in the global marketplace.

The cities of Vancouver and Sherbrooke provide useful contexts for understanding approaches to the management of urban goods movement. Like most urban centres, dense resident populations and a concentration of businesses in Vancouver's downtown core creates demand for goods transport on inner-city streets. As host city for the 2010 Winter Games, Vancouver welcomed over a quarter million visitors over a two-month period. Managing this increased demand on local infrastructure while ensuring the smooth and efficient running of the Games presented a number of transportation challenges.

Sherbrooke is a medium sized city (2009 population of 153,384) in southern Quebec. It is serviced by a number of provincial highways and the TransCanada Highway, providing east-west connections and links to the US. It is also served by three rail freight lines - Quebec Central Railway, the St. Laurent and Atlantic and the Montreal, Maine and Atlantic Railway.

Policy context

The policy context for urban goods movement in Canada has traditionally been shaped around considerations for economic prosperity. More and more, however, issues such as climate change, public health and safety, and quality of life are having a greater influence. Signalling this shift, the Government of Canada announced in May of 2010 that it plans to regulate GHG emissions from "heavy-duty vehicles" starting in 2014[3].

Still, the transportation of goods continues to receive less attention than the transportation of people, in terms of the related health, social and environmental concerns and opportunities for policy innovation.

The development of policy around urban goods movement is complicated by the cross boundary nature of shipping: goods movement occurs in and out of cities, between regions and provinces and across international boundaries. Addressing this requires a coordinated approach, not only between various levels of government, but also with private industry.

The shipping sector also lacks data in urban areas. While statistical information exists for Canada-wide shipping (origins, destinations, load factors), there is little data for intra-urban areas. This makes planning, as well as monitoring and evaluation, difficult.

A number of policy tools are available, including pricing and tax policies (e.g., weight-distance charges, fuel pricing options, etc.), land use regulations, design standards for loading infrastructure, emissions standards, and time of day regulations.

[2]Government of Canada, Canada's Action on Climate Change, www.climatechange.gc.ca

[3]Government of Canada, Canada's Action on Climate Change, www.climatechange.gc.ca

Municipalities specifically have opportunities to support urban goods movement through local bylaws (e.g., noise, idling, emissions), land use designations (e.g., industrial areas to support freight consolidation) and the management of parking and loading zones. Municipalities are also central to coordinating with other levels of government to manage passage on provincial and federal level highways through cities and regional transportation authorities to designate trucks routes and associated regulations.

Current transportation policy in the City of Sherbrooke is guided by the 2002 Estrie Transportation Plan (the larger Sherbrooke region, encompassing a population of 288,250 and a total area of 10,183 km^2.) Reducing environmental impacts of transportation was set out as a major concern in this plan. The project reviewed in this case study was designed with the long-term goal of informing municipal policy around goods movement.

Hosting the 2010 Winter Games required a number of substantial changes to City of Vancouver policies and bylaws, including measures to manage public, private and goods transportation. Transportation demands to and from downtown during the Olympics were predicted to be on average 30% greater than weekday norms. This was compounded by measures, such as road and area closures, required for security and to ensure the efficient flow of resources, staff and athletes during the Games.

A Host City Transportation Plan was developed with three goals in mind: 1) achievement of a successful and sustainable Olympic Games, 2) a functioning urban city, and 3) a lasting transportation legacy. The plan summarized changes for cyclists and pedestrians, public transport and road networks, including goods movement and deliveries.

Transport truck travelling heading into Sherbrooke, QC
(photo by: www.hankstruckpictures.com)

Rationale and objectives

Increasing the efficiency of urban goods movement is important for reducing emissions, accident risk, congestion, and noise. It is also important for improving air quality and neighbourhood vitality, as well as the corporate and public bottom line.

Strategies for managing urban goods movement may take the following objectives into consideration:

- **Reduce GHG Emissions** – The growth in GHG emissions from freight trucking has outpaced all other transportation sources since Kyoto baselines were established in 1990. The overall increase totalled 60% between 1999 and 2001 (compared with rail and marine emissions which grew by just 5%). Almost all transport trucks rely on diesel fuel, which burn more GHGs per litre than gasoline[4].

