

FOUNDATIONAL RESEARCH BULLETIN

SUSTAINABILITY BY DESIGN
*A comparison of two transportation
expenditure strategies.*

No. 8
May 2009

One Port Mann Bridge Or An Entire Light Rail Network?

Professor Patrick M. Condon, Kari Dow



Figure 8-1: Traffic congestion leading up to the Port Mann Bridge has motivated plans to build a new bridge and widen the highway at either end.

Purpose

This bulletin explores the application of European modern tram technology as an alternative to highway expansion. Specifically, it examines the relative advantage of spending public funds in excess of 3 billion dollars for bridge and highway construction to provide freeway access to Vancouver versus spending the same amount for an easily accessible light rail system to serve the entire South of Fraser region.

Background

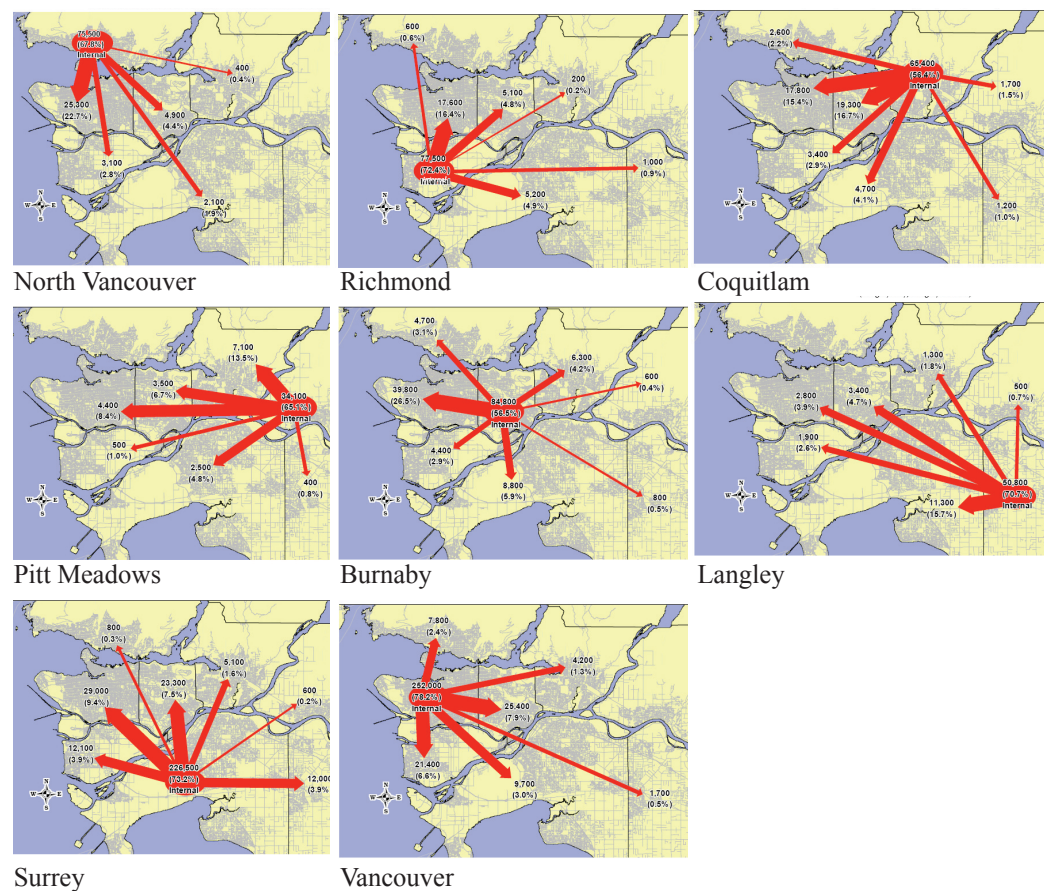
On January 31, 2006 the British Columbia Ministry of Transportation launched the Gateway Program, a regional transportation initiative aimed at combating congestion in Metro Vancouver. As one component of this program the provincial government originally planned to twin the Port Mann Bridge, a length of the Trans-Canada Highway that spans the Fraser River and connects Coquitlam to Surrey. In 2006 when the project was first proposed, the cost of twinning the Port Mann Bridge and widening the highway at either end was estimated at \$1.5 billion. Between 2006 and 2009 this budget has more than doubled, consequent to increased construction costs and a 2008 decision to completely replace the existing Port Mann Bridge rather than twin it. During this same period, global financial turmoil threatened private investors, forcing the Province to assume 100% of the financial responsibility for a project that was originally intended to be entirely privately financed. Today, the Province is poised to spend approximately \$3.1 billion to build a new Port Mann Bridge and widen the road on either end.

This brief study attempts to use these emerging financial circumstances as the basis for a cost comparison between two very different transportation strategies. It is provoked by a desire to more fully understand what would be the most appropriate way to expend limited transportation funds to maximize the public benefit.

The widening of the Port Mann Bridge has been posited as an answer to growing congestion in the central part of the region. This strategy has been called into question due to a number of emerging factors. The first is a direct result of the changing financial situation described above. With the Province

taking full financial responsibility for the project, many question how our limited public funds can be best managed for the public good? Second, the commuting patterns of the region are no longer from suburb to centre. In the past decade the majority of employment growth has occurred outside of regional town centres, including the downtown core. Between 1996 and 2001, 7% of new office jobs were based in regional town centres while almost 50% went into suburban business parks, located primarily in Burnaby, New Westminster and Richmond (BC Ministry of Transportation, 2006). This has resulted in more complex, many-to-many travel patterns as people and jobs become increasingly dispersed (Translink 2004). With this web-like commute pattern would it be propitious for us to consider a system more suited to moving people in all directions rather than in just one?

Figure 8-2: Shows commute patterns of daily trips by origin. This illustrates the more complex, many-to-many travel patterns found in Metro Vancouver.



This study is not meant to exhaustively examine the costs and benefits of either strategy, but to simply provide some concrete benchmarks such that the regional conversation will be enriched. Two scenarios are illustrated. The first shows current plans by the Province to build a new Port Mann Bridge. The second shows what could be accomplished if the public funds intended for the bridge were instead put towards investment in state of the art public transit.

Scenario 1: A New Port Mann Bridge

The first scenario is based on current plans to build a new 10-lane crossing over the Fraser River at a cost of about \$3.1 billion. The 37-kilometer project includes widening Highway 1, adding two lanes each way on the east side of the bridge and an extra lane in both directions on the west side. Congestion-reduction measures such as HOV lanes, transit and commercial vehicle priority access to highway on-ramps, improvements to the cycling network and electronic tolling on the Port Mann Bridge are also included. This first scenario is shown below.



Figure 8-3: The Port Mann Bridge project includes widening the highway, construction of a new Port Mann Bridge (shown above), and improvements along Highway 1 from the McGill Interchange in Vancouver to 216th Street in Langley, a distance of approximately 37 kilometres.





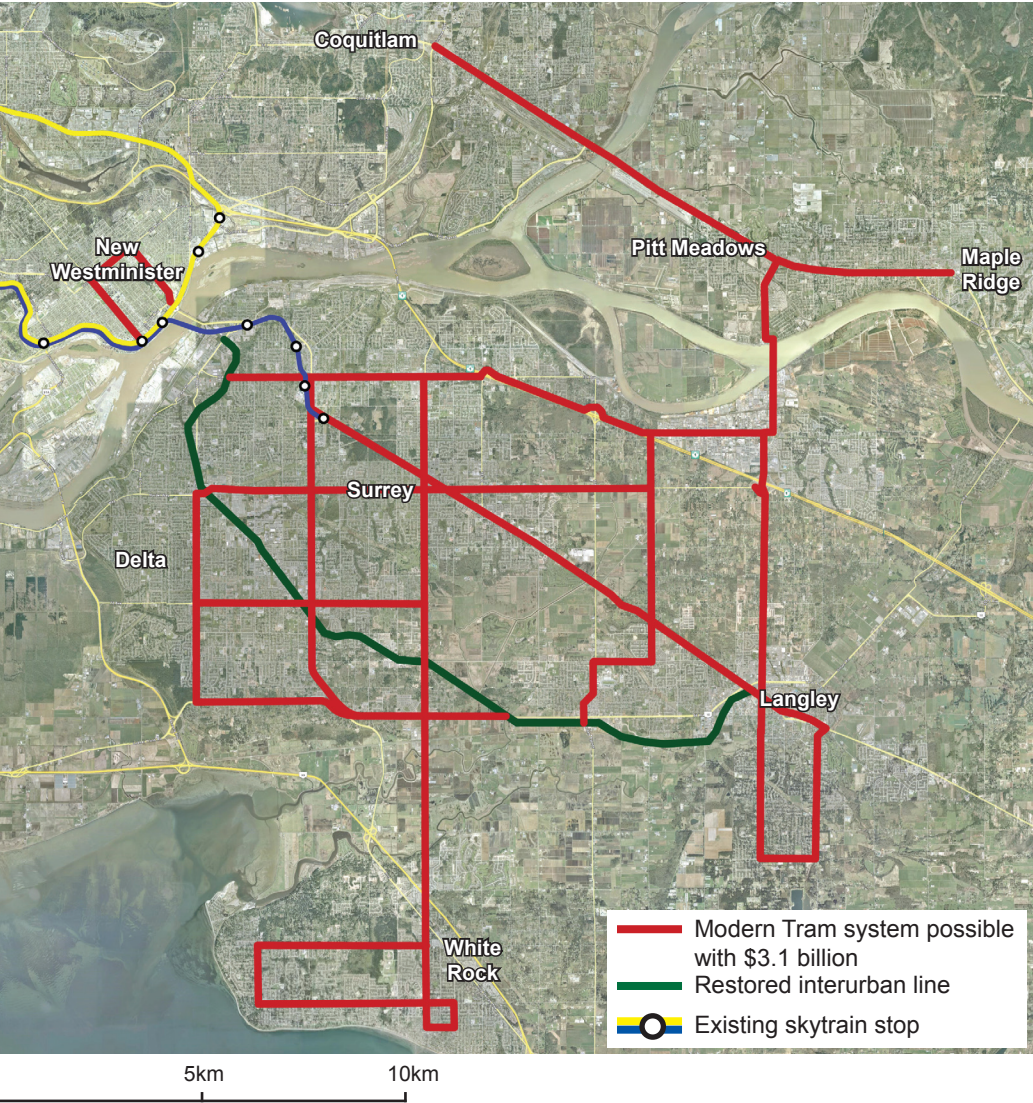
Figure 8-4: An example of a modern tram in Budapest.