- **Reduce air pollution** – Apart from GHGs, truck vehicle emissions create ground-level ozone, contribute to smog and impair air quality. Nitrogen oxides and particulates are the main contributors to air quality issues.

- **Reduce congestion** – One study found that congestion in urban areas costs

[4] Diesel emits 2.62kg CO2 per litre burned compared with 2.34kg CO2 for gasoline. Review, Sherbrooke.

Canadians between $2.3 billion and $3.7 billion per year (in 2002 dollars). More than 90% of this cost is due to time lost in traffic to drivers and passengers; seven percent occurs because of fuel consumed; and three percent is from increased GHGs[5].

- **Improve quality of life** – Roadways used by heavy truck traffic tend to be less hospitable for local resident uses. Noise levels associated with truck traffic is one of the most cited impacts to local neighbourhoods. Walkability, aesthetics, local business viability and community cohesion are also typically compromised along these corridors. Furthermore, while the rates of crashes with transport trucks are relatively low they tend to cause greater damage per incident[6].

Actions

The two case studies presented here highlight municipal approaches for managing inner-city truck travel and deliveries, reducing distances travelled by freight trucks, optimizing routing and loads, and integrating consolidation into strategies.

Vancouver, BC
The Host City Transportation Plan developed by the City of Vancouver included several policy changes affecting the movement of goods, in particular deliveries in the downtown core. It also relied on a coordinated communication strategy and the voluntary cooperation of affected businesses to ensure successful outcomes. Public engagement with residents, institutions and businesses played a role in the strategy development, alongside technical expertise from City staff.

Underlying all actions was a targeted 30% reduction in vehicle demand in downtown Vancouver.

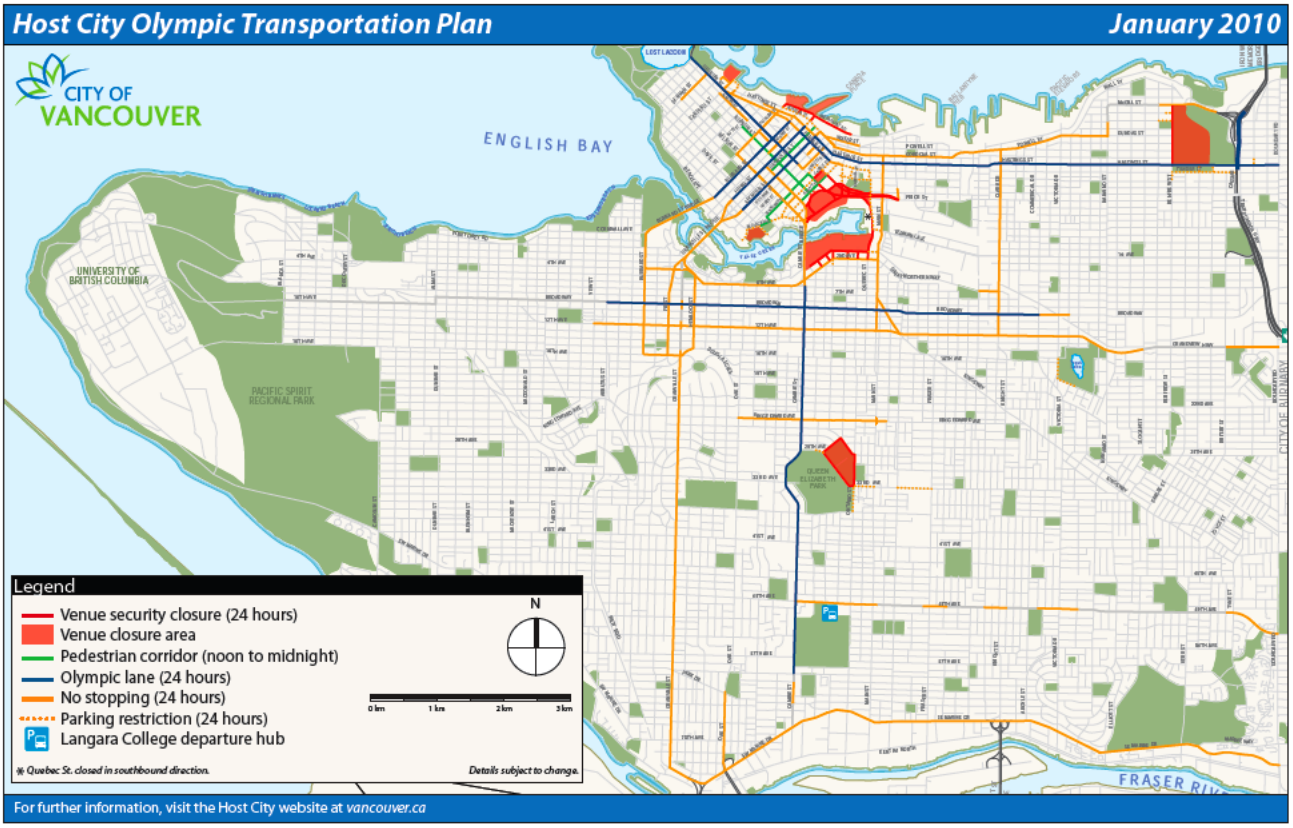
The bylaw changes required for the Olympics involved temporary amendments to and relaxation of existing bylaws. Relevant changes were consolidated into a 2010 Winter Games By-law. Several of these, described here, impacted the movement of goods in the city.

- Street and traffic by-laws were introduced to allow closures around security areas, Games venues, City-sponsored "LiveCity sites," temporary pedestrian-only areas, as well as on designated routes to, from and between Games venues.
- The City's existing noise control by-law was amended to allow deliveries within the downtown area 24-hours a day, 7-days a week. The noise by-law change was applied between February 1 and 28, 2010.
- Truck routes were temporarily added to accommodate road closures.
- Three new routes were put into effect for the time between February 1 and March 21, 2010:
  - Hastings Street: Main Street to Burrard Street
  - Nelson Street: Burrard Street to the Cambie Bridge
  - Smithe Street: Cambie Bridge to Burrard Street

The City also developed a number of strategies to encourage downtown businesses to alter operations to reduce inconveniences.

- The City communicated the forecasted increased demands on road networks and venue operation hours to businesses and recommended that deliveries be scheduled for between midnight and 6am. If this was not possible, scheduling deliveries before noon was encouraged as the next best option.
- Games time street-use was closely managed by the City. In some cases, loading and parking zones were relocated to adjacent streets and lanes, consolidated or temporarily removed. The City worked with businesses to ensure reasonable access throughout, though in some cases feasible accommodations could not be made.

[5] http://www.tc.gc.ca/eng/mediaroom/releases-nat-2006-06-h006e-2353.htm
[6] Victoria Transport Policy Institute http://www.vtpi.org/tdm/tdm16.htm



Vancouver Host City Transportation Plan Map

- Businesses were generally encouraged to reduce their transportation requirements during the Games by ordering goods in advance, scheduling periodic or seasonal maintenance prior to February 1, 2010, and consolidating orders to minimize vehicle trips.

Sherbrooke, QC

In 2006, the City of Sherbrooke co-funded a study initiated by the University of Sherbrooke (CEREF) to assess load factors in the local trucking transport industry. The aim was to identify options for load optimization that would reduce fuel consumption and ultimately, GHGemissions. It is important to note that while the actions highlighted in this case were undertaken by private carriers, this project shows that municipalities can play an important role in providing information that improves the way in which urban goods are moved.

Prior research had shown that Canadian trucks on average carried loads at no more than 50% capacity (1999). Given that 80% of fuel consumption is attributable to moving the truck itself (rather than the load) optimizing loads and reducing overall travel was seen as a promising intervention for reducing overall GHGemissions related to fuel consumption.

A research phase for the project included a literature review of current trucking data and a survey of the 155 biggest employers in the Sherbrooke area. Seven local companies participated in specific case studies aimed at identifying transportation issues and options for improving performance.