Scenario 2: A Modern Tram Network

The second scenario is based on a light rail, or modern tram, network modelled on similar systems recently built in many European cities (including Basel, Budapest and Zurich). The existing arterial network and railway right of ways provide the underlying structure on which to base the system. This eliminated the need for additional bridges or ROW acquisitions. Data from Portland formed the basis for cost estimates per double track kilometer of modern tram network. The potential extent of a new light rail network was determined by dividing the \$3.1 billion intended for the new Port Mann Bridge by the cost per kilometer for a new modern tram line.

When we examined the consequence of reallocating these same funds we found that for the same money, the government could finance a 200-kilometer modern tram network that would place 80 per cent of all the residents in Surrey, White Rock, Langley, and the Scott Road district of Delta within a 10 minute walk of a modern, European-style tram. In addition, it would provide a connection from Surrey to the new Evergreen skytrain line and connect Pitt Meadows and Maple Ridge to a regional tram system.

Figure 8-5: The diagram to the right shows the extent of light rail transit (nearly 200 km) you could finance for the same price as the freeway widening and replacement of the Port Mann Bridge.



Greenhouse Gas Consequences

Global concern over greenhouse gas emissions has prompted our provincial government to set some of the most ambitious GHG emission reduction targets in North America. The Province has thus far depended on improvements in vehicle emission standards and technology as the primary means of reducing traffic-related GHG emissions. But is this enough?

Although there is always inherent uncertainty in any projections about the future, it is safe to assume that highway expansion projects tend to increase the demand for auto use and act as a disincentive to transit use (Litman, 2005; Hansen & Huang, 1997). This happens for a large number of complex reasons that won't be discussed in detail here. Suffice it to say that highway expansion temporarily makes it easier for people to drive and so they do. Over the long term, highway expansion tends to spur new, auto-oriented development which adds commuters and general traffic to the road system.

If only half of the approximately 40 million annual trips anticipated for the new Port Mann Bridge were captured by the tram system illustrated in scenario 2, it would mean a reduction of nearly 10,000 metric tons of GHG per year, the equivalent of taking more than 21,000 cars off the road completely. This amount likely pales in comparison to the total reductions of car use throughout the South Fraser region that would result from the extensive modern tram network. The significant decreases in carbon emissions associated with shifting trips from autos to trams are illustrated below, along with other competing modes.



Figure 8-6: Air pollution from automobiles over the Fraser Valley. Photo: Environment Canada

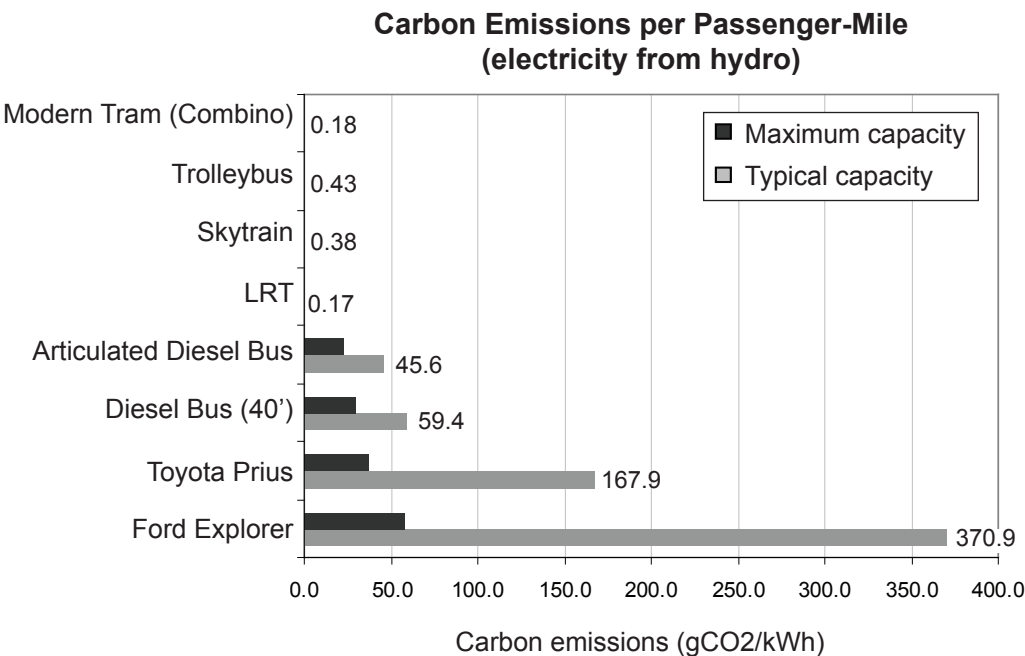


Figure 8-7: Although all forms of public transit exhibit much lower carbon emissions per passenger-mile than personal vehicles, light rail or modern tram score best overall as a result of their energy source, low frictional resistance and ability to capitalize on regenerative braking technology, which allows them to convert the kinetic energy of the vehicle in motion to electrical energy when it brakes.

Source: Strickland, 2008; EPA, 2005; Spadaro et al. 2000

Conclusion



Figure 8-8: Passengers loading onto a modern tram in Portland, OR.

This study explores one potential alternative to a very large investment of public funds in highway expansion. It shows that with the money currently earmarked for the construction of a new Port Mann Bridge, the Province could build 200 kilometres of double track, modern tram lines throughout the South Fraser Region, bringing nearly 80% of all residents within a ten minute walk of a tram line. There can be no doubt that this would have a transformative effect on this emerging landscape, and provide a strong inducement to move from auto dependence to transit reliance. If we in this province cannot imagine dramatic changes in our urban landscape, such as this example, there seems little hope that we can meet our GHG reduction goals, and create the complete and walkable communities anticipated in the Livable Region Strategic plan.

References

- EPA, 2005. Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. EPA420-F-05-001 February 2005.
- BC Ministry of Transportation. 2006. Gateway Program Definition Report. January 31, 2006.
- Hansen, Mark and Y. Huang. 1997. Road Supply and Traffic in Urban Areas: a Panel Study, *Transportation Research*, Vol. 31A, pp.205-218.
- Litman, Todd. 2005. *Induced Travel Impact Evaluation: Evaluating impacts of increasing roadway capacity to the Island of Montreal*. Victoria Transport Policy Institute.
- Spadaro, Joseph, V., Lucille Langlois, and Bruce Hamilton. 2000. Greenhouse Gas Emissions of Electricity Generation Chains: Assessing the Difference. IAEA Bulletin 42/2/2000. IAEA Planning and Economic Studies Section, Department of Nuclear Energy.
- Strickland, James. 2008. Energy Efficiency of different modes of transportation. Available online: <http://strickland.ca/efficiency>
- Translink. 2004. *Greater Vancouver Trip Diary Survey*. Translink: Greater Vancouver Transportation Authority.



THE UNIVERSITY OF BRITISH COLUMBIA
School of Architecture + Landscape Architecture

Contact us
SUSTAINABILITY BY DESIGN
Design Centre for Sustainability
School of Architecture and Landscape Architecture
394 - 2357 Main Mall, Vancouver, BC
Canada V6T 1Z4

FUNDING PARTNERS



For more information please visit our website at:
www.sxd.sala.ubc.ca