While the specific actions undertaken varied from company to company, several general approaches are worth highlighting here:

- Working with participating companies and the University of Sherbrooke optimization scenarios were developed to assess how to reduce employ backhauling by linking different needs.
- Evaluations were undertaken to assess the costs and benefits of scenarios designed to optimize the load factor and, in so doing, reduce GHG emissions. Beyond GHG

emissions, savings in terms of costs related to tire wear, maintenance and repairs and fuel were also measured.
- Road transportation simulations were developed using the Interface-Map software. The MaxTour module was used to identify itineraries that would reduce the distance of empty backhauls and evaluate the benefits of using multiple-commodity trailers.
- Benefits associated with reducing weights of production being hauled were explored (e.g., drying products before shipping).
- Research was conducted into the potential gains associated with an Urban Distribution Consolidation (UDC) centre in Sherbrooke in order to scope a framework and build support for a project.

For one local business it was found that savings of $1 million per year could be achieved through investments in better logistics. By having a truck travel between one drop-off and one pick-up location, they could prevent having loads entering and leaving urban areas empty. The company felt however that this caused added complication and risks around contamination (i.e., goods from one shipment being accidentally mixed with goods intended for another business) were not worth the savings.

Resources

Vancouver, BC
Significant resources were required to ensure safe and effective transportation during the Vancouver Olympic Winter Games. Within the City of Vancouver, a dedicated Olympic Transportation Branch was created four years in advance of the games to plan for and manage all Games related transportation matters. In addition to this, resources from all over the City contributed to planning for the Games. A Transportation Operations Centre was established during the Games to manage daily operations and to address unexpected issues that could arise. Goods movement to support the Games themselves was managed by the Vancouver Olympic Organizing Committee VANOC and supported by the City through road closures and street-space allocation at venues.

Partnerships were also essential. In addition to the ongoing close collaboration with VANOC and the Integrated Security Unit, The City of Vancouver liaised with the British Columbia Trucking Association and downtown business organizations to communicate expectations and strategies for avoiding major inconveniences as a result of Games related changes.

Sherbrooke, QC
The total cost of the Sherbrooke study was $124,790. The Green Municipalities Fund contributed $59,895 in funding to the project. Additional partners included the City of Sherbrooke, the Centre for the Study of Regulatory Economics and Finance at the University of Sherbrooke, Natural Resources Canada, the Quebec Ministry of Transport and the Quebec Ministry of the Environment.

Results

Vancouver, BC
A monitoring program developed by City staff provided a baseline for pre-Games travel behaviour. Data was collected throughout the Games period and following to determine changes in travel demand. This included vehicles counts for transport/ delivery trucks that helped to assess the effectiveness of policy and strategies for goods movement during the Games.

Results showed that there were fewer overall truck trips into the downtown core during the Games. Total truck volumes decreased by 37% overall. Trips into downtown between midnight and 6am however almost doubled.

While specific feedback from residents was not gathered, the City feels the goods movement related changes during the Games did not overly burden public well-being. The fact that the Games were the largest special event to be hosted in Vancouver, and the large amount of messaging created to manage expectations, likely influenced resident's and businesses' receptiveness to unconventional solutions (e.g., 24-hour deliveries, etc).

Strategies to encourage overnight freight deliveries could provide a useful solution for major cities or neighbourhoods experiencing significant congestion. While Vancouver has not continued this post-Games, cities like New York have explored how off-peak deliveries can reduce costs and impacts to the environment and human health.

Sherbrooke, QC
Data from each of the four participating companies was reviewed to assess existing load factors versus optimization scenarios in order to understand the potential impact on fuel consumption.

The results were compelling. Findings suggested potential fuel consumption savings of 22% to over 47%, or an average of about 37%, if measures such as backhauling, revised scheduling and logistics, or outsourcing were implemented. For one company it was found that load factor improvements could result in over $1 million in cost savings and reduction of GHG emissions of over 2,500 tonnes in one year.

It also became clear that a number of challenges stood in the way of the City of Sherbrooke being able to effectively promote these changes. The City's jurisdiction is limited to traffic-related issues, which hampers its ability to promote or incentivize the goods movement program. A lack of relevant data on the movement of goods within Sherbrooke itself also limited project uptake.

While the study provided information for private companies on the potential for internal costs savings and GHG emission reductions, implementing the changes proved difficult. For instance, companies were concerned about risks around mixed orders (order contamination) when different load types were combined. There were also added coordination requirements to work with other companies or product lines. It was also noted that the price of gas is not high enough to create price signals that would encourage more efficient transport.

Challenges

The following section presents challenges relevant to sustainable urban goods transportation, including those highlighted in the case studies but based on experience from beyond these as well.

- **Data and communications** – While a good range of data is available on origins, destinations and loads for cross-country shipping, this data is lacking for intra-urban shipping. Private trucking dominates urban areas and Statistics Canada has not collected data on private trucks since 1998. Real time communication and data acquisition technology is needed for effective logistical planning and route optimization. The availability of necessary data is also limited by the confidentiality of private company information. Shipping details can sometimes be related to competitive activities, in which case companies are not likely to share this information.

- **Jurisdictional coordination -** Jurisdiction over transportation in Canada is complex. The federal government's role is limited primarily to the inter-provincial and international movement of passengers and freight, construction regulations for vehicles, and funding for infrastructure projects. Provinces are largely in control of all other transportation issues, including standards for mitigating the environmental effects of transport. Increasingly however, responsibility for goods movement and transportation is being transferred to the local level. None of these levels of government can create effective sustainable strategies alone - a coordinated approach is needed to bring public and private stakeholders together.

- **Awareness** – There is a general lack of awareness among policy makers and within the public at large around the importance of urban goods movement, its impacts, and opportunities for improvements. A large

majority of transportation policy is devoted to passenger transportation with inadequate consideration given to goods movement.

- **Demand-side factors -** The transport industry has seen a shift in how customer inventory is managed. Just-in-time delivery is replacing traditional warehousing with strategies for more frequent, smaller deliveries. One estimate suggests that 'just-in-time' delivery systems involve about twice the transport fuel use of what are described as "efficient non-JIT logistics"[7].

Best Practices

- **Shift modes**: Trucking has greater per unit energy requirements than either rail or marine transportation (up to ten times more in some cases). Shifting away from trucking can help reduce congestion on inter-city roads, reduced the number of roads needed, and consolidate environmental impacts (potentially making impacts easier to manage and mitigate). Shifting to human-powered transportation should also be considered where possible. An example of this is Pedal Express - a human-powered cargo delivery service in the San Francisco Bay. It operates a fleet of cargo bicycles capable of carrying up to 700 pounds each.

A commercial bike delivery in Portland, Oregon
(photo by: mmrhanna)

- **Work with industry:** Some successes have been achieved in the US with voluntary agreements. Through the SmartWay voluntary partnership, the Environmental Protection Agency is working with various freight industry sectors to create incentives for fuel efficiency and GHG emission reductions. The program has three main target components: fleet management, idling and rail/ intermodal shipping.

- **Inter-governmental coordination:** Coordinated strategies, incorporating all levels of government, are needed to address the trans-boundary nature of the transport industry. The Ontario-Quebec Trade and Cooperation Agreement signed in November 2007 set out an agenda for establishing shipping efficiencies between the two provinces to, among other goals, reduce shipping related GHGs. Inter-governmental coordination can include agreements on approaches to improve the accessibility and efficiency of airports, rail and other methods of inter-city transport. Coordinated strategies also need to be formalized into infrastructure development, land use, economic development and other relevant plans.

- **Improve load management:** Trucks travelling empty consume 80% as much fuel and those travelling fully loaded, meaning large gains are to be made in optimizing load factors. Reverse logistics (the management of used materials, including used and reusable packaging, returns, and waste) can be facilitated to increase efficiencies. HBC is a company that has taken a leadership role on this, by pledging to eliminate the movement of empty trailers through backhauling with partners in need of complementary shipping. Several studies found that load factors are best managed from within companies rather than through government policy or programming.

- **Consolidate deliveries**: Consolidation of deliveries is emerging as an important tool for solving problems, but little attention is

[7] Sustainable Transportation Monitor. Centre for Sustainable Transportation. April 2001.

being paid to accommodating or facilitating this through policy measures. This approach relies on infrastructure such as freight campuses, logistics centres and reload centres acting as hubs and linking with streamlined inner city delivery services. Fukuoka City in Japan provides an example of successful delivery consolidation. Here over 30 freight operators have formed a co-operative to manage logistics in the high traffic congestion region. As a result, the number of freight vehicles has been reduced by 67% and freight vehicle kilometers travelled has been reduced by 87%.

- **City logistics**: Building on consolidation activities, city logistics links with consolidation centres outside the city and manages logistics for local delivery. Local governments, chambers of commerce and large haulers partner to create facilities to provide coordinated delivery services within the city. Consolidation at the city level can facilitate standardization of shipping within urban centres and streamline efforts to employ technologies such as noise emission reduction features. To be competitive, the quality of service needs to be better than average. This type of service benefits municipalities (less spending on roads), citizens (less noise and pollution), railways (new inter-city traffic), and shippers (reduced costs). Manhattan, where the last leg of deliveries is sub-contracted to local carries, also provides a valuable example of this approach.

- **Use new technologies for more efficient goods movement:** Federal government initiatives in both the US and Canada are already in place to stimulate advanced technology adoption. These include increased aerodynamics, weight reductions, reduced engine friction, improved engine and transmission designs, more efficient tires, and more efficient accessories. In addition, Intelligent Transportation System (ITS) technologies aim to increase transportation system integration, improve efficiency, safety, productivity and general mobility, while reducing threats to travel safety and security.

- **Supporting road infrastructure:** Adequate logistic facilities need to be provided including adequate on- and off-street loading areas to promote trans-shipment facilities and to facilitate e-commerce. Along with the delivery consolidation cooperative established in Fukuoka City, Japan, freight only parking meters were also installed at designated loading areas.

Lessons Learned

These case studies, as well as a general review of actions being taken in the goods movement sector in Canada and internationally, reveals a number of important lessons. These include:

- **Build awareness of goods movement sector and opportunities for efficiency:** As previously stated, the goods movement sector receives less attention than passenger transportation. Private companies and policy makers alike need greater exposure to pilot projects, demonstrations and interventions that have been implemented in order to better understand alternatives and make informed decisions about what is best in specific situations. Efforts should also be made to distinguish those actions that are best carried out within private companies and those that will be effective through delivery by local governments. As a starting point, more examples, pilot and demonstration projects are needed to build momentum and encourage action.

- **Explore demand-side opportunities:** Demand-side influences, including trends such as just-in-time shipping are playing a large role in shaping the transport industry. These need to be better understood and taken into consideration when designing strategies to improve the environmental performance of the trucking industry.

- **Be wary of relying on price signals alone to achieve compliance:** Strategy-makers

need to be weary of reliance on pricing approaches to influence change. The Sherbrooke study found that the price of gas was not high enough to create price signals that would encourage more efficient transport. Research has shown that even with a three-fold price increase, the sector would be unlikely to change shipping patterns to increase fuel efficiency.

Sources

Study to Address Trucking Inefficiencies. City of Sherbrooke, Quebec. Green Municipal Fund Case Study.

Host City Transportation Plan Brochure. City of Vancouver. October 2009.

Host City Olympic Transportation Plan: A Sustainable Legacy for Vancouver. October, 2010.

www.sustainablecommunities.ca/Search/PDF/GMEF2790_CS_e.pdf

Reducing Greenhouse Gas Emissions from Truck Activity in Urban Areas - Overview of the Literature and Available Data. DRAFT. 2005.

Sustainable Urban Transportation - A Winning Strategy for Canada. Conference Board of Canada. May 2007.

Victoria Transport Policy Institute http://www.vtpi.org/tdm/tdm16.htm

Greenhouse Gas Emissions and the Surface Transport of Freight in Canada. Paul Steenhof, Clarence Woudsma, Erik Sparling. 2006.

Dispatch – Bridging the Gap Between Government, Industry and Education. Spring 2009